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PUBLIC SERVICE COMMISSION OF WISCONSIN
WISCONSIN DEPARTMENT OF NATURAL RESOURCES

North Appleton-Morgan Transmission Lines Volume 1

Final Environmental Impact Statement

PSC Docket 137-CE-166

Date Issued: December 2014

PUBLIC SERVICE COMMISSION OF WISCONSIN
WISCONSIN DEPARTMENT OF NATURAL RESOURCES

North Appleton-Morgan Transmission Lines

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This final Environmental Impact Statement for the proposed North Appleton-Morgan Transmission Lines project is progress towards compliance with the Public Service Commission's requirement under Wis. Stat. § 1.11 and Wis. Admin. Code § PSC 4.30. It also is progress toward compliance with the Department of Natural Resources requirements under Wis. Admin. Code § NR 150.22.

By: Kathleen J. Zuelsdorff Date: December 2, 2014

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To the Reader

This final environmental impact statement (EIS) fulfills part of the requirements of the Wisconsin Environmental Policy Act (WEPA), Wis. Stat. § 1.11. WEPA requires state agencies to consider environmental factors when making major decisions. The purpose of this final EIS is to provide the decision makers, the public, and other stakeholders with an analysis of the economic, social, cultural, and environmental impacts that could result from the construction of the proposed new 345 kV transmission line, proposed new 138 kV transmission line, and their associated facilities. This document has been prepared jointly by the Public Service Commission of Wisconsin (Commission or PSC) and the Department of Natural Resources (DNR).

Comments received during the comment period on the draft EIS were considered in the preparation of the final EIS. The final EIS will be considered by the Commission when it makes its final decision on this project. AT this time, the Commission decision is expected in April 2015.

Specific questions on the final EIS should be addressed to:

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The Commission decision on the merits of this project will be based on the record of a hearing that will held beginning on February 27, 2015. Written comments will be accepted until Thursday, February 5, 2015. Hearing sessions in the project area for members of the public will be held at:

- Oconto Falls Senior Center Dining Room Area, 512 Caldwell Avenue, Oconto Falls, Wisconsin on Tuesday, February 3, 2015, at 3:00 p.m.
- Seymour City Hall Multipurpose Room, 328 North Main Street, Seymour, Wisconsin on Wednesday, February 4, 2015.

A Notice of Hearing will be mailed by the Commission to affected landowners and other interested persons at least 30 days prior to hearing. The Notice includes the places, dates, and times of the hearing sessions. It will also include additional information about the different methods of testifying/commenting and the deadline for accepting public testimony.

The final EIS and testimony from the public hearing will be included in the hearing record.

If necessary, DNR will hold separate hearings on its water permits or other DNR regulatory actions discussed in this final EIS.

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Executive Summary

On May 1, 2014, American Transmission Company LLC (ATC or the applicant) filed an application for a Certification of Public Convenience and Necessity (CPCN) with the Public Service Commission of Wisconsin (PSC or Commission) under Wis. Stat. §196.491 and Wis. Admin. Code §111.53 for authority to construct and place in operation two new electric transmission lines between its North Appleton Substation in Outagamie County and Morgan Substation in Oconto County and to perform a variety of upgrades and reconfigurations in the transmission system in northeastern Wisconsin.

PROPOSED NORTH APPLETON–MORGAN PROJECT

For its proposed project, ATC would construct one new North Appleton-Morgan 345 kilovolt (kV) transmission line and one new North Appleton-Morgan 138 kV transmission line, as well as reconfigure the existing ATC Morgan-Stiles 138 kV transmission line. The project also would include upgrades to substation facilities in Brown, Kewaunee, Marinette, Oconto, Outagamie, Shawano, and Winnebago Counties in Wisconsin, and Dickinson County, Michigan.

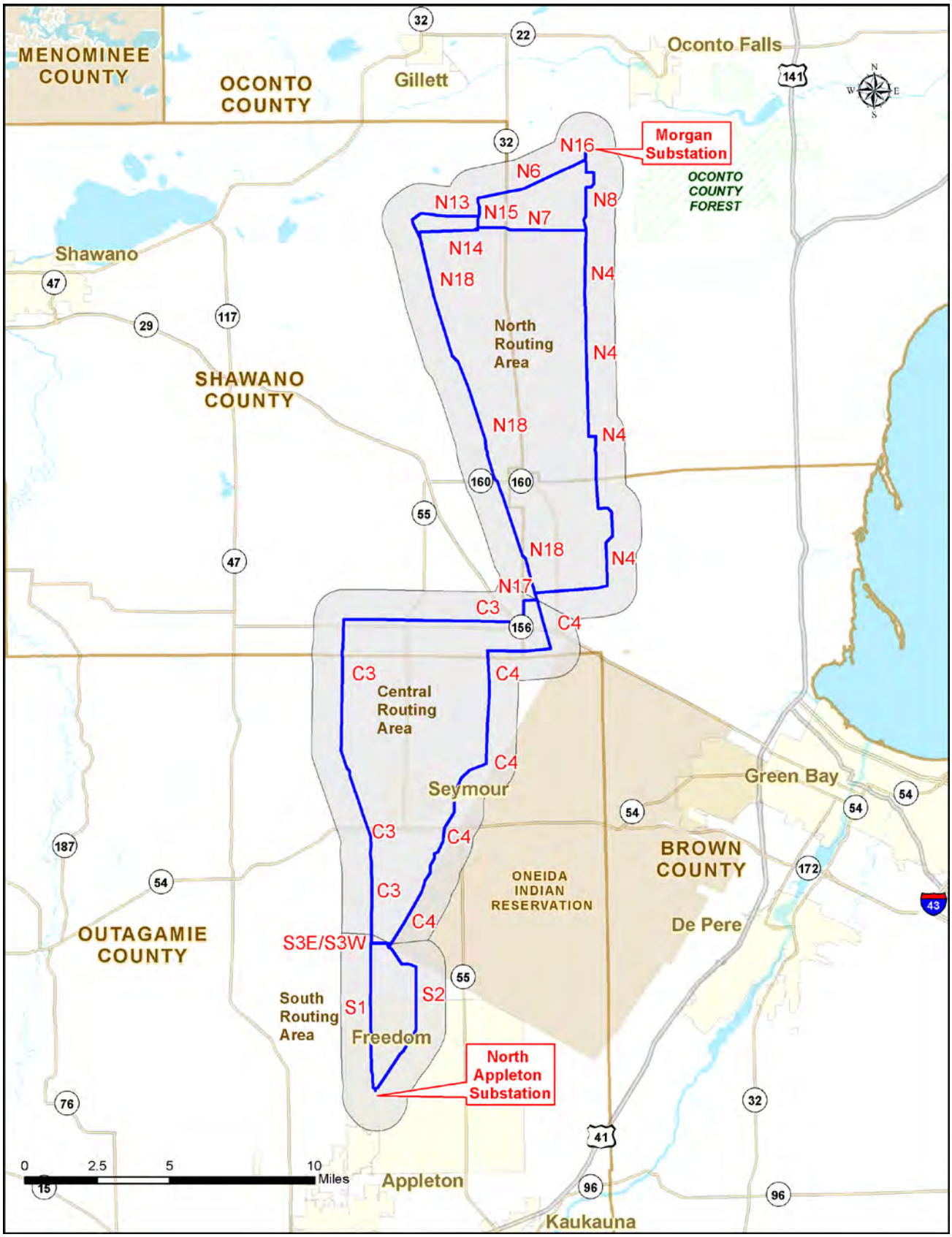
The two new transmission lines would share right-of-way (ROW) with some partially overlapping electric transmission, gas pipeline, and road ROWs and would be constructed on separate sets of monopole structures. The lines would be approximately 40 to 48 miles long, depending on the route ordered by the Commission if the project was approved.

In its application, ATC provides two general transmission route corridors (western and eastern) on either side of the city of Seymour and the village of Pulaski. The proposed route corridors are separated into three geographic "routing areas" ("South," "Central," and "North"), between which the route can switch from west to east or vice versa. The South Routing Area covers the region in Outagamie County from the North Appleton Substation to County Trunk Highway (CTH) EE, the Central Routing Area extends from CTH EE northward to State Highway (STH) 29 in Brown County, and the North Routing Area extends from northeast of STH 29 in Brown County and Shawano County, and terminates at the Morgan Substation in Oconto County. The proposed project potentially involves 13 municipalities and townships.

Each of the three routing areas includes "route sections" that make up the route alternatives, and at least one route section from each routing area is required to complete the overall route alternative. The eastern and western route alternatives intersect at three nodes (between routing areas) and provide 16 different final route combinations (described in the application as Route Alternatives A through P). The Commission may choose any route alternative if it determines that the project should be built.

See Figure ES-1 showing the routing areas and route sections and their location in northeastern Wisconsin.

Figure ES-1 North Appleton-Morgan project routing areas and route sections



Both general transmission routes (western and eastern) follow portions of existing gas pipeline and electric transmission ROW although large portions of some route sections run cross-country and require all new ROW, primarily through agricultural lands. In the South and Central Routing Areas, there are generally two route sections to consider. The North Routing Area has several route sections to consider.

ATC states that a majority of the structures for both the new North Appleton-Morgan 345 kV line and the new North Appleton-Morgan 138 kV line would be single-circuit, self-supporting tubular steel monopole structures. The heights of the new 138 kV structures range from 85 to 100 feet. The heights of new 345 kV structures range from 120 to 135 feet.

If approved, the facilities would be solely owned and operated by ATC. The total project cost would be between $307,356,560 and $326,608,960 depending on the route ordered by the Commission if approved.

The intervenors in PSC docket 137-CE-166, the North Appleton-Morgan docket, include consumer, industry, and environmental advocacy groups, a regional transmission organization, and individual landowners. The Commission has also received many comments from local landowners. The primary issues of concern based on comments received during the scoping process, include: 1) vegetation management within the ROW; 2) individual hardships and property impacts; 3) the need for the proposed project; 4) project design; 5) reliability impacts; 6) project cost; and 7) potential environmental impacts. Technical and public hearings on the project will be held in January and February 2015, and the final Commission decision is anticipated in spring of 2015.

NEED FOR THE PROPOSED PROJECT

Staff analysis of project need is on-going and will be covered in greater detail in the final EIS. The need for the proposed North Appleton-Morgan Project is and will continue to be a subject of scrutiny throughout the Commission's preview process including during the public and technical hearings.

The applicant's stated purpose for the North Appleton-Morgan transmission line project is to provide better reliability to the northeastern area of the applicant's transmission system including the ability to reliably schedule maintenance outages of the transmission lines serving the region. Reasons provided by ATC for the project need are:

1. The "Planning Study Area" (SA0F[1] experiences unusually constant load (demand) patterns, greatly restricting ATC's ability to schedule line outages in order to conduct routine, preventive maintenance of the transmission system.
2. The availability of existing generation has declined, and that of future generating capacity is uncertain within the SA.
3. There are limited transmission line connections into the SA from the outside.

The applicant states that certain outages tend to overload the Werner West-North Appleton 345 kV line, which can constrain transmission flows. ATC has stated its belief that the existing transmission system in the PSA is not robust enough for the company to perform required maintenance properly while remaining in compliance with National Electric Reliability Corporation (NERC) criteria. ATC's analysis of the

[1] ATC's Planning Study Area is the Upper Peninsula of Michigan plus northeastern Wisconsin including Green Bay and Appleton to the south and Tomahawk to the west but excluding Wausau and Weston to the southwest.

proposed project has determined that, for expected scenarios, the North Appleton-Morgan project would address all NERC category B, category C.3, category C.5, and maintenance plus category B contingencies in the study area.[2] As a result, ATC states that the North Appleton-Morgan project would enhance the system reliability within the study area.

Existing Transmission Resources

Northeastern Wisconsin is served by a network of 345 kV, 138 kV, and 69 kV lines. The transmission system in the Green Bay area includes two parallel 138 kV paths from the Forest Junction Substation: the Highway V-Preble-Pulliam line along the east side of the Fox River and the De Pere-Glory Road-Pulliam line west of the river. The Werner West-North Appleton 345 kV line southwest of Green Bay is the only tie between the eastern and western portions of ATC's 345 kV transmission system. The transmission system immediately west and north of the Green Bay area includes a 345/138 kV double-circuit line from the Morgan Substation to the Werner West Substation near New London, and a double-circuit 138 kV line from the Stiles Substation to the Pulliam Substation in Green Bay.

The primary transmission ties to the Upper Peninsula of Michigan (UP) include a 345 kV line and a double-circuit 138 kV line south from Quinnesec near Iron Mountain, Michigan to the Oconto area north of Green Bay. In addition, a single 138 kV tie from the western UP to the Rhinelander area in Oneida County, Wisconsin and a single 138 kV line from the Amberg area south of Iron Mountain to West Marinette.

SYSTEM ALTERNATIVES

Non-transmission alternatives to this project discussed in the North Appleton-Morgan application and being analyzed by Commission staff include: load reduction potential, generation alternatives, and a no-build alternative.

In addition to the non-transmission alternatives, two transmission alternatives were also described in the application. These include:

- The Gardner Park to Plains Solution Package, which involves a new Gardner Park-Plains 345 kV line, a new North Appleton-Morgan 138 kV line, upgrades to the Morgan-Stiles 138 kV line, a new Holmes-Old Mead Road 138 kV line, expansion of the Morgan Substation for two additional 138 kV line positions, expansion of the Gardner Park 345 kV Substation, and a new 150 MVAR SVC (Benson Lake Substation) near the Amberg Substation.
- The low-voltage alternative (referred to as the Two North Appleton to Morgan 138 kV Lines Alternative in the application), which would not involve construction of additional 345 kV lines. The low-voltage alternative involves a new North Appleton-Morgan 138 kV line, a second new North Appleton-Morgan 138 kV line, upgrades to the Morgan-Stiles 138 kV line, expansion of the North Appleton Substation for two additional 138 kV positions, expansion of the Morgan Substation for three additional 138 kV positions, and a new 150 MVAR SVC (Benson Lake Substation) near the Amberg Substation.

[2] Current NERC criteria on transmission system planning performance requirements, p. 4, http://www.nerc.com/files/tpl-001-2.pdf.

ATC indicated that the first alternative is very costly, over $500 million, and would have routing concerns. The second alternative solves some transmission concerns but could ultimately be the most expensive transmission alternative and does not provide a second 345 kV transmission path between the North Appleton Substation and points west which ATC thinks is an important solution to constraints on the existing 345 kV connections with areas outside the PSA.

PROPOSED PROJECT AND ROUTE ALTERNATIVES

The applicant has proposed two general transmission routes to connect the North Appleton Substation north of Appleton, Wisconsin, to the Morgan Substation southeast of Oconto Falls, Wisconsin. Both routes are oriented south to north and, either east or west of the city of Seymour and village of Pulaski, Wisconsin. Route sections intersect at common points creating South, Central, and North routing areas. Each route would have the two proposed lines on single poles, side by side, sometimes in combination with a third, and fourth, existing line on single poles, in adjoining and slightly overlapping ROWs. This configuration of transmission lines is not common in rural areas of the state but is stated by ATC in its application to be necessary for this project.

The routing areas provide an organizational tool in ATC's CPCN application and in this EIS, for presenting information about the possible route alternatives. See Figure ES-1. The structure of each proposed routing area follows.

South Routing Area

The South Routing Area is generally located west of Freedom, Wisconsin, and lies entirely within Outagamie County. Approximately 82 percent of the land cover in the proposed ROW is agricultural land. Forested areas and wetlands are also present, including small scattered upland woodlots, wet meadows, shrub-carr wetlands, and forested wetlands. Water bodies and waterways are also present, with the most prominent feature being Duck Creek.

There are two main route sections in this area and one connecting section that differs depending on whether it is making a connection eastward or westward. Thus, four South Routing Area route options are proposed.

- South Option West (S1), running generally parallel to the existing ATC North Appleton-White Clay 138 kV line, and connecting to Central Option West (C3)
- South Option West (S1) and S3 Eastbound connecting to Central Option East (C4)
- South Option East (S2) and S3 Westbound connecting to Central Option West (C3)
- South Option East (S2) connecting to Central Option East (C4)

Central Routing Area

The Central Routing Area is located in Outagamie, Shawano, and Brown Counties. Approximately 91 percent of the land cover in the proposed ROW is agricultural land. Forested areas and wetlands are also present, including small, scattered woodlots, upland forests, wet meadows, shrub-carr wetlands, and wooded wetlands. Water bodies and waterways are also present, with the most prominent features being Black Creek and Toad Creek.

Two main route sections are proposed in this routing area that can be combined with the four South Routing Area Options listed above.

- Central Option West (C3)
- Central Option East (C4)

North Routing Area

The North Routing Area is located within Brown, Shawano, and Oconto Counties. Approximately 72 percent of the proposed ROW is agricultural land. Besides the cropland, there are small, scattered woodlots, upland forests, wet meadows, shrub-carr wetlands, and wooded wetlands. Water bodies and waterways are also present, with the most prominent features being the Pensaukee River, the North Branch of the Pensaukee River, and the Little Suamico River. The two main route sections in the North Routing Area, N18 and N4, run on either side of the village of Pulaski.

Ten route sections in the North Routing Area can be assembled into four reasonable combinations proposed as North Options:

- North Option West with N13: Route Sections N17, N18, N13, N6, N16
- North Option West with N15: Route Sections N17, N18, N14, N15, N6, N16
- North Option West with N7: Route Sections N17, N18, N14, N7, N8, N16
- North Option East: Route Sections N17, N4, N8, N16

Overall Routes Proposed

Overall, the four South Options, two Central Options, and four North Options can be combined into 16 reasonable route alternatives between the North Appleton and Morgan Substations. The CPCN application identifies these 16 route alternatives by the letters A through P, as does this EIS.

POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

The potential environmental and community-social impacts of the project is analyzed within the routing areas that comprise the project area.

South Routing Area (Route Sections S1, S2, S3)

In the South Routing Area, the main choices are Route Sections S1 and S2, with S3 offering some flexibility for crossovers between the eastern or western routes when proceeding north into the Central Routing Area. Route Section S1 passes through two moderately dense residential developments and, as a result, has more than twice the number of homes within 300 feet of the proposed centerlines than Route Section S2, although S2 has one house less than 50 feet from the centerlines. Although agricultural land use is most common along the southern routes, both S1 and S2 cross areas of wetlands and waterways, as well as upland forests. Both routes share at least part of their length with existing transmission lines, with four lines side by side proposed for a short part of S1, and three side by side, all on separate structures, for the rest of Route Section S1. Route Section S2 shares a corridor with a 345 kV line for part of the route,

with all three lines on separate structures, and at different heights for most of the route, before leaving that corridor to join the Guardian pipeline.

Central Routing Area (Route Sections C3, C4)

The Central Routing Area route sections are relatively similar in length and the types of landscape they pass through. Both C3 and C4 cross lands that are predominately agricultural, west and east of the city of Seymour, respectively. C4 has several more residences within 300 feet of the proposed project centerlines. Both routes share existing utility corridors. Route Section C3 shares the existing 138 kV transmission line corridor from the south and, as a result, there would be three transmission line structures adjacent to each other across the landscape. This situation is in contrast to Route Section C4, which shares a gas pipeline corridor and therefore would result in the new addition of two side-by-side transmission lines on the landscape. Both routes cross similar types and amounts of wetland and forested lands, with C3 appearing to have more impacts on wetlands, including more wooded wetland acreage than C4.

North Routing Area (Route Sections N17, N18, N16, N15, N14, N13, N8, N7, N6, N4)

The North Routing Area route sections are more varied and more than two options are available for consideration if this project is approved. Two of the sections, N17 in the south and N16 in the north near the Morgan Substation, are common to all of the route options.

As mentioned above, there are four reasonable combinations of routes proposed by ATC as "north options." Of these, North Option East, with Route Sections N17, N4, N8, and N16, has almost double the number of residences within 300 feet of the centerlines than the other north options. All of the north options pass through more woodlands or wetlands than the Central or South route sections, although agricultural land is still the primary land use in the proposed ROWs in the North Routing Area. Of the various options in the North Routing Area, North Option East also has the greatest potential to impact upland forest, and nearly the greatest impact on wetlands and wooded wetlands. North Option West with N7 has the most impact on wetlands, including wooded and non-wooded wetland acreages. It also has the most transmission structures sited in wetlands.

Overall Route Alternatives

Route Alternatives A through P can be compared and contrasted to some extent, depending on the factors being considered:

- In terms of cost, Route A would cost the most at $326,608,960, and Route P would cost the least at $307,356,560.
- Specific route alternatives can be identified and contrasted in terms of their potential impacts on agricultural land, waterways, wetlands, forests, and residences:
    - Route I impacts the most amount of agricultural land (920.8 acres) and Route H the least (721.7 acres). Route I follows the eastern route option in the South Routing Area and the western route option in the Central and North Routing Areas, whereas Route H follows the eastern route option in each routing area.

- Routes I and M impact the highest number of waterways, as well as require the highest number of temporary clear span bridges, whereas Routes G and D impact the fewest waterways. Routes M and I have a commonality in that they both utilize northern Route Sections N13 and N6, which have significantly greater potential to adversely impact waterways than their counterparts (N14 and N7).
- Routes K and C have the greatest impact on wooded wetlands and require the highest number of structures to be constructed within wetlands. Routes N and F impact the smallest amount of wooded wetlands and require the fewest number of wetland structures. The routes with the greatest impact (K and C) share Route Section N7, whereas the routes with the lowest impact (N and F) share Route Sections N14, N15, and N6.
- Route H impacts the greatest amount of upland forest (47.7 acres) and the highest number of residences within 300 feet of either centerline (85 homes). Route K impacts the least amount of upland forest (24.4 acres) and has the fewest number of residences (44) within 300 feet of the proposed centerlines.

CHAPTER

1

1. Project Overview and Regulatory Requirements

1.1. PROJECT OVERVIEW

1.1.1. Project proposal

On May 1, 2014, American Transmission Company LLC (hereafter ATC or applicant) proposed and sought authority from the Public Service Commission of Wisconsin (PSC or Commission) to construct and place in operation two new electric transmission lines between its North Appleton and Morgan Substations. ATC applied to the Commission for a Certification of Public Convenience and Necessity (CPCN) to obtain this authority.[3] Related application materials for permits were submitted to the Wisconsin Department of Natural Resources (DNR).[4]

ATC states that the project is needed to address reliability issues. The project to be constructed would include 345 kilovolt (kV) and138 kV electric transmission lines running from an expanded North Appleton Substation in Outagamie County, north through Brown and Shawano Counties, to an expanded Morgan Substation in Oconto County. The proposed project also includes upgrades to substation facilities in Brown, Kewaunee, Marinette, Oconto, Outagamie, Shawano, and Winnebago Counties in Wisconsin and Dickinson County, Michigan. The two new transmission lines would share the same right-of-way (ROW) corridor. However they would generally be constructed on separate, steel, mono-pole structures. The electric transmission lines, as proposed, would be approximately 40 to 48 miles long depending on the route ordered by the PSC if the project is approved.

In its application, ATC provides two general transmission route alternatives separated into three geographic routing areas: a South Routing Area between the North Appleton Substation and Outagamie County Highway (CTH) EE, a Central Routing Area from CTH EE northward to State Highway (STH) 29 in Brown County, and a North Routing Area extending from that area into Shawano and Oconto Counties. Each of the routing areas includes sections of the route alternatives so that at least one route section from each routing area is required to complete the overall route alternative. Both general transmission routes follow existing gas pipeline and electric transmission ROW, as well as running cross country primarily through agricultural lands. The eastern and western alternatives intersect at three nodes (between routing areas) and provide 16 different final routing combinations. See Section 2.4 of this

[3] PSC REF#: 203921, 204071, and related materials.
[4] PSC REF#: 203886 and related materials.

Environmental Impact Statement (EIS). The Commission has the opportunity to choose any routing combination if it determines that the project is to be built.

1.1.2. Project cost and ownership

The proposed North Appleton-Morgan transmission line project, if approved, would be solely owned and operated by ATC. The total project cost would be between $307,356,560 and $326,608,960 depending on the route ordered by the Commission if the project is approved.

1.1.3. Proposed construction schedule

In the application, ATC proposed that construction begin in June of 2017, after state approval, final project design completion, and ROW acquisition. In order to meet this goal, the applicant has asked for approval by mid-2015. If the applicant gains approval for the proposed project and begins construction in accordance with the proposed schedule, the expected in-service date is in May 2019.

The Commission has the final authority to certify if and how the project may be built. See Section 1.2 for further discussion. It determined that the project application was complete in May 2014 and, with the statutorily mandated limit of 360 days for review, final Commission action on the application is required by June 2015. [5]

1.2. ROLE OF THE PUBLIC SERVICE COMMISSION OF WISCONSIN

1.2.1. Approval, denial, or modification of this proposed project

Under Wis. Stat. § 196.491(3), the Commission has the authority of approve, deny, or modify and all facilities proposed by the applicant in the North Appleton-Morgan Project application. If the project is approved, the Commission will select the route and design for the proposed transmission lines and the site and layout of the proposed substation expansions and modifications.

1.2.2. Required Commission considerations

Regulatory interests of the Commission cover the need for the project, the project cost and electrical performance, and the project's short- and long-term environmental social impacts (other than those specifically addressed under DNR permits).

1.2.2.1. Certificate of Public Convenience and Necessity law

This rigorous analysis is mandated under Wis. Stat. § 196.491(3) and requires the Commission to make all of the following determinations prior to approving construction of a project such as North Appleton to Morgan:

- Under Wis. Stat. § 196.491(3)(d)2, the proposed facilities must satisfy the reasonable needs of the public for an adequate supply of electric energy.

[5] Under Wis. Stat. § 196.491(3)(g), the Commission must take final action on the application within 180 days after the application is determined to be complete unless the Chairperson grants a one-time 180 day extension period. Without the extension and if the Commission fails to take action within 180 days, the Commission is considered to have granted and issued a CPCN with respect to the application.

- Under Wis. Stat. § 196.491(3)(d)3, the facilities must be in the public interest, considering: alternative sources of supply, alternative locations or routes, individual hardships, engineering factors, economic factors, safety, reliability, and environmental factors.
- Under Wis. Stat. § 196.491(3)(d)3t, the 345 kV line must provide usage, service, or increased regional reliability benefits to the wholesale and retail customers or members in this state, and benefits of the line must be reasonable in relation to the costs.
- Under Wis. Stat. § 196.491(3)(d)4, the facilities must not have undue adverse impact on environmental values such as, but not limited to: ecological balance, public health and welfare, historic sites, geological formations, aesthetics of land and water, and recreational use.
- Under Wis. Stat. § 196.491(3)(d)5 and 196.49(3)(b), the facilities must not substantially impair the efficiency of the applicant's service or reasonably exceed the applicant's probable future requirements, and the value or available quantity of service the facilities provide must be proportionate to their cost.
- Under Wis. Stat. § 196.491(3)(d)6, the facilities must not unreasonably interfere with the orderly land use and development plans for the area involved.
- Under Wis. Stat. § 196.491(3)(d)7, the facilities must not have a material adverse impact on competition in the relevant wholesale electric service market.

1.2.2.2. Required priorities for meeting energy demands

In addition to these statutory determinations, the Commission must address the priorities provided in Wis. Stat. §§ 1.12 and 196.025. These laws require the Commission to give reasonable priority to specific methods of meeting energy demands. The Commission must consider options based on the following priorities, in the order listed, for all energy-related decisions:

- Energy conservation and efficiency
- Noncombustible renewable energy resources
- Combustible renewable energy resources
- Nonrenewable combustible energy resources, in the order listed:
  - Natural gas
  - Oil or coal with a sulfur content of less than one percent
  - All other carbon-based fuels

If the Commission finds that any of these statutorily preferred options, or a combination of these options, constitutes a cost-effective and technically feasible alternative to the proposed project, the Commission must reject all or a portion of the project as proposed.

1.2.2.3. Required priorities for electric transmission corridors

Wisconsin Stat. § 1.12(6) also directs the Commission to consider corridor sharing opportunities when reviewing transmission facility projects. The statute states that, when siting new electric transmission lines, it is the policy of the state to attempt to share existing corridors to greatest extent feasible. Corridors to be considered for sharing are prioritized in the following order:

- Existing utility corridors
- Highway and railway corridors
- Recreational trails, to the extent that the facilities may be constructed below ground and that the facilities do not significantly impact environmentally sensitive areas

- New corridors

However, when selecting corridors to share, the Commission must also determine that the corridor sharing is consistent with economic and engineering considerations, electric system reliability, and environmental protection.

1.2.3. Intervenors in the Commission process

A few organizations and individuals have requested to "intervene," to become parties to the docket before the Commission. The intervenors would have some additional legal rights and obligations as participants in the Commission proceeding. Those who have requested full party status as intervenors in the docket at this point in the proceeding are:

- Midwest Independent Transmission System Operator, Inc. (MISO)[6]
- Citizens Utility Board[7]
- Lila Zastrow and Dave Hendrickson[8]
- Larry, Milada, and Rubhen Rice[9]
- Melvin R. Schampers[10]
- Wisconsin Industrial Energy Group[11]
- Clean Wisconsin[12]

Under Wis. Stat. § 196.31 and Wis. Admin. Code ch. PSC 3, the Commission may compensate any organization or individual for the cost of participating in its proceedings if all the following conditions are met:

- The intervening organization or individual is a customer of the utility that is the subject of the proceeding or is someone who may be materially affected by the proceeding's outcome.
- The intervening organization or individual must have been granted full party status and will participate as such in the proceeding.
- Without compensation, the intervenor would experience "significant financial hardship."
- Without compensation for the intervenor, an interest that is material to the proceeding would not be adequately represented.
- The intervenor's interest and position must be represented to result in a fair determination in the proceeding.

1.2.4. Public involvement

Public involvement and comments throughout the Commission's review process is encouraged. Public input is solicited through:

[6] PSC REF#: 207058
[7] PSC REF#: 208247
[8] PSC REF#: 209771
[9] PSC REF#: 209952
[10] PSC REF#: 210005
[11] PSC REF#: 213380
[12] PSC REF#: 214672

- Written and spoken comments from the public information meetings sponsored by the applicant as well as online using the project interactive mapping tool, and by e-mail and U.S. mail.
- Written or public comments solicited by the Commission at environmental scoping meetings.
- Phone calls and written comments received prior to the completion of the final EIS
- Oral and written comments on the draft EIS
- Testimony at public hearings held by the Commission

1.2.4.1. Applicant-sponsored meetings

The applicant sponsored public information meetings as part of developing the proposed project. Early meetings served to introduce area landowners to the project being developed and to elicit feedback from residents. The applicant informed Commission staff about these meetings and about their results, and Commission staff attended the final two meetings in spring of 2013 when it appeared the project routes were being finalized.

The meetings had different locations and emphases depending on stage of project development. They began in spring of 2012 with ATC discussing why the project was needed and seeking public input on siting and routing concerns. At each of the meetings, developing project information was shared with the public, and public input on the project was solicited and received.

1.2.4.2. Commission-sponsored meetings and hearings

After the application was submitted and declared complete, staff of the PSC, DNR, and Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) held a series of public open house meetings as part of the state's environmental scoping process in preparation of the draft EIS. During these meetings, Commission staff explained the state review process for transmission line projects, provided related background information, and solicited comments regarding the proposed project from the public. The Commission also solicited comments from the public in a letter sent on June 26, 2014, to interested and affected persons, towns, counties, municipalities, and libraries. Throughout the time that Commission staff was preparing the draft EIS, comments and questions continued to be received at the Commission by first class mail, e-mail, telephone, and through the PSC website. Several comments resulted in Commission staff requests for additional information from ATC to address potential routing issues.

Following the release of the draft EIS, a 45-day public comment period will be observed. Written and oral comments made to staff during this comment period will be considered by Commission staff as it prepares the final EIS.

The Commission staff review process focuses on gathering, organizing, and analyzing information for technical hearings on the project. Public hearings are required to be held in the project area. A period of at least 30 days will occur between the issuance of the final EIS and the opening of the hearings for this case. This period will allow the public and government offices time to review the final EIS prior to the technical and public hearings so that they can prepare appropriate, informed, and useful written or oral testimony or comments.

Testimony received during the public hearing will become part of the case record. The Commission will approve, reject, or modify the applicant's proposal based on its reading and discussion of the case record. At the hearing sessions, a court reporter will record the oral and written testimony presented by Commission staff, utility staff, staff of other agencies, representatives of intervening organizations, and the public. The final EIS will be entered into the hearing record as a portion of Commission staff's testimony.

At this time, the technical and public hearings for the North Appleton-Morgan project are expected to occur in January and February 2015. An official notice that includes specific times for these hearings will be mailed to the entire project mailing list when the final EIS is issued.

1.3. INTER-AGENCY RELATIONSHIPS IN THE COMMISSION PROCESS

Commission staff routinely consult with various government regulatory agencies to better understand the potential impacts of a project. However, certain Wisconsin departments are more integrated into the preparation of this EIS. These include DNR, which by law is a co-author of the EIS, and also DATCP, Wisconsin Department of Transportation (WisDOT), and the Wisconsin Historical Society (WHS). The related responsibilities of these agencies are described briefly in this section and integrated into the impact discussions later in the document where appropriate.

1.3.1. Role of the Department of Natural Resources

During its review of this project, Commission staff has consulted with DNR to assess the potential impact the project may have on Wisconsin's resources. DNR enforces provisions of Wis. Stat. ch. 30 on navigable waterways, including approval for temporary clear span bridges (TCSB) over streams. It enforces provisions of Wis. Stat. § 281.36 on wetlands and the Wetlands Practicable Alternatives Analysis required under Wis. Admin. Code ch. 103.

DNR is the permitting authority also for construction site erosion control. Stormwater permits must be obtained from DNR under Wis. Stat. ch. 283 and Wis. Admin. Code chs. NR 216 and NR 151.

Connected with this permitting, DNR will also process any Incidental Take Authorization for Endangered or Threatened Species, as needed, under Wis. Stat. § 29.604, depending on the route approved.

DNR works with the U.S. Army Corps of Engineers (USACE) and the U.S. Fish and Wildlife Service (USFWS) as well as with the Commission. However, these federal agencies require separate permitting beyond what may be provided by DNR or ordered by the Commission.

With the Chapter 30 permits, the Commission and DNR are required under Wis. Stat. § 196.025(2m)(b)(1)1. and 3. to prepare the final EIS cooperatively and include all of the information needed by both agencies to carry out their respective duties under Wis. Stat. § 1.11 (Wisconsin Environmental Policy Act (WEPA) - governmental consideration of environmental impact). These two agencies are co-authors of the final EIS, with the Commission as the lead agency.

1.3.2. Role of the Department of Agriculture, Trade and Consumer Protection

DATCP has responsibilities to farm landowners that begin after a CPCN is issued and easement negotiations have commenced. Under Wis. Stat. § 32.035(4), DATCP must prepare and Agricultural Impact Statement (AIS) if the project involves the potential exercise of the power of eminent domain and if more than 5.0 acres of any farm operation could be taken, as is the case with the North Appleton-Morgan project. The AIS must include a list of the acreage and description of all land lost to agricultural production and all other land with reduced productive capacity, plus DATCP's analyses, conclusions, and recommendations concerning the agricultural impact of the project. When an AIS is prepared, it is made available to farm land owners to aid them in easement negotiations.

DATCP and Commission staffs have consulted during the review of this project, and DATCP representatives attended the two scoping meetings held in the cities of Oconto Falls and Seymour in the project area, hosted by the Commission. Currently, the AIS for this project is still being drafted. Its executive summary, or perhaps the full document if completed, will be included in the final EIS as Appendix C. When complete, the full document will be available on DATCP's website.[13] At this time, Appendix C of this EIS includes a draft table of contents for the AIS plus a letter describing in detail a major concern for which DATCP specifically requests consideration.[14]

1.3.3. Role of the Department of Transportation

WisDOT, under Wis. Stat. § 86.07(2), controls whether and how utility facilities and access driveways may be located and constructed on highway ROW. Under Wis. Stat. § 86.16, utilities may locate their facilities along and across highway ROW with the written consent of WisDOT and its regional offices for the state trunk highway system. The state trunk highway system includes state highways, federal highways, and the Interstate System. WisDOT also has federal obligations under 23 USC 111 and 23 CFR 645. These include maintaining a Utility Accommodation Policy, which is approved by the U.S. Federal Highway Administration and the protection of scenic easements from above-ground construction of any type.

There are no roads in the project area that have scenic easements that would be affected by the construction of the proposed transmission lines.

WisDOT and PSC have a Cooperative Agreement and liaison procedures to ensure that, whenever practical, existing transportation corridors are used for new electric transmission facilities instead of new corridors. Only a few portions of the proposed project would follow existing transportation corridors.

For this project, ATC would need WisDOT Utility Permits for overhead highway crossings including construction permits within permitted highway crossing areas and temporary access permits for construction. WisDOT also would be the agency that permits oversize loads and weight limits on highways for the transport of construction materials for the transmission lines and substations, under Wis. Stat. ch. 348. Most ATC/WisDOT interaction has been through the North East and North Central regional WisDOT offices.

1.3.4. Role of the Wisconsin Historical Society

Under Wis. Stat. § 44.40, the Commission must determine if a requested action is going to affect historic properties listed with WHS. Historic properties include archeological, architectural, and other historical cultural resources. The Commission, like all Wisconsin state agencies, must report to WHS on potential impacts of the proposed project to listed historic properties. WHS determines if those impacts would be adverse and provides direction to the Commission for avoided or reducing potential impacts. If sites must be protected or their impacts mitigated as part of a proposed project, the Commission must enforces those mitigation measures in its certification of the project.

WHS also has federal obligations. It is the home of the Wisconsin State Historic Preservation Officer (SHPO), who provides direction to federal agencies complying with Section 106 of the National Historic Preservation Act (NHPA) in Wisconsin. There is federal interest in portions of the North Appleton-Morgan project, as described under "Federal Interest and Permits" in the next section of the

[13] http://datcp.wi.gov/Environment/Agricultural_Impact_Statements/Current_Projects/index.aspx
[14] Letter from Sara Walling, AIS Program Supervisor and Chief, Nutrient Management and Water Quality Section, DATCP to Ken Rineer of the Commission staff.

EIS. The NHPA requirements for the federal agencies supersede but do not eliminate the requirements of Wis. Stat. § 44.40 for the Commission. They often are more stringent than state law requirements and are enforced directly by the interested federal agency complying with the NHPA. WHS as the SHPO might require a field survey of any federal area of potential effect. Resolution of all Section 106 requirements might not be completed at the time of the Commission hearing for this project.

A review of a database of historic resources maintained by WHS found incidences of potential cultural resources near the proposed project area. WHS may require a field survey of any cultural resource prior to construction activities.

1.4. FEDERAL INTERESTS AND PERMITS

USACE, USFWS, and the Federal Aviation Administration (FAA) each have responsibilities related to construction of the proposed project. Table 1.4-1 summarizes the different federal interests.

Table 1.4-1 Federal interests in the construction of the North Appleton-Morgan transmission project

Agency	Activity Regulated	Permit Type	Status
USACE	Wetland impacts	Sections 401 and 404 of Clean Water Act (CWA)	ATC states that it would apply for the permit when a route was ordered.
	Archaeological review	Section 106 of NHPA	ATC has had cultural resources assessment prepared as part of its CPCN application. It states that it would submit information to the USACE for its areas of potential effect on receipt of a Commission order.
FAA	Construction of transmission lines near airports	FAA 7460 Notifications	Notices for Assurance of Navigational Signal Reception and Notices Due to Height Restrictions have been identified and would be resubmitted to FAA after a route was ordered by the Commission.
USFWS	Activities near federally protected and listed rare species	Endangered Species Act; Bald and Golden Eagle Protection Act; Migratory Bird Act	ATC has submitted review of protected and rare species; coordination with agency as applicable.

One of the federal agencies (most likely USACE) will take the lead role in meeting the federal environmental review requirements under the National Environmental Policy Act (NEPA) for the project. The lead agency would solicit comments on the project from other federal agencies and may prepare an environmental assessment or environmental impact statement. This process would likely not be initiated unless and until the Commission made its final decisions on the project docket. If draft permits are issued at the federal level, the lead agency would likely hold public hearings.

1.5. COUNTY AND LOCAL GOVERNMENT INTERESTS AND PERMITS

County and local governments have numerous responsibilities that can be addressed during the PSC project review. Local governments have written seeking to minimize adverse impacts on the local communities that they are charged to manage and protect. They attempt to ensure that the routes and design of the proposed transmission facilities meet local agency standards and permitting requirements and conform to local ordinances and zoning regulations. They also provide information including land use plans, county forest plans, watershed management plans, recreational plans, and agricultural extension programs.

Several county and local jurisdictions would be affected by the potential transmission construction for this project. They are listed in Table 1.5-1 along with the route sections (see Section 1.1.1 and Figure Vol. 2-1 Index) that would affect each.

Table 1.5-1 County and municipal jurisdictions affected by the North Appleton-Morgan transmission project

County	Municipal Jurisdiction			Route Sections
	Town	Village	City	
Outagamie	Freedom			S1, S2
	Osborn			S1, S2, S3, C3, C4
	Seymour			C3, C4
			Seymour	C4
	Cicero			C3
Shawano	Lessor			C3
	Maple Grove			C3, C4, N18
	Angelica			N18
		Pulaski (also in Brown and Oconto Counties)		N18
	Green Valley			N6, N7,N13, N14, N15,N18
Brown	Pittsfield			C3, C4, N4, N17, N18
Oconto	Chase			N4
	Morgan			N4, N6, N7, N8, N18

The situation with local permits is less firm than with state or federal permits. In terms of potential local impacts, potential effects on a local government jurisdiction should and would be considered by the Commission as an impact on the existing local social environment. However, it must be noted that, in a situation where a project CPCN is approved, Wis. Stat. § 196.491(3)(i) says:

> "If installation or utilization of a facility for which a certificate of convenience and necessity gas been granted is precluded or inhibited by a local ordinance, the installation and utilization of the facility may nevertheless proceed."

ATC has shown in its application that it is fully cognizant of this section of the statutes, and it has established a policy of applying for permits under local ordinance only where they involve matters of public safety. Depending on the municipality, applicable local safety ordinances might include road crossing permits, road weight limits, noise abatement ordinances like those regulating hours or times of construction, building permits, and driveway and culvert permits. ATC would not apply for other types of permits including Conditional Use Permits or permits to protect local vulnerable environments or to regulate visual impact because it would assume those concerns were being handled through the PSC and DNR authorizations. ATC states that, if it became aware that a local environmental design requirement was more stringent than the applicable state requirement, it would do its best to follow the local requirement. It states that it "…will keep all affected local units of government updated to ensure that the representatives of those units of government are informed regarding ATC's proposed construction activities."[15]

[15] CPCN Application, Section 1.6.3, "Local Permits," pp. 12-13 of 157.

Identified local environmental design requirements more stringent than state standards are so far limited to Outagamie County storm water management maintenance requirements. ATC has indicated that it would follow these applicable county requirements.

Before the CPCN can be issued, the Commission under Wis. Stat. §196.491(3)(d)6 must determine that:

> "The proposed facility will not unreasonably interfere with the orderly land use and development plans of the area involved."

This last section of the CPCN statute indicates that the Commission must be aware of potential conflicts with existing local ordinances, zoning, or land use plans and determine whether they are reasonable when making its final decisions about the project. Local land use or development plans that might be affected are discussed in the route impact Chapters 7 through 9 of the EIS.

1.6. REGIONAL PLANNING COMMISSION INTEREST

Related to the Commission's requirement to consider local land use and development plans is a requirement to keep the regional planning commissions (RPC) apprised of its cases and project reviews. Regional planning commissions are listed as one of the categories of organizations and government offices that receive copies of Commission notices and environmental impact statements. RPCs in the project are the East Central Wisconsin Regional Planning Commission, which includes Outagamie and Shawano Counties, and the Bay-Lake Regional Planning Commission, which includes Brown and Oconto Counties. No comments have been received at the Commission from either of these RPCs.

1.7. ONEIDA NATION OF WISCONSIN

The Oneida Reservation is present on the eastern side of the proposed project area and existing infrastructure corridors that could provide additional potential routes cross this area. However, no routes through the reservation for the North Appleton-Morgan project were proposed in the application.

The Oneida Environmental Resources Board and Oneida Land Commission held a joint meeting in July 2012. At that time, the Resources Board voted to reject ATC's proposal to utilize corridors within the reservation. The Land Commission then took two important actions on behalf of the Tribe:[16]

- It carried a motion to "not engage" with ATC on this project.
- It passed a motion "to recommend ATC go around the Oneida Reservation," possibly extending from west of the town of Freedom following CTH C to Kropp Road and running parallel to the reservation boundary and "following a the ridge separating the Duck Creek Watershed from the Black Creek Watershed to minimize impacts to the regional stream network."

[16] Letter from Amelia Cornelius, Chair, Oneida Land Commission to Tom Schemm, Project Manager, ATC, dated July 17, 2012.

CHAPTER

2

2. Description of Proposed Project

2.1. ENGINEERING AND DESIGN OF NEW TRANSMISSION

2.1.1. Transmission structures and conductors

2.1.1.1. Voltages

ATC proposes to construct a new 345 kV line and three new 138 kV lines. The new 345 kV line would run from the North Appleton Substation to the Morgan Substation. One of the new 138 kV lines would run from the North Appleton Substation to the Morgan Substation. Another new 138 kV line would run from the Morgan Substation to the Stiles Substation. A third new 138 kV line would connect the existing Amberg Substation with the proposed new Benson Lake Substation.

2.1.1.2. Structures and foundation types

ATC states that a majority of the structures for both the new North Appleton-Morgan 345 kV line and the new North Appleton-Morgan 138 kV line would be single-circuit, self-supporting tubular steel monopole structures. Tangent and small angle structures would predominantly be in a delta configuration except where limited ROW availability exists. A representative drawing of this delta configuration can be seen in Appendix A Figure 1. If the ROW was limited, the structures in the vicinity of the limited ROW would transition from a delta configuration to a vertical configuration and maintain the vertical configuration throughout the area of limited ROW width. A representative drawing of this vertical configuration can be seen in Appendix A Figure 2. Single-circuit 138 kV medium angle, large angle, and dead-end structures would be in a vertical configuration for the purpose of turning an angle in the route, regardless of ROW width availability.

For most of the current route, the new Morgan-Stiles 138 kV line would use existing conductors supported on existing structures. A limited amount of current conductor would be replaced near the Falls, Pioneer, and Stiles Substations. ATC's proposal would not require new structures. However, three new 138 kV structures would be installed directly south of the Morgan Substation to support the existing Morgan-Falls 138 kV line as it enters the substation. These structures would use the same structure configurations as the new North Appleton-Morgan 138 kV line, as previously described. South of the Pioneer Substation, one new 138 kV structure would be required for the existing Pioneer-Stiles 138 kV line, as well as the modification of one existing double-circuit 138 kV structure.

Based on the figures in ATC's application, the height of new 138 kV structures would range from 85 to 100 feet. The height of new 345 kV structures would range from 120 to 135 feet.[17]

[17] Appendix C, CPCN Application.

All structures for each of the route options are expected to be self-supporting. Based on ATC's preliminary assessment of the soil and geologic conditions, two predominant foundation types are anticipated for this project: direct-embedded steel and reinforced concrete drilled pier. The 138 kV and 345 kV tangent structures would be primarily supported by direct-embedded steel foundations. For the single-circuit angle and dead-end structures, as well as the double-circuit tangent, angle, and dead-end structures for both 138 kV and 345 kV facilities, it is expected that they would be primarily supported by reinforced, concrete drilled pier foundations.

ATC states that the excavated holes for concrete drilled pier foundations would generally range from 5.0 to 12 feet in diameter and from 15 to 50 feet in depth or greater depending on soil conditions. Holes excavated for direct-embedded structures without concrete drilled pier foundations would generally range from 4.0 to 7.0 feet in diameter and from 10 to 25 feet in depth. The method of installation and the diameter and depth of the foundation would vary, depending on the soil capability and structure loadings. Excavation is required for both direct-embedded and reinforced concrete foundations.

For concrete drilled pier foundations, the hole is excavated and a rebar cage and anchor bolts are placed into the excavation, which is then filled with concrete until the rebar cage and anchor bolts are covered. This, in general, leaves a 1.0- to-2.0-foot reveal of the foundation above grade with exposed threaded anchor bolts. The complete caisson is then allowed to cure.

For direct-embedded structures (no concrete foundation required), a hole is excavated to the appropriate depth. The base of the structure is placed into the excavated hole and the area around the structure is backfilled with clean, granular fill. Depending on soil conditions, a permanent casing or culvert may have to be installed. Granular backfill would also be added between the structure and casing. Equipment for this phase of construction would include dump trucks, drill rigs, cranes, vacuum trucks, backhoes, loaders, and tanker trucks.

2.1.1.3. Transmission line and structure configurations

The two new North Appleton-Morgan transmission lines would be designed for and energized at 345 kV and 138 kV operating voltages. ATC states that it intends to locate structures side by side where possible, with span lengths for both lines around 600 to 800 feet.

For each phase of the new North Appleton-Morgan 138 kV line, ATC proposes the use of Twisted Pair (TP) 556.5 kilo circular mils (kcmil) Aluminum Conductor Steel Reinforced (ACSR) Dove conductors. The conductors would primarily be supported by polymer insulators in a braced post configuration. The line would use one shield wire to help protect the phase conductors from lightning strikes and to provide a communication path between substations. This shield wire would be one steel- and aluminum-stranded wire containing a 24-fiber optic bundle core (generally known as optical ground wire or OPGW).

For each phase of the new North Appleton-Morgan 345 kV line, ATC proposes the use of a vertically bundled pair of TP-556.5 kcmil ACSR (Dove) conductors but continues to evaluate the possibility of a horizontal configuration.[18] The conductors would be primarily supported by porcelain or glass insulators in a V-string configuration. The line would use two shield wires to help protect the phase conductor from lightning strikes and to provide a communication path between substations. The two shield wires would consist of one standard steel-stranded wire and one steel- and aluminum-stranded wire containing a 24-fiber OPGW.

[18] ATC comments on draft EIS. PSC REF#: 224839.

A new Morgan-Stiles 138 kV line would use existing conductors supported on existing structures and would not require new conductors. Three spans of new conductor would be required for entering the Morgan Substation, as well as one span each of new conductor for entering the Pioneer and Stiles Substations. ATC proposes the use of TP-477.0 kcmil ACSR (Hawk) conductors for each phase of the new Morgan-Stiles 138 kV line where new conductor is required. The proposed conductor matches the existing conductor used for the remainder of the line.

ATC states that the use of a conductor size different from what is currently on the existing line would be required at two locations along the existing transmission line rebuild. For rebuilding the existing North Appleton-White Clay 138 kV line along Route Section S1 and the existing North Appleton-Kewaunee 345 kV line along Route Section S2, the conductor size on the existing lines would be incompatible with proposed new vertical conductor arrangements that ATC intends to use to reduce the width of the ROW as much as possible. The use of a new conductor size in these two rebuild portions would not impact the existing line rating or operating capability. ATC's proposed conductor size for the existing North Appleton-White Clay 138 kV line along Route Section S1 is a minimum TP-477.0 kcmil ACSR (Hawk) up to TP-556.5 kcmil ACSR (Dove). Its proposed conductor size for the existing North Appleton-Kewaunee 345 kV line along Route Section S2 is a minimum bundled pair of TP-477.0 kcmil ACSR (Hawk) up to bundled pair of TP-556.5 kcmil ACSR (Dove).

For all existing line reroutes around substations and all areas of existing line rebuild along route sections, with the exception of the two locations described above, the existing conductor size is adequate.

ATC proposes that the new 138 kV and 345 kV lines between the North Appleton and Morgan Substations be independent lines on separate structures, rather than double-circuited lines on the same structures, or double- or triple-circuited configurations with the existing lines in the area.[19] This proposal is discussed in greater detail in Chapter 3, Section 3.6.3 of the EIS.

2.1.2. Distribution facilities

Several existing distribution lines along the route alternatives might require removal and relocation to accommodate the new transmission lines. For cost estimating purposes, ATC has assumed that the local distribution companies would relocate their respective distribution lines to accommodate the project. Several existing distribution lines cross the various route alternatives. At each distribution line crossing, ATC states that it and the affected local distribution company would relocate or bury distribution lines that would otherwise require taller structures on the new line.

Potential effects on local distribution lines are discussed for the three project Routing Areas in Chapters 7, 8, and 9 of this EIS, in Sections 7.3.8, 8.3.8, and 9.3.8, respectively.

2.1.3. Right-of-way requirements

As illustrated in the figures in Appendix A, the ROW width for the proposed and existing lines would range from 145 to 330 feet. The width of the ROW at any location would depend on the structure types used and whether the new lines would share a ROW with existing facilities.

ATC has stated its intention to clear all vegetation through the full width of the ROW in order to facilitate construction equipment access and ensure safe clearances between vegetation and the transmission line. Vegetation would be cut at or slightly above the ground surface using mechanized mowers, sky trims, processors, harvesters, or hand tools. Rootstocks would generally be left in place except in areas where

[19] Appendix D, Exhibit 1a, PSC REF#: 201022, p. 255 of 278.

stump removal was necessary to allow the movement of construction vehicles. Side trimming the ROW would happen shortly after the clearing was completed. Following the side trimming, a final mowing of debris and stump cleanup would be completed. Where permission of the landowner was obtained, stumps of tall-growing species would be treated with an herbicide to discourage re-growth.

The new Morgan-Stiles 138 kV line would not require modification of the existing ROW.

In addition to storing materials at laydown yards, ATC would have temporary staging for materials like structures and hardware along the ROW prior to installation. This staging work would involve equipment such as semi-trucks, loaders, and cranes to unload structures and other materials near each work location.

2.2. SUBSTATIONS

The project would include major construction at the existing North Appleton, Morgan, and Amberg Substations. In addition, modifications would be required at several other substations in the northeastern part of Wisconsin. The names and locations of the substations can be found in Figure Vol. 2-3. The proposed modifications are discussed below.

2.2.1. North Appleton Substation

ATC plans to construct a new eight-position 345 kV breaker-and-a-half bus arrangement, with provisions for expansion to 10 positions. The existing and new 345 kV lines would be connected to the new substation configuration. ATC also proposes to construct a new 138 kV line termination, relocate existing 138 kV transmission lines, and connect the new 138 kV line to the Morgan Substation. A new control building would be constructed and various equipment upgrades and replacements in the existing substation would be required.

Security features would include a new perimeter wall up to 24 feet in height with a possible addition of up to one foot of barbed wire around the entire new and existing substation and a 10-foot high fence around the microwave tower outside of the existing substation. The proposed substation modifications would require an approximately 10-acre fence expansion to the north of the existing substation, plus a new access road and a detention basin. All construction would be conducted within the existing ATC North Appleton property boundary. Changes to the topography in the vicinity of the fence expansion would be needed.

The North Appleton Substation work would include the following transmission line work for lines near the substation.

- For the existing North Appleton-Kewaunee 345 kV line, ATC would install four self-supporting, steel, three-pole dead-end structures. Three of these structures would be for temporary use to relocate the transmission line out of the way for construction of the substation expansion. They would likely have a height range of 90 to 100 feet. ATC would also install one self-supporting, steel, H-frame angle structure. This structure is expected to be approximately 95 feet in height. About 0.5 miles of new conductor and shield wire would be needed on the new structures for temporary use to relocate the transmission line out of the way for construction of the substation expansion. About 0.3 miles of conductor and shield wire would be removed for the permanent configuration. Also removed would be two wood H-frame tangent structures, one self-supporting steel lattice tower dead-end structure, and approximately 0.3 mile of existing conductor and shield wire. Additional transmission line work on the existing North Appleton–Kewaunee 345 kV line might be required, depending on the route selected.

- For the existing Werner West-North Appleton 345 kV line, ATC intends to install two self-supporting, steel, three-pole dead-end structures that are expected to have a height range of 90 to 100 feet, and to install approximately 0.2 miles of new conductor and shield wire. ATC plans to remove one self-supporting steel three-pole dead-end structure and approximately 0.3 miles of existing conductor and shield wire.
- For the existing Fitzgerald-North Appleton 345 kV line, ATC intends to install two self-supporting, steel, three-pole dead-end structures that are expected to have a height range of 90 to 100 feet. ATC plans to install approximately 0.2 miles of new conductor and shield wire and remove one wood H-frame tangent structure and approximately 0.1 miles of existing conductor and shield wire.
- For the existing North Appleton-Fox River 345 kV line, ATC intends to install one monopole, dead-end structure with an expected height range between 110 and 130 feet, plus one self-supporting, steel, three-pole dead-end structure with an expected height of approximately 100 feet, and approximately 0.1 miles of conductor, OPGW, and shield wire. ATC plans to remove one self-supporting steel lattice tower dead-end structure and approximately 0.1 miles of existing conductor, OPGW, and shield wire.
- For the existing Apple Hills-North Appleton 138 kV line, ATC intends to install two wood H-frame tangent structures with an expected height between 70 and 85 feet and approximately 0.2 miles of conductor and shield wire. ATC plans to remove one wood H-frame tangent structure and approximately 0.2 miles of existing conductor and shield wire.
- For the existing North Appleton-Lost Dauphin 138 kV line, ATC intends to install two wood H-frame tangent structures with an expected height between 70 and 85 feet and approximately 0.2 miles of conductor, OPGW, and shield wire. ATC plans to remove one wood H-frame tangent structure and approximately 0.2 miles of existing conductor, OPGW, and shield wire.
- For the existing North Appleton-Mason St. 138 kV line, ATC intends to install one wood H-frame tangent structure with an expected height of approximately 85 feet and approximately 0.1 miles of conductor and shield wire. ATC plans to remove approximately 0.1 miles of existing conductor and shield wire.
- For the existing North Appleton-Kaukauna North 138 kV line, ATC intends to install one wood H-frame tangent structure with an expected height of approximately 85 feet and one guyed wood three-pole in-line dead-end structure with an expected height of approximately 55 feet, and approximately 0.2 miles of conductor and shield wire. ATC plans to remove one self-supporting two-pole tangent structure and approximately 0.2 miles of existing conductor and shield wire.
- For the existing Ellington-North Appleton 138 kV line, ATC intends to install one wood H-frame tangent structure with an expected height of approximately 85 feet and approximately 0.1 miles of conductor and shield wire. ATC plans to remove approximately 0.1 miles of existing conductor and shield wire.
- For the existing North Appleton-White Clay 138 kV line, ATC intends to install one wood H-frame tangent structure with an expected height of approximately 85 feet and approximately 0.2 miles of conductor and shield wire. ATC plans to remove approximately 0.2 miles of existing conductor and shield wire. Additional transmission line work more distant from the North Appleton Substation might be necessary depending on the route selected.
- For the existing Butte Des Morts-North Appleton 138 kV line, ATC intends to install two wood H-frame tangent structures with an expected height between 70 and 85 feet and approximately

0.2 miles of conductor and shield wire. ATC plans to remove one wood H-frame tangent structure and approximately 0.2 miles of existing conductor and shield wire.

2.2.2. Morgan Substation

The intended work for the Morgan Substation includes construction of a new 345 kV termination and relocation of the existing Highway 22-Morgan 345 kV line and the existing Morgan-Plains 345 kV line. The relocation of the existing lines would open space to connect the new North Appleton-Morgan 345 kV line if it is approved. Morgan Substation work would also include construction of two new 138 kV terminations and relocation of the existing White Clay-Morgan 138 kV line. The relocation of the existing 138 kV line would open space to connect the new North Appleton-Morgan 138 kV line. The other new 138 kV termination would be for a newly-separated circuit from the Stiles Substation.

Proposed Morgan Substation work would require a fence expansion on the west side of the existing substation of approximately 0.2 acres, as well as a fence expansion on the east side of the substation of approximately 0.26 acres, all on existing ATC property. The existing access road would be widened. Changes to the topography in the vicinity of the fence expansion would also be required. No detention basins would be required, and no changes in zoning would be required.

The Morgan Substation work would also include following transmission line work for lines near the substation.

- For the existing Highway 22-Morgan 345 kV line, ATC intends to install one steel monopole dead end structure with an expected height of approximately 115 feet and approximately 0.1 miles of conductor and OPGW. ATC plans to remove one monopole dead-end structure and approximately 0.1 miles of existing conductor and OPGW. Additional transmission line work on the existing Highway 22-Morgan 345 kV line, more distant from the substation, would be dependent on the route selected.
- For the existing Morgan-Plains 345 kV line, ATC intends to install one steel H-frame angle structure with an expected height of approximately 70 feet, one steel H-frame dead-end structure with an expected height of approximately 75 feet and approximately 0.3 miles of conductor and shield wire. ATC plans to remove two H-frame structures and approximately 0.3 miles of conductor and shield wire.
- For the existing White Clay-Morgan 138 kV line, no structures would need to be installed or removed. ATC would construct two new 138 kV terminations and relocate the White Clay-Morgan 138 kV line. This relocation will open up space for the new North Appleton-Morgan 138 kV line. Because of this relocation of the White Clay-Morgan 138 kV line, ATC intends to install approximately 0.5 miles of conductor and shield wire to a new position of the circuit and remove approximately 0.5 miles of conductor and shield wire from the existing position of the circuit. Additional transmission line work on the existing White Clay-Morgan 138 kV line more distant from the substation would be dependent on the route selected.
- For the existing Morgan-Falls 138 kV line and New Morgan-Stiles 138 kV line, ATC states that the transmission line work near the Morgan Substation on the existing Morgan–Falls 138 kV line and the new Morgan-Stiles 138 kV line would be related to the new Morgan–Stiles 138 kV line and not directly related to the Morgan Substation work.

2.2.3. Benson Lake Substation (new)

The work at the Benson Lake Substation would consist of installing a 138 kV static VAR compensator (SVC) at a new site on existing ATC property. The SVC would be connected to ATC's existing Amberg

Substation via a short 138 kV transmission line. The new fenced area around the SVC is expected to be approximately 300 feet by 250 feet, based on layouts of similarly rated SVCs provided by SVC suppliers. The exact size of the footprint would not be determined until after a contract was awarded to purchase the necessary SVC equipment. In general, ATC states that a typical 138 kV SVC consists of power transformers, circuit breakers, switchgear, thyristor[20] controlled reactors, thyristor-switched capacitors, thyristor valve modules, cooling system, auxiliary electric power system, control/valve building, spare parts building, control and protection system, disconnect switches, bus work, instrument transformers, communications equipment, surge arresters, structures, foundations, control cable, lighting, and all appurtenances for a complete substation installation.

Changes to the site topography would be required.

The Benson Lake-North Substation work would include the following transmission line work for lines near the substation.

- For the new Benson Lake-Amberg 138 kV line, ATC plans to install approximately 0.1 miles of conductor and OPGW.
- For the existing Amberg-Holmes 138 kV line, ATC intends to install three steel monopole dead-end structures with an expected height between 75 and 100 feet and approximately 0.2 miles of conductor and OPGW. ATC plans to remove one monopole dead-end structure and approximately 0.3 miles of existing conductor and OPGW.

The Benson Lake-South Substation work would include the following transmission line work for each line near the substation.

- For the new Benson Lake-Amberg 138 kV line, ATC intends to install four steel monopole dead-end structures with an expected height between 75 and 100 feet, one steel H-frame dead-end structure with an expected height between 75 and 100 feet and approximately 0.4 miles of conductor OPGW.
- No line modifications are needed for the existing Amberg-Holmes 138 kV line.

2.2.4. Other existing substations

2.2.4.1. Falls Substation

The application states that protection and control upgrades at the Morgan Substation necessitate upgrades at the Falls Substation. Because the existing control building is only 12 feet wide, the installation of any new protection and control panels would violate Occupational Health and Safety Administration (OSHA) clearance requirements. Construction of a new control building would therefore be required to house fiber-optic communications and supervisory control and data acquisition equipment for system protection, remote control, and monitoring of the substation. All work would occur within the existing fenced-in area of the substation. No change to the access road would be required, and no change in zoning or land use would be required. Transmission line work near the Falls Substation would be related to the new Morgan-Stiles 138 kV line and would not be directly related to the Falls Substation work.

2.2.4.2. White Clay Substation

Protection and control upgrades at the Morgan and North Appleton Substations would necessitate upgrades at the White Clay Substation. All work would occur within the existing fenced-in area of the

[20] A thyristor is a four-layer semiconductor that is often used for handling large amounts of power. http://www.techterms.com/definition/thyristor

substation, and no change to the access road would be required. No change in zoning or land use would be required, and no transmission line work would be required.

2.2.4.3. Plains Substation

Protection and control upgrades at the Morgan Substation would necessitate upgrades at the Plains Substation. ATC states that the existing control building is too small to accommodate all planned work and would need to be replaced. This work would occur within the existing fenced-in area of the substation, and no change to the access road or transmission line work would be required to support the Plains Substation work.

2.2.4.4. Highway 22 Substation

Protection and control upgrades at the Morgan Substation would necessitate upgrades at the Highway 22 Substation. All work would occur within the existing fenced-in area of the substation, and no change to the access road or transmission line would be required to support the Highway 22 Substation work.

2.2.4.5. Fitzgerald, Werner West, Kewaunee and Fox River Substations

Protection and control upgrades at the North Appleton Substation would necessitate upgrades within the existing fenced-in areas of these substations. No changes to the access roads would be required. Also, no change in zoning or land use would be necessary, and no transmission line work would be needed to support the Fitzgerald, Werner West, Kewaunee, or Fox River Substations work.

2.2.4.6. Lost Dauphin Substation

Protection and control upgrades at the North Appleton Substation would necessitate upgrades at the Lost Dauphin Substation. This work would occur within the existing fenced-in area of the substation. No change to the access road will be required and no transmission line work is required to support the Lost Dauphin Substation work.

2.2.4.7. Stiles Substation

As part of the proposed project, the existing six conductors of the Pioneer-Stiles 138 kV line would be separated into two circuits, necessitating upgrades at the Stiles Substation. The existing control building is too small to accommodate all planned work. Therefore, a new control building would be constructed. All work would occur within the existing fenced-in area of the substation, and no change to the existing access road would be required. However, a new, separate access road and culvert would be needed.

The Stiles Substation transmission line work for lines near the substation would involve only a relocation of about 0.1 miles of conductor and shield wire to a new substation terminal location for the existing Stiles-Amberg 138 kV line. ATC's planned transmission line work near the Stiles Substation on the existing Pioneer-Stiles 138 kV and the new Morgan-Stiles 138 kV lines would be related to the new Morgan-Stiles 138 kV line and would not be directly related to the Stiles Substation work.

2.2.4.8. Amberg Substation

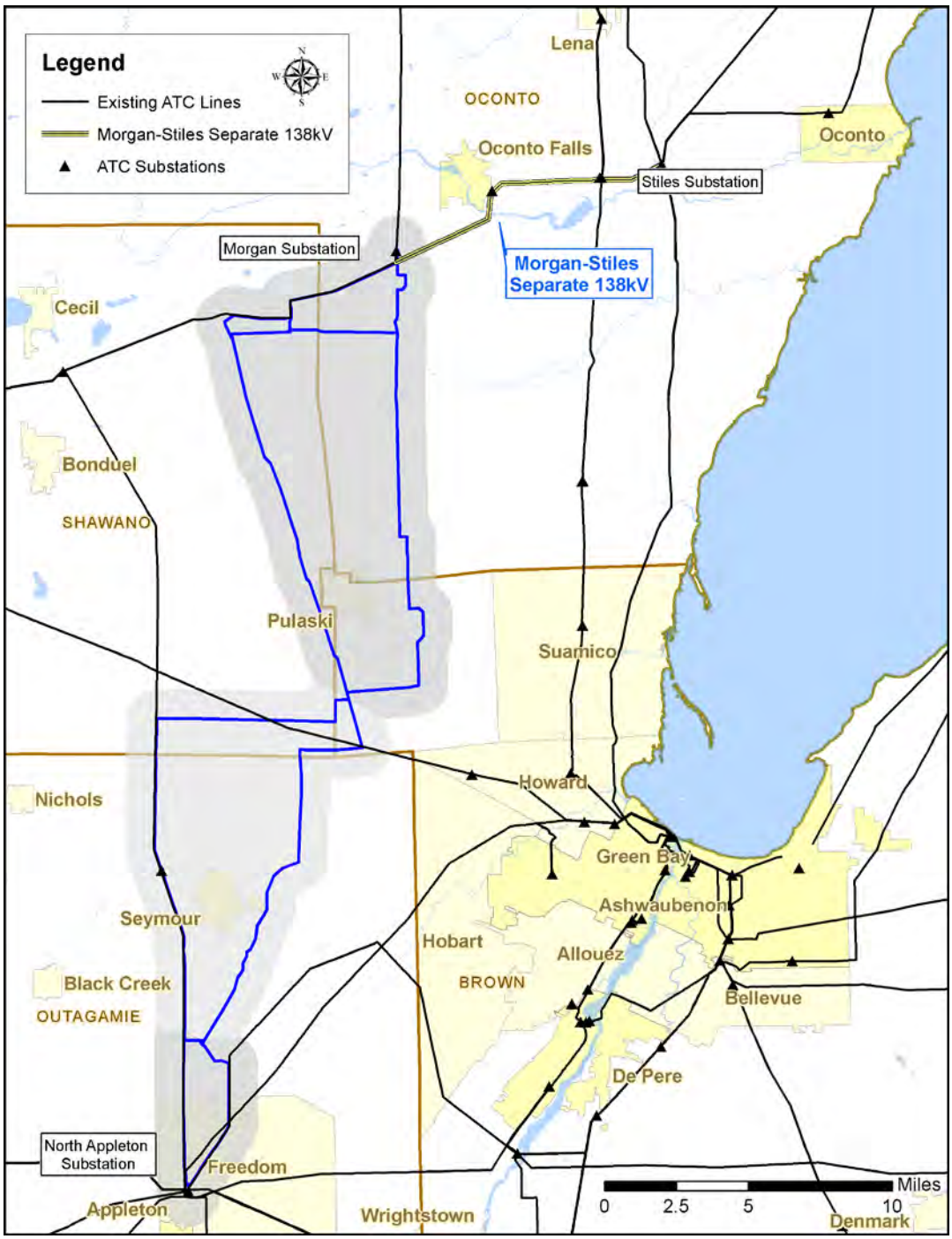
The work at this substation would include installing one additional line terminal to connect with the new SVC device to be installed at the Benson Lake Substation. This would not require any expansion of the existing fence. No transmission line work would be required to support the Amberg Substation work. Transmission line work near the Amberg Substation is accounted for under the Benson Lake Substation as set out above.

2.3. MORGAN-STILES SEPARATE 138 KV LINE

ATC proposes to separate an existing Morgan-Stiles 138 kV circuit electrically into two circuits as a part of the work to support the North Appleton- Morgan Project. The new Morgan-Stiles 138 kV line would use

existing conductors supported on existing structures and would not require new structures or conductors along the line, except as described in Section 2.1.1.2.[21] The location of the Morgan-Stiles line is shown in Figure 2.3-1. On the map, the main project area is shaded, and the proposed Morgan-Stiles separated 138 kV lines are shown northeast of the project area.

Figure 2.3-1 Location of Morgan-Stiles 138 kV line in relation to the proposed North Appleton-Morgan lines



[21] CPCN Application, Sections 5.3.1-5.32.

Electrically separating the existing six conductors on the existing double circuit structures between the existing Morgan, Falls, Pioneer, and Stiles Substations would require new 138 kV terminations at the Morgan and Stiles Substations. These conductors are currently operating as one line electrically. Although the new line would be formed from conductors currently energized as part of the existing transmission lines, the loss of use of one set of conductors along the existing lines would not impact the operating capacities of those lines because each of the existing transmission lines are currently operating with a single conductor entering each of the Morgan, Falls, Pioneer and Stiles Substations.[22]

2.4. THREE ROUTING AREAS: ROUTE SECTIONS AND ROUTE SEGMENTS

For this project, the applicant has proposed two general transmission routes to connect the North Appleton Substation north of Appleton, Wisconsin, to the Morgan Substation southeast of Oconto Falls, Wisconsin. Both routes are oriented south to north, either to the east or to the west of the cities of Seymour and Pulaski, Wisconsin. If the project is approved and a route selected, two new transmission lines would be constructed side by side, a 345 kV line and a 138 kV line co-located on separate structures. The project is 40 to 48 miles long, depending on the route used. The anticipated total ROW width needed for the co-located lines would generally be 180 feet.

For purposes of analysis, the routes are broken down into Route Sections: S1, S2, S3 Eastbound, S3 Westbound, C3, C4, N4, N6, N7, N8, N13, N14, N15, N16, N17, and N18. Some of these Route Sections intersect at common points (S3 Eastbound or S3 Westbound, and N17) creating three Routing Areas: the South Routing Area, the Central Routing Area, and the North Routing Area. The Routing Areas provide an organizational tool in ATC's CPCN application and this EIS, for presenting information about the possible route alternatives. Each Routing Area is covered in a separate environmental analysis chapter.[23] The route sections are described in greater detail in each of those chapters.

Figure Vol. 2-4 illustrates the three Routing Areas with their Route Sections. Figure Vol. 2-5 illustrates 16 possible overall routes between the North Appleton and Morgan Substations that have been proposed by ATC.

2.4.1. South Routing Area

The South Routing Area is generally located west of Freedom, Wisconsin, and lies entirely within Outagamie County. The South Routing Area is comprised of four route sections. Route Sections S1 and S2 travel south to north. Route Sections S3 Westbound and S3 Eastbound provide connection alternatives between the South Routing Area and the Central Routing Area. The South Routing Area is discussed in detail in Chapter 7 of the EIS.

The majority (approximately 82 percent) of the land cover in the proposed ROW within the South Routing Area is agricultural land, with row crops comprising the majority of this area. Forested areas and wetlands are also present, including small scattered upland woodlots, wet meadows, shrub-carr wetlands, and forested wetlands. Water bodies and waterways are also present, with the most prominent feature being Duck Creek, approximately two miles north of the North Appleton Substation.

There are two main route sections in this area, and one connecting section, that differs depending on whether it is making the connection eastward or westward. Thus, there are four South Routing Area route options proposed in the CPCN application (also see Figure Vol. 2-5:

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[22] CPCN Application, Section 5.3.3.
[23] Chapters 7, 8, and 9 address the South, Central, and North Routing Areas, respectively.

- South Option West (S1), running generally parallel to the existing ATC North Appleton-White Clay 138 kV line, and connecting to Central Option West (C3)
- South Option West (S1) and S3 Eastbound connecting to Central Option East (C4) (see below)
- South Option East (S2) and S3 Westbound connecting to Central Option West (C3) (see below)
- South Option East (S2) connecting to Central Option East (C4)

2.4.2. Central Routing Area

The Central Routing Area is located in Outagamie, Shawano, and Brown Counties. The Central Routing Area is comprised of two Route Sections. Route Sections C3 and C4 generally travel south to north, straddling the area around the city of Seymour. This routing area is discussed in detail in Chapter 8 of the EIS.

Approximately 91 percent of the land cover in the proposed ROW within the Central Routing Area is agricultural land, with row crops comprising the majority of this area. Forested areas and wetlands are also present, including small, scattered woodlots, upland forests, wet meadows, shrub-carr wetlands, and wooded wetlands. Water bodies and waterways are also present, with the most prominent features being Black Creek and Toad Creek.

There are two main route sections in this routing area as well, but no connector. Thus, there are two routing options in the Central Routing Area that can be combined with the four South Routing Area Options listed above (see also Figure Vol. 2-5):

- Central Option West (C3)
- Central Option East (C4)

2.4.3. North Routing Area

The North Routing Area is located within Brown, Shawano, and Oconto Counties. The terminus of the North Routing Area is at the Morgan Substation, located near Oconto Falls, Wisconsin. The North Routing Area includes ten route sections to provide options for avoiding wetlands around the Pensaukee River and elsewhere. They run to the east or west of the city of Pulaski. The North Routing Area routes all connect to Route Section N17, a short common route section that connects the North Routing Area with the Central Routing Areas.

Approximately 72 percent of the proposed ROW within the North Routing Area is in agricultural land with row crops comprising the majority. Besides the cropland, there are small, scattered woodlots, upland forests, wet meadows, shrub-carr wetlands, and wooded wetlands. Water bodies and waterways are also present, with the most prominent features being the Pensaukee River, the North Branch of the Pensuakee River, and the Little Suamico River.

The numerous route sections and routing alternatives in the North Routing Area can be assembled into four reasonable combinations that ATC has proposed as North Options (see also Figure Vol.. 2-5):

- North Option West with N13
- North Option West with N15
- North Option West with N7
- North Option East.

All the North Options terminate in the south at Route Section N17, which connects to either of the two Central Options.

2.4.4. Overall routes proposed

Overall, the four South Options, two Central Options, and four North Options can be combined into 16 overall route alternatives between the North Appleton and Morgan Substations. The CPCN application identifies the 16 alternatives by the letters A through P, and this EIS does the same. The 16 route alternatives A through P are illustrated by the maps in Figures Vol. 2-5.01 through 5.04. These are the routes under consideration in this Commission docket 137-CE-166.

2.4.5. Original route segments

To facilitate continuity and understanding through the route development process, ATC has endeavored to show a clear chain from the identifier codes used during its earlier public meetings through to the route section numbers used in the CPCN application. During public meetings and early project development, ATC used slightly different coding for different route pieces (original route segments are illustrated in the map in Figure Vol. 2-6). All route section codes began with the number "1." The route sections included an "A" if they were original and a "B" if they were added later in the process. Local landowners may recognize these earlier, more complicated labels for route sections.

- In the South Routing Area, route Section S1 might be recognized as "1S1A." Similarly, Route Section S2 would also be "1S2A," and Route Section S3 would be "1S3A."
- In the Central Routing Area, Route Section C3 was identified as "1C1A," and Route Section C4 was "1C2A."
- In the North Routing Area, the earlier identifications of route sections were similar except for Route Sections N17 and N18: 1N13B, 1N14B, 1N15B, 1N6B, 1N7A, 1N8B, 1N16A, 1N4A. Route Section N17, a cross-over section, appears to be distilled from section codes in its vicinity: 1N9A and 1N10A. Route Section N18 is made up of earlier identified sections 1N12A, 1N11A, 1N3A, and 1N5B.

Each original or added route section was made up in the applicant's early routing work by "segments" identified with a "designator" and an identification number. Early maps showed segments within each route section. The designator was a letter to designate whether the segment of the route section followed an ATC transmission line (A), county highway (C), gas pipeline (G), major road (M), state highway (S), section line (P), or "other" (O).

As an example, the landowner who had his or her home located in Segment A480-1 of Route Section 1S1A during ATC public meetings can use Figure Vol. 2-1.10 to show the home in a certain part of Route Section S1 in the CPCN application and this EIS.

2.5. COSTS

The tables below show ATC's estimated costs for the proposed route alternatives.[24] The cost estimates are based on a projected in-service date of May 2019. To provide a uniform comparison of the various route alternatives, a combination of 1) the North Appleton Substation Alternative 1 and 2) the Benson Lake Substation North Alternative (Benson Lake–North Substation) was used by ATC for all of the cost tables shown. If the Commission authorizes the proposed project but chooses an alternative for the North Appleton or Benson Lake Substations that is different than those described above, the total estimated project cost would change.

[24] ATC provided these costs in Tables 4.1-1.a through 4.1-1.d of its application, PSC REF#: 204071.

ATC states that the North Appleton Substation Alternative 2 represents a cost increase of $20,000 but that transmission line costs are not affected by the alternative substation layout. If the North Appleton Substation Alternative 2 is chosen, $20,000 would have to be added to each Route Alternative listed in Tables 2.5-1 through 2.5-3.

The Benson Lake Substation South Alternative (Benson Lake-South Substation) would require a cost increase of $2,640,000 (substation and transmission line costs combined) and if it is chosen, $2,640,000 would have to be added to each Route Alternative listed in the tables below.

2.5.1. Facilities costs – total and itemized

2.5.1.1. Cost by route option[25]

ATC combined the various Route Sections/Route Options into Route Alternatives that serve as ATC's proposed Routes. The Route Sections across the three Routing Areas can be combined to create 16 Route Alternatives. The Route Alternatives are described by the naming convention (A through P) and comprised of Route Sections/Route Options.

ATC described the Route Alternatives in two ways: as a combination of individual Route Sections or as a combination of the Route Options. ATC Appendix A Figure 1gi depicts the Route Alternatives, while Appendix A Figure 1gii depicts the Route Options.

Table 2.5-1 Route Alternative transmission line and substation costs by Route Option

Route Alternative	Total Line and Substation Costs	Route Sections	Route Options Line Costs Only
A	$300,850,000	S1 C3 N17-N18-N13-N6-N16	South Option West-$31,770,000 Central Option West-$66,360,000 North Option West with N13-$92,860,000
B	$299,130,000	S1 C3 N17-N18-N14-N15-N6-N16	South Option West-$31,770,000 Central Option West-$66,360,000 North Option West with N15-$91,130,000
C	$298,610,000	S1 C3 N17-N18-N14-N7-N8-N16	South Option West-$31,770,000 Central Option West-$66,360,000 North Option West with N7-$90,610,000
D	$291,520,000	S1 C3 N17-N4-N8-N16	South Option West-$31,770,000 Central Option West-$66,360,000 North Option East-$83,520,000
E	$297,570,000	S1-S3 Eastbound C4 N17-N18-N13-N6-N16	South Opt West/S3 Eastbnd-$34,070,000 Central Option East-$60,780,000 North Option West with N13-$92,860,000
F	$295,840,000	S1-S3 Eastbound C4 N17-N18-N14-N15-N6-N16	South Opt West/S3 Eastbnd-$34,070,000 Central Option East-$60,780,000 North Option West with N15-$91,130,000
G	$295,320,000	S1-S3 Eastbound C4 N17-N18-N14-N7-N8-N16	South Opt West/S3 Eastbnd-$34,070,000 Central Option East-$60,780,000 North Option West with N7-$90,610,000
H	$288,230,000	S1-S3 Eastbound C4 N17-N4-N8-N16	South Opt West/S3 Eastbnd-$34,070,000 Central Option East-$60,780,000 North Option East-$83,520,000

[25] The costs shown in Sections 2.5.1.1 and 2.5.1.2 are not total project costs. They do not include cost categories like pre-certification costs and environmental fees. These other project costs are set out in Section 2.5.1.3 along with the total project cost for each route alternative.

Route Alternative	Total Line and Substation Costs	Route Sections	Route Options Line Costs Only
I	$300,060,000	S2-S3 Westbound C3 N17-N18-N13-N6-N16	South Opt East/S3 Westbnd-$30,970,000 Central Option West-$66,360,000 North Option West with N13-$92,860,000
J	$298,330,000	S2-S3 Westbound C3 N17-N18-N14-N15-N6-N16	South Opt East/S3 Westbnd-$30,970,000 Central Option West-$66,360,000 North Option West with N15-$91,130,000
K	$297,810,000	S2-S3 Westbound C3 N17-N18-N14-N7-N8-N16	South Opt East/S3 Westbnd-$30,970,000 Central Option West-$66,360,000 North Option West with N7-$90,610,000
L	$290,720,000	S2-S3 Westbound C3 N17-N4-N8-N16	South Opt East/S3 Westbnd-$30,970,000 Central Option West-$66,360,000 North Option East-$83,520,000
M	$291,440,000	S2 C4 N17-N18-N13-N6-N16	South Option East-$27,940,000 Central Option East-$60,780,000 North Option West with N13-$92,860,000
N	$289,710,000	S2 C4 N17-N18-N14-N15-N6-N16	South Option East-$27,940,000 Central Option East-$60,780,000 North Option West with N15-$91,130,000
O	$289,200,000	S2 C4 N17-N18-N14-N7-N8-N16	South Option East-$27,940,000 Central Option East-$60,780,000 North Option West with N7-$90,610,000
P	$282,110,000	S2 C4 N17-N4-N8-N16	South Option East-$27,940,000 Central Option East-$60,780,000 North Option East-$83,520,000

2.5.1.2. Cost by voltage class including substations

Table 2.5-2 Route Alternative transmission line and substation costs by voltage class

Route Alternative	345 kV Cost Category	345 kV Cost	Less Than 345 kV Cost Category	Less Than 345 kV Cost	Total Line and Substation Costs[1]
A	Transmission Substations Subtotal Cost	$125,210,000 $ 44,090,000 $169,300,000	Transmission Substations Distribution Mod Subtotal Cost	$ 69,460,000 $ 53,490,000 $ 8,600,000 $131,550,000	$300,850,000
B	Transmission Substations Subtotal Cost	$124,290,000 $ 44,090,000 $168,380,000	Transmission Substations Distribution Mod Subtotal Cost	$ 69,010,000 $ 53,490,000 $ 8,250,000 $130,750,000	$299,130,000
C	Transmission Substations Subtotal Cost	$123,170,000 $ 44,090,000 $167,260,000	Transmission Substations Distribution Mod Subtotal Cost	$ 69,580,000 $ 53,490,000 $ 8,280,000 $131,350,000	$298,610,000
D	Transmission Substations Subtotal Cost	$122,360,000 $ 44,090,000 $166,450,000	Transmission Substations Distribution Mod Subtotal Cost	$ 70,110,000 $ 53,490,000 $ 1,470,000 $125,070,000	$291,520,000
E	Transmission Substations Subtotal Cost	$120,830,000 $ 44,090,000 $164,920,000	Transmission Substations Distribution Mod Subtotal Cost	$ 65,440,000 $ 53,490,000 $ 13,720,000 $132,650,000	$297,570,000

Route Alternative	345 kV Cost Category	345 kV Cost	Less Than 345 kV Cost Category	Less Than 345 kV Cost	Total Line and Substation Costs[1]
F	Transmission	$119,890,000	Transmission	$ 65,000,000	
	Substations	$ 44,090,000	Substations	$ 53,490,000	
			Distribution Mod	$ 13,370,000	
	Subtotal Cost	$163,980,000	Subtotal Cost	$131,860,000	$295,840,000
G	Transmission	$118,780,000	Transmission	$ 65,560,000	
	Substations	$ 44,090,000	Substations	$ 53,490,000	
			Distribution Mod	$ 13,400,000	
	Subtotal Cost	$162,870,000	Subtotal Cost	$132,450,000	$295,320,000
H	Transmission	$117,970,000	Transmission	$ 66,090,000	
	Substations	$ 44,090,000	Substations	$ 53,490,000	
			Distribution Mod	$ 6,590,000	
	Subtotal Cost	$162,060,000	Subtotal Cost	$126,170,000	$288,230,000
I	Transmission	$127,440,000	Transmission	$ 65,660,000	
	Substations	$ 44,090,000	Substations	$ 53,490,000	
			Distribution Mod	$ 9,380,000	
	Subtotal Cost	$171,530,000	Subtotal Cost	$128,530,000	$300,060,000
J	Transmission	$126,500,000	Transmission	$ 65,210,000	
	Substations	$ 44,090,000	Substations	$ 53,490,000	
			Distribution Mod	$ 9,040,000	
	Subtotal Cost	$170,590,000	Subtotal Cost	$127,740,000	$298,330,000
K	Transmission	$125,380,000	Transmission	$ 65,780,000	
	Substations	$ 44,090,000	Substations	$ 53,490,000	
			Distribution Mod	$ 9,070,000	
	Subtotal Cost	$169,470,000	Subtotal Cost	$128,340,000	$297,810,000
L	Transmission	$124,570,000	Transmission	$ 66,310,000	
	Substations	$ 44,090,000	Substations	$ 53,490,000	
			Distribution Mod	$ 2,260,000	
	Subtotal Cost	$168,660,000	Subtotal Cost	122,060,000	$290,720,000
M	Transmission	$119,310,000	Transmission	$ 60,050,000	
	Substations	$ 44,090,000	Substations	$ 53,490,000	
			Distribution Mod	$ 14,500,000	
	Subtotal Cost	$163,400,000	Subtotal Cost	$128,040,000	$291,440,000
N	Transmission	$118,380,000	Transmission	$ 59,600,000	
	Substations	$ 44,090,000	Substations	$ 53,490,000	
			Distribution Mod	$ 14,150,000	
	Subtotal Cost	$162,470,000	Subtotal Cost	$127,240,000	$289,710,000
O	Transmission	$117,280,000	Transmission	$ 60,160,000	
	Substations	$ 44,090,000	Substations	$ 53,490,000	
			Distribution Mod	$ 14,180,000	
	Subtotal Cost	$161,370,000	Subtotal Cost	$127,830,000	$289,200,000
P	Transmission	$116,450,000	Transmission	$ 60,700,000	
	Substations	$ 44,090,000	Substations	$ 53,490,000	
			Distribution Mod	$ 7,380,000	
	Subtotal Cost	$160,540,000	Subtotal Cost	$121,570,000	$282,110,000

2.5.1.3. Other project costs and total project cost per route

The total project cost for each route shown in the table below is the sum of the "Other Project Costs" subtotal and the "Total Line and Substation" cost from the tables in either Section 2.5.1.1 or Section 2.5.1.2. In the table headings below EIF means Environmental Impact Fee.

Table 2.5-3 Route Alternative total project costs

	Other Costs (non-capital)				Total Route Alternative Cost
Route Alternative	Pre-Certification Cost	One-time 5.0 percent EIF	Total Annual 0.3 percent EIF (during construction)	Subtotal Other Project Costs	Total cost Equals Subtotal Other Plus Total from Table 2.5-2
A	$15,810,000	$8,883,000	$1,065,960	$25,758,960	$326,608,960
B	$15,810,000	$8,776,000	$1,059,360	$25,697,360	$324,827,360
C	$15,810,000	$8,539,000	$1,053,120	$25,639,120	$324,249,120
D	$15,810,000	$8,539,000	$1,024,680	$25,373,680	$316,893,680
E	$15,810,000	$8,819,500	$1,058,340	$25,687,840	$323,257,840
F	$15,810,000	$8,764,500	$1,051,740	$25,626,240	$321,466,240
G	$15,810,000	$8,712,500	$1,045,500	$25,568,000	$320,888,000
H	$15,810,000	$8,475,500	$1,017,060	$25,302,560	$313,532,560
I	$15,810,000	$9,013,000	$1,081,560	$25,904,560	$325,964,560
J	$15,810,000	$8,958,000	$1,074,960	$25,842,960	$324,172,960
K	$15,810,000	$8,905,500	$1,068,660	$25,784,160	$323,594,160
L	$15,810,000	$8,669,000	$1,040,280	$25,519,280	$316,239,280
M	$15,810,000	$8,769,000	$1,052,280	$25,631,280	$317,071,280
N	$15,810,000	$8,714,500	$1,045,740	$25,570,240	$315,280,240
O	$15,810,000	$8,662,000	$1,039,440	$25,511,440	$314,711,440
P	$15,810,000	$8,425,500	$1,011,060	$25,246,560	$307,356,560

2.5.2. Environmental impact assessment fees

Wisconsin communities in which high-voltage transmission lines at 345 kV or greater are constructed receive both a one-time payment and annual payments from fees paid by the utility. Under Wis. Stat. §§ 16.969 and 196.491(3g), and Wis. Admin. Code ch. ADM 46, construction applicants that receive a CPCN from the Commission for a 345 kV line are required to pay an annual impact fee and a one-time environmental impact fee to the state Department of Administration (DOA). The Commission is responsible for approving the cost of the project, the "base cost" from which a percentage will represent the fees to be paid. DOA then distributes the money to the local municipalities and counties through which the transmission line is built.

The money from the fee payments may not be used to offset any other mitigation measure that is required of the applicants in the CPCN order from the Commission.

2.5.2.1. One-time environmental impact fees

Under Wis. Admin. Code § ADM 46.05, the one-time environmental impact fee, to be paid in the calendar year when construction begins, is equal to 5.0 percent of the cost of the transmission line as determined by the Commission in the CPCN. This one-time fee is currently estimated for each project route alternative as shown in Table 2.5-3 in Section 2.5.1.3.

Under Wis. Admin. Code § ADM 46.06(2), DOA distributes 50 percent of the funds from this one-time fee to the eligible counties in proportion to the length of the line that is constructed through each county. Likewise, it distributes the other 50 percent of the funds to the eligible towns, villages, and cities in proportion to the percentage of the line that is constructed through each eligible political subdivision. The Commission determines the appropriate allocations.

As stated in Wis. Stat. § 16.969(4), a county, town, village, or city that receives money for the one-time environmental impact fee may use its distribution only for park, conservancy, wetland, or other similar

environmental programs. The local government may request in writing from the Commission approval of a different use for the funds, provided the use is in the public interest.

For the proposed North Appleton-Morgan project, 50 percent of the one-time fee would be allocated between Outagamie, Shawano, Brown, and Oconto Counties, and the other 50 percent would be allocated between all the towns, villages, and cities along the selected route described in the Commission's CPCN order if the project is approved.

2.5.2.2. Annual impact fees

Under Wis. Admin. Code § ADM 46.04, the annual fee to the DOA would equal 0.3 percent of the cost of the line as determined by the Commission in the CPCN under Wis. Stat. § 196.494(3)(gm). This annual fee during construction is currently estimated for each project route alternative as shown in Table 2.5-3 in Section 2.5.1.3.

Under Wis. Admin. Code § 46.06(1), DOA distributes the funds from the annual fee to each eligible town, village, and city in proportion to the length of the line constructed through each municipality as determined by the Commission in the CPCN. After construction of the line is completed and final costs are submitted to the Commission, the annual fee may be adjusted to reflect the actual cost of the line.

2.5.3. Cost allocation in MISO footprint

MISO in its MTEP process[26] reviews submitted transmission owners' reliability class projects for their electric and network capability to meet the North American Electric Reliability Corporation (NERC) criteria and also to do no harm to other network facilities. The review process takes 18 months. The projects are modeled with the design voltage, conductor sizes, terminus points, expected mileage, and other electrical characteristics for testing against the planning and performance criteria sets. When the final solution is determined, MISO moves the project into Appendix A of the MTEP year of review as approved to proceed, ready for the transmission owner to obtain all the necessary certificates and permits for construction. MISO does not approve any routes.

The projects are often grouped as they are required for the area solution. The North Appleton-Morgan Project as a Baseline Reliability Project is labeled in MTEP12 as "ATC LLC P3679." It has the following title and description:

Green Bay to Morgan 345 kV and in Michigan a Menominee Co. to Delta Co. 138 kV line

Facilities

- Green Bay – Morgan 345 kV line (40 mi)
- Holmes – Escanaba 138 kV single circuit on double towers (65 mi) [State of Michigan] also known as Chalk Hill -18th Road
- 150 Mvar reactive supply near Amberg/Holmes 138 kV also known as SVC Static Var Compensator
- Split terminations of Morgan-Falls-Pioneer-Stiles 138 kV
- Shared facilities cost $275,700,000 based on a $280M estimated cost

[26] MISO Transmission Expansion Plan (MTEP), explained in Section 3.1 in Chapter 3 of the EIS.

On December 13, 2012, MISO approved the North Appleton – Morgan 138 kV line and the North Appleton 345/138 kV transformer, both portions of the North Appleton – Morgan project, in MTEP Appendix A. These portions appear in MTEP Appendix A as an "Other" project type (MTEP PID 3952) and are not cost-shared.

At the time the North Appleton – Morgan Project was approved in Appendix A of MTEP, the costs of Baseline Reliability projects were allocated to various transmission owners across the MISO footprint based on the reliability benefits they received. For this case, 25 MISO area transmission owners would be allocated percentages of the cost of the project if it is approved. The allocations follow the cost allocation for the project class known as RECB1, and would be as shown in Table 2.5-4.

Table 2.5-4 Transmission project cost allocations in the MISO footprint

Transmission Owner	Dollar Amount ($)	Allocation Percentage (%)
ATC	246,041,244	89.24
NSP	6,923,227	2.51
ITC	3,068,399	1.11
AMIL	2,684,213	0.97
AMMO	2,575,774	0.93
METC	2,423,647	0.88
ALTW	2,342,856	0.85
18 other TOs	9,640,637	3.5
Total	275,700,000	100.00

CHAPTER

3

3. Assessment of Need and Potential System Solutions

3.1. DESCRIPTION OF MIDCONTINENT INDEPENDENT SYSTEM OPERATOR, INC.

MISO is a not-for-profit, member-based organization that administers the wholesale electricity market in the mid-continental U.S. MISO is responsible for providing transmission service, coordinating daily operations of generating and transmission facilities, administering bulk energy markets, and transmission system planning. MISO manages the energy and operating reserves markets using security-constrained economic dispatch of generation. The energy and operating reserves markets include a day-ahead market, a real-time energy market, and a financial transmission rights (FTR) market.[27] These markets are operated and settled separately.[28]

Figures 3.1-1 and 3.1-2 show the MISO market and reliability coordination areas.

[27] 1 FTRs are financial instruments may be used to provide a financial hedge to manage risk associated with congestion on the electric transmission system. The value of FTRs are determined by the transmission congestion charges that arise in the operating reserves and day ahead markets. These charges lead to differences in the marginal congestion components of locational marginal prices (LMP).
[28] https://www.misoenergy.org/Library/Repository/Communication%20Material/Corporate/Corporate%20Fact%20Sheet.pdf

Figure 3.1-1 MISO market area

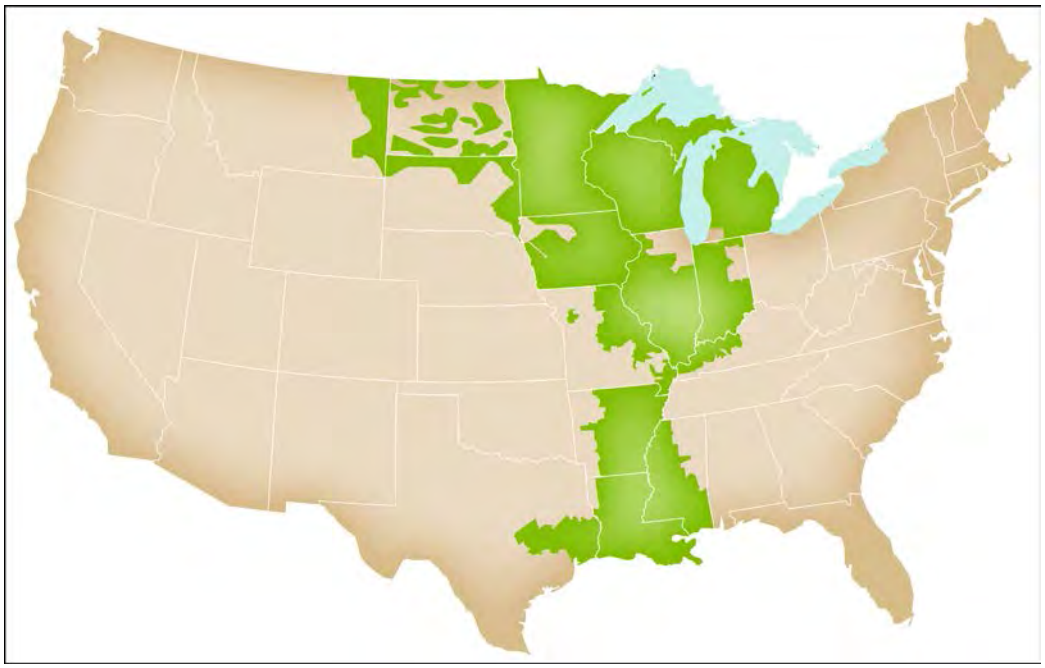
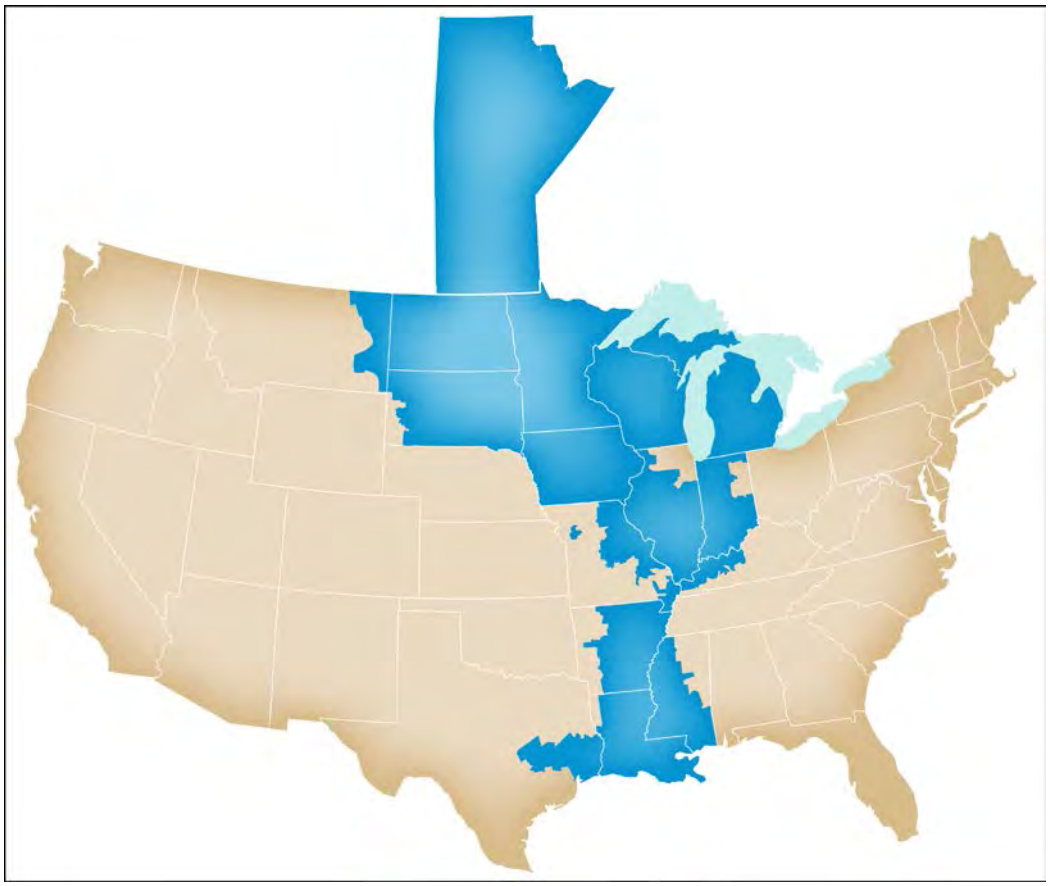


Figure 3.1-2 MISO reliability coordination area



As described in detail below, the MISO board of directors has approved the proposed North Appleton-Morgan project as a reliability project.

3.1.1. Transmission planning process in MISO

The transmission planning process for the MISO region is documented in the MISO Business Practices Manual Transmission Planning, BPM-020-r10.[29] The manual describes the annual process used to develop a comprehensive transmission plan to meet reliability and economic needs. Entities interested in the plan, referred to as stakeholders, participate in the evaluation of system alternatives. Each annual planning cycle results in an MTEP which is typically approved by the MISO Board of Directors each December. The Organization of MISO States (OMS)[30] is an active stakeholder and participant in this planning process. Each approved MTEP includes a list of transmission projects deemed as necessary by the MISO board.

MISO has five planning principles that guide the process with transmission owners, generation owners, load serving entities, OMS, environmental groups, marketers, other regional transmission operators (RTO), and other stakeholders. These five principles include:

- Make the benefits of a competitive energy market available to customers by providing access to the lowest possible electric energy costs.
- Provide a transmission infrastructure that safeguards local and regional reliability.
- Support state and federal renewable energy objectives by planning for access to all such resources (*e.g.* wind, biomass, demand-side management).
- Create a mechanism to ensure that investment implementation occurs in a timely manner.
- Develop a transmission system scenario model and make it available to state and federal energy policy makers to provide context and information regarding potential policy choices.[31]

It is a goal of MISO that the transmission planning process be fully compliant with planning principles presented in the Federal Energy Regulatory Commission's (FERC) Order Nos. 890 and 890-A.[32] In Order No. 890, FERC identified nine planning principles "that must be satisfied for a transmission provider's planning process to be considered compliant with the final rule." MISO has incorporated each of the FERC Order No. 890 planning principles into its transmission planning process, and describes these planning principles in BPM-020[7].[33] These nine planning principles include:

I. Coordination
II. Openness
III. Transparency
IV. Information Exchange
V. Comparability
VI. Dispute Resolution
VII. Regional Participation
VIII. Economic Planning Studies
IX. Cost Allocation for New Projects

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[29] Available for download at https://www.misoenergy.org/Library/BusinessPracticesManuals/Pages/BusinessPracticesManuals.aspx
[30] http://misostates.org/
[31] MISO BPM-020, p. 13.
[32] Available at http://www.ferc.gov/whats-new/comm-meet/2007/021507/E-1.pdf and http://www.ferc.gov/whats-new/comm-meet/2007/122007/E-1.pdf
[33] MISO BPM-020, pp. 13-14.

There are many different planning functions during the different phases of MTEP development. The major planning functions are listed below:[34]

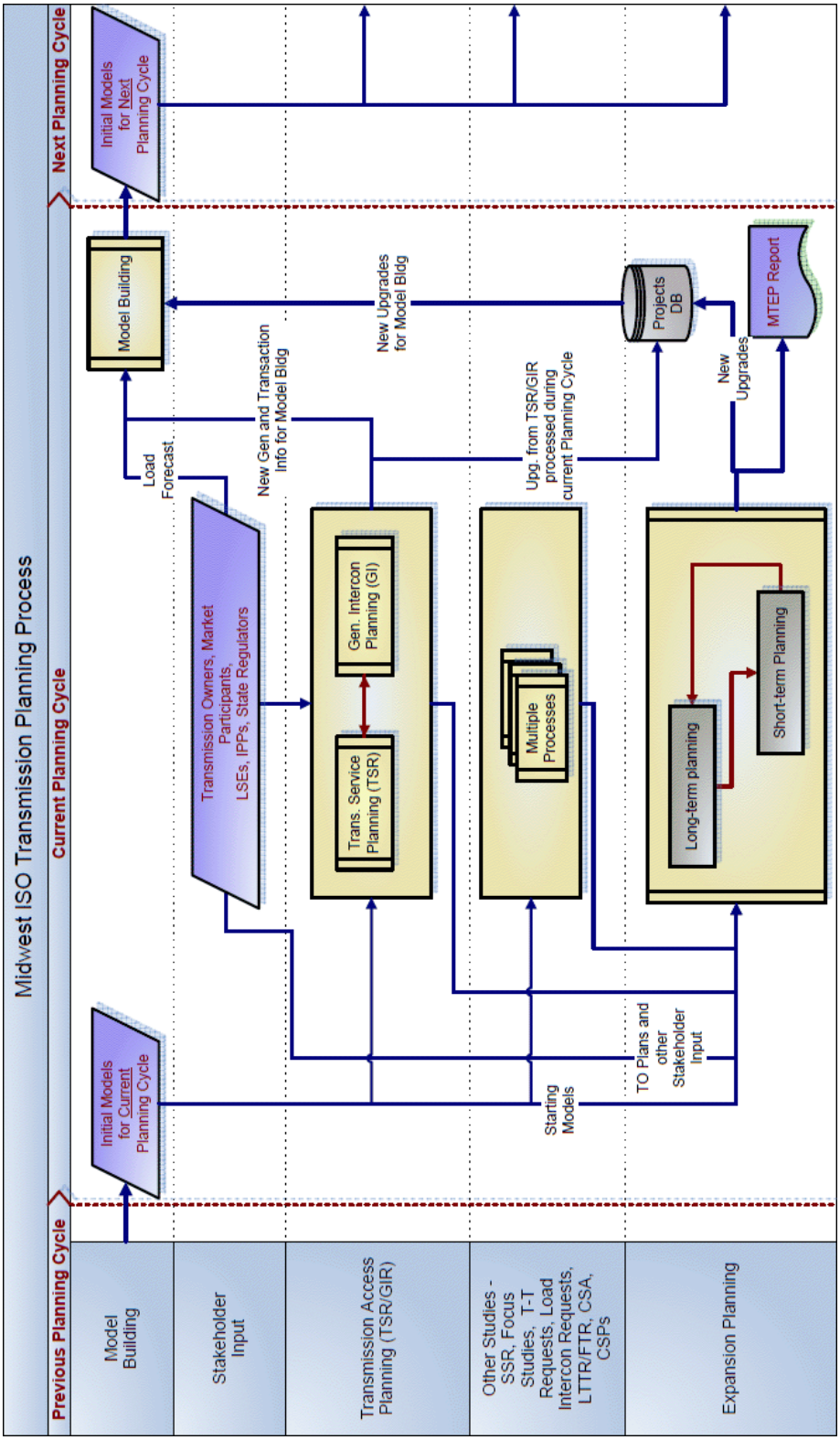
- Model Development
- Cyclical Baseline Reliability and Economic Planning
- Transmission Access Planning
- Generator Interconnection Planning
- Transmission Service Planning
- Coordinated Inter-regional Planning (with other RTOs/Regions)
- Non-cyclical Planning Needs
- System Support Resource (SSR) Studies for unit de-commissioning
- Transmission Interconnections
- Load Interconnections
- Focus Studies – Studies initiated during the cyclical baseline planning process that cannot wait until the next planning cycle (for example NERC/FERC directives, near-term critical operational issues)

Some planning functions, such as transmission access planning and generator interconnection planning, are conducted on an on-going basis.

A flow diagram of the MISO transmission planning process is included in Figure 3.1-3:

[34] MISO BPM-020, p. 14.

Figure 3.1-3 MISO transmission planning process flow diagram[35]



[35] MISO BPM-020, p. 15.

3.1.2. Model building and analysis techniques

Computer models used by MISO for reliability analysis have both near-term (one- to five-year) and long-term (six- to ten-year) planning horizons. Economic studies include five-, ten-, and 15-year model runs so that conditions may be evaluated over a period of time.

The primary focus of the MTEP process is to assure compliance with NERC[36] planning and operating standards including the Regional Entities standards. One of the most significant NERC standards is the transmission planning standards included in Standards TPL-001 through 004.[37] These standards address transmission system performance under normal and emergency conditions. Standards MOD-001 through 033 prescribe methods for modeling transmission system elements to evaluate various capabilities of the transmission system.

3.1.3. Planning Advisory Committee

The MISO Planning Advisory Committee (PAC)[38] is a significant source of input for the MISO planning staff during the MTEP development process. The committee is comprised of one member from each of the following MISO stakeholder groups:

- Transmission owners
- Municipal and cooperative electric utilities and transmission-dependent utilities
- Independent power producers and exempt wholesale generators
- Power marketers and brokers
- Eligible end-use customers
- State regulatory authorities
- Representative of public consumer groups
- Environmental and other stakeholder groups
- Transmission developers

The PAC meets monthly to review the progress of the current MTEP process.

3.2. EXISTING ELECTRICAL FACILITIES IN THE STUDY AREA

3.2.1. Existing transmission system in the North Appleton-Morgan project study area

As shown in Figure Vol. 2-2, northeastern Wisconsin is served by a network of 345 kV, 138 kV, and 69 kV lines. The utility's Planning Study Area (PSA), which encompasses Green Bay, Marinette/Menominee, Iron Mountain, Marquette, and surrounding areas of Wisconsin and the Upper Peninsula of Michigan (UP), is located in the northern portion of ATC's footprint. The area of the PSA is illustrated on the map in Figure Vol. 2-7.

In its application, ATC states that the transmission system in the Green Bay area includes two parallel 138 kV paths that traverse through the city from the Forest Junction Substation located south of the

[36] http://www.nerc.com
[37] http://www.nerc.com/pa/Stand/Reliability%20Standards%20Complete%20Set/RSCompleteSet.pdf
[38] https://www.misoenergy.org/StakeholderCenter/CommitteesWorkGroupsTaskForces/PAC/Pages/home.aspx and https://www.misoenergy.org/Library/Repository/Meeting%20Material/Stakeholder/PAC/2014/2014%20PAC%20Charter.pdf

greater Green Bay area. The Highway V-Preble-Pulliam 138 kV path is located on the east side of the Fox River, and the De Pere-Glory Road-Pulliam 138 kV path is located west of the river.

The Werner West-North Appleton 345 kV line southwest of Green Bay is the only tie between the eastern and western portions of ATC's 345 kV transmission system. Certain outages tend to overload the Werner West-North Appleton 345 kV line, which can constrain transmission flows.

The transmission system immediately west and north of the Green Bay area includes a 345/138 kV double-circuit line from the Morgan Substation near Oconto Falls in Oconto County southwest and south to the Werner West Substation near New London in western Outagamie County, and a double-circuit 138 kV line from the Stiles Substation between Oconto Falls and Oconto south to the Pulliam Substation in Green Bay.

The primary transmission ties to the UP include a 345 kV line and a double-circuit 138 kV line south from Quinnesec near Iron Mountain in Michigan to the Oconto area north of Green Bay in Wisconsin. In addition, there is a single 138 kV tie from the western UP to the Rhinelander area in Oneida County in Wisconsin and a single 138 kV line from the Amberg area south of Iron Mountain in Marinette County to West Marinette between Marinette and Peshtigo.

The transmission system in the Escanaba, Michigan, area consists of a 138/69 kV network where the primary 138 kV facilities include a double-circuit line between the Chandler and Perkins Substations. The 69 kV sources consist of two 69 kV lines, one from the west and one from the northwest.

ATC states that the PSA possesses at least three unique characteristics that contribute to the need for increased transmission facilities.

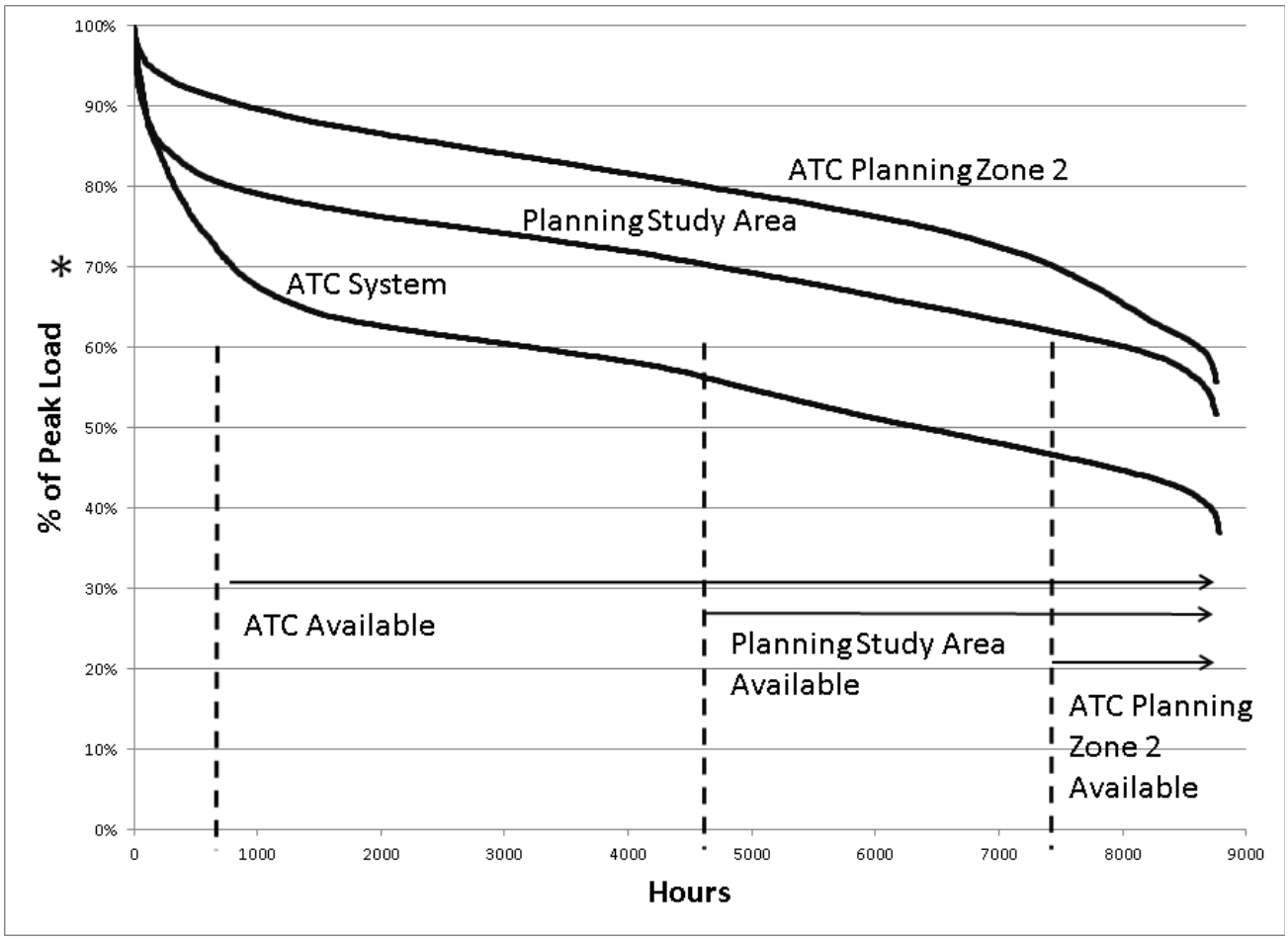
1. The PSA experiences unusually constant load (demand) patterns, restricting greatly the ability to schedule line outages in order to conduct routine, preventive maintenance of the transmission system. This limitation on maintenance is discussed below.
2. The availability of existing and future generating capacity is uncertain within the PSA, as discussed in Section 3.2.2 in this chapter.
3. There are limited transmission line connections into the PSA from outside of it, as discussed above.

Regarding the first characteristic that the PSA load patterns are constant and restrict the opportunities to conduct routine maintenance, those load patterns can be contrasted with the load patterns for the ATC system as a whole. There is a contrast in maintenance outage availability in terms of hours available per year. NERC reliability standards state that maintenance outages need to be taken only when demand levels are low enough that such work could normally take place. Generation and transmission line maintenance outages are typically performed in the spring and fall during the off-peak ("shoulder") load periods and are usually planned for when the system of concern is at 70 percent of peak load levels, to ensure adequate availability to perform maintenance. The UP load level does not drop to 70 percent of peak for as many hours of the year and so does not allow as many hours as does the ATC system as a whole, or the PSA. In other words, the UP experiences a higher load factor for a longer period of time than the PSA or the ATC system as a whole. The ATC system has approximately 7,500 hours available, the PSA has approximately 4,000 hours available, and the UP has approximately a 1,000 hours available to perform maintenance within a calendar year at 70 percent of peak load level.

For illustration, Figure 3.2-1 shows this contrast. An approximate 70 percent load level in the UP and in the PSA result in a much lower number of available hours to perform maintenance compared to what is typically available on the ATC system as a whole. This is the fundamental basis for ATC's conclusion that

adequate maintenance windows cannot be found at this time within the PSA or the UP at the typical load level (70 percent) at which maintenance is performed.[39]

Figure 3.2-1 Hours available in a year for maintenance activities and outages using NERC 70 percent of peak load standard



Although the load growth within the PSA is relatively low compared to the rest of the ATC transmission system, as discussed in Section 3.3 in this chapter, demands on the transmission system have been increasing as behind-the-meter, customer generation declines in the PSA. This effectively increases the power flows into the PSA, resulting in longer periods of exposure to more severe critical contingencies. ATC expects loss of behind-the-meter generation to continue to occur within the Wisconsin portion of the PSA and use of the transmission system to increase.

As discussed above, the PSA has limited connections to the rest of the Eastern Interconnection transmission system. Most study areas have ties to the rest of the transmission system on multiple sides. By contrast, the ties to this area are only on its southern boundary in Wisconsin and a small tie on the eastern boundary. The limited number of connections means that the area has to rely on internal resources more than other areas to meet NERC reliability standards.

All these characteristics have increased the flow duration curve for the PSA by over 300 megawatts (MW) since 2007/2008. Such an increase has been a key factor in stressing the reliability of the transmission

[39] ATC Application, Appendix D, PSA, Figure 3.5.

system in this area. Even if Presque Isle and Escanaba generation remain at current levels, ATC expects that power would continue to flow into the PSA. This suggests that the risk of voltage collapse and the amount of load that would be lost from multiple outages is increasing.

The qualitative risk for load loss has increased over the past few years so that it is no longer acceptable under the NERC Reliability Standards.[40]

The proposed project, along with another anticipated 138 kV line in the UP, would fortify the transmission system within the PSA and would provide additional necessary transmission lines and allow more available hours for transmission maintenance.

3.2.2. Existing generation system in the North Appleton-Morgan project study area

The ability of the regional transmission system to serve the study area depends on the status of major local power plants. The names, capacities, fuel types, and location of major existing generating facilities in the North Appleton-Morgan project study area are listed Table 3.2.-1.[41]

Table 3.2-1 Existing major generation facilities in the North Appleton-Morgan project study area

Unit	Capacity (MW)	Fuel Type	Location
Presque Isle	344	Coal	Marquette, MI
Escanaba	44	Coal/Natural Gas	Escanaba, MI
Pulliam	395	Coal/Natural Gas	Green Bay, WI
Warden	18	Biomass	L'Anse, MI
Gladstone	16	Diesel	Gladstone, MI
Eastern UP Diesels	20	Diesel	Various
Portage	16	Diesel	Houghton, MI
White Pine	40	Coal/Natural Gas	Ontonagon, MI
West Marinette	206	Natural Gas	Peshtigo, WI
US Hydro and Edison Sault Electric Hydro	51	Hydro	Sault St. Marie, MI
Behind-the-meter Generation	300	Various	Various

The PSA experiences relatively high loads during traditional non-peak hours. Consequently, the load shape in the PSA is much flatter than the remainder of the ATC System, making it extremely difficult to find times of the year to schedule generation system maintenance.

ATC states that it is aware of a number of uncertainties that may affect generating resources in the PSA. Some of the known variables include the long-term availability of generation in the Marquette, Green Bay, Marinette, and Escanaba areas. For example, there have been many news reports about the status of the Presque Isle generation in Marquette, the retirement of Pulliam 5-6, and loss of 60 MW of behind-the-meter generation. There is also uncertainty regarding Escanaba's generation levels. The continued availability of this generation is uncertain.[42] Generation uncertainties explain, in part, the need to add the transmission facilities proposed in this project.

[40] NERC TPL-001-1, TPL-002-1b, TPL-003-1a.
[41] ATC CPCN Application, Appendix D, pp. 28-32 of 278, PSC REF#: 201022.
[42] ATC CPCN Application, Appendix D, Section 3.1.6 and Section 4.

3.3. AREA LOAD

3.3.1. Existing load patterns

Flows have increased in the project area by over 300 MW since 2007/2008. The 300 MW increase is approximately 40 to 50 percent above the 2007/2008 flows overall.

The existing load pattern in this area is relatively flat, not varying as much as other portions of ATC's system. The Empire Mine load is reduced during summer peak, but may still be online during off-peak shoulder periods. Customers' use of their own, behind-the-meter generation has been declining, and this decline has increased the demand on the transmission system to meet their electricity needs. Also, unit retirements and de-rates at the Presque Isle Power Plant, and changes to other generation plants, have decreased available generation in the study area, again increasing the need for transmission.

There are higher levels of non-scalable load in the area. ATC estimates that between 25 and 30 percent of the load is non-scalable. As discussed in Section 3.2, this high percentage makes scheduling transmission maintenance more difficult because there are fewer windows of time available for maintenance outages. Also, because of the geography of the area, there are limited transmission line connections.

3.3.2. Load forecast

ATC's estimate of load growth in the area is 0.66 percent for the years 2013 through 2021, based on estimates from the local electric distribution companies. Load growth is not the primary driver for this project, which is being proposed for reliability reasons. Higher power flows during outages in the area, and the difficulty of planning times for maintenance, point to a need for additional transmission capacity in the project area.

3.4. SYSTEM BENEFITS

3.4.1. System reliability

Several significant outages within the planning study area (see Figure Vol. 2-7) have occurred since November 2001, with each outage caused by multiple circuit contingencies, failures of more than one transmission system element at the same time or in succession. On May 10, 2011, an extremely strong lightning stroke resulted in a 95 kA fault current, much higher than normal, which resulted in the loss of customer connections or "load." Based on the frequency of previous double-circuit outages and other significant loss-of-load events, ATC believes that the chance of a recurrence of this type of event is high.

This section will examine the effect of the proposed North Appleton-Morgan project from a reliability standpoint.

The applicant has used the Power System Simulator for Engineering (PSS®E) simulation model from Siemens Power Technologies, Inc. (PTI), to perform the power flow and contingency analysis of the proposed North Appleton-Morgan project. Other software utilized in this analysis include PowerTech Labs' Voltage Security Assessment Tool (VSAT), Physical and Operational Margins-Optimal Mitigation Measures (POM/OPM) software by Ventyx, and PROMOD. Commission staff uses PowerWorld Simulator for reviewing the reliability analysis. The reliability analysis consists of power flow analysis for NERC contingencies and voltage collapse simulations.

The NERC and ATC guidelines require that an interconnected transmission system consisting of numerous elements such as generators, transformers, transmission lines, and circuit breakers successfully operates in the event of failure of one or more system elements. In the study, ATC first utilized the POM/OPM software to perform a multiple contingency screening analysis followed by PSS®E power

flow simulations of various scenarios based on MISO's Transmission Expansion Plan 11 (METP11) data. All the models used in this study were based on MISO's MTEP11 series models, which were developed from the 2010 NERC Multi-Modeling Working Group (MMWG) model series for industry-wide use. The base models used for this analysis included Summer Peak and Shoulder Off-Peak model for the years 2016 and 2021. In coordination with MISO, ATC updated its footprint with the most updated topology, generation dispatch, and the load forecast prepared by the local distribution companies in 2011. These models are referred to as the MTEP11 Modified models.

The transmission System Alternatives considered as a part of the analysis for the North Appleton- Morgan project are:

- A new North Appleton-Morgan 345 kV line and a new North Appleton-Morgan 138 kV line on separate structures
- A new Gardner Park-Plains 345 kV line and a new North Appleton-Morgan 138 kV line
- Two new North Appleton-Morgan 138 kV lines on separate structures

VSAT was used for voltage stability analysis by validating voltage collapse scenarios in the planning study area. The Transient Thermal Limits (TTL) for transmission lines were incorporated in these simulations. TTL refers to the condition where the flow on the transmission line exceeds its applicable emergency rating. If TTL is exceeded, operators need to take quick action to prevent unacceptable loss of equipment life and/or electric conductor clearance violations. ATC also performed cascading analysis according to planning guidelines and consistent with MISO's business practices.

Contingency analysis helped assess the impacts of NERC standards at voltage levels 69 kV and above. Contingency analysis consisted of simulating NERC Category A (system intact), Category B (one item out), and select Category C (two or more items out simultaneously or in succession) and prior maintenance plus Category B contingencies on both the peak and off-peak demands. The following demand levels and associated scenarios were modelled to determine the sensitivity to certain system conditions:

- 2016 Summer Peak, Expected Scenario with Study Based Rating Methodology (SBRM) applied
- 2016 Off-Peak, Expected Scenario with SBRM applied
- 2016 Summer Peak, Expected Scenario with reduced mine load and SBRM
- 2016 Off-Peak, Expected Scenario with reduced mine load and SBRM
- 2016 Summer Peak, Highly Likely Scenario
- 2016 Off-Peak, Highly Likely Scenario

The Category A simulations assess the ATC transmission system under normal conditions in terms of voltages and other facility ratings. The Category B simulations analyze the ATC transmission system under various single contingency conditions and also prior maintenance outage conditions followed by a single contingency. The TTL are also monitored. Category C contingencies analyze the system under multiple contingencies. Simulations of all NERC Category C.1 (bus section fault), C.2 (bus tie breaker fault), C.3 (two or more elements), and C.5 (two or more circuits on a common tower) contingencies in the planning study area have been conducted.

ATC concluded from NERC Category A simulations that, under normal system conditions, there were no thermal or voltage limitations within the planning study area (Figure Vol. 2-7) for the 2016 Summer Peak or Off- Peak scenarios. Category B contingency analysis showed that, for the Summer Peak scenario, there were no voltage or thermal limitations found within the planning study area. However, in the Off-Peak scenario, ATC identified several voltage and thermal limitations under maintenance-plus-single-contingency conditions. Category C.1, C.2, C.3, and C.5 contingencies highlighted severe thermal

overloads and various potential voltage collapse conditions in the planning study area, demonstrating the need for reinforcements in the Green Bay and Morgan-Plains areas.

Three sensitivities were modelled to determine the potential impact of load and generation changes impacting the flow into the planning study area. The sensitivities were:

- 2016 Expected Scenario,[43] Study Based Rating Methodology (SBRM) Ratings applied, Summer Peak and Off-Peak
- 2016 Expected Scenario, SBRM Ratings applied, plus reduced mine load, Summer Peak and Off-Peak
- 2016 Highly Likely Scenario,[44] SBRM Ratings applied, Summer Peak and Off- Peak

Voltage collapse simulations performed for North Appleton- Morgan using VSAT validate that the contingencies simulated in PSS®E are due to voltage collapse, illustrating that the planning study area (Figure Vol. 2-7) is vulnerable to imminent voltage collapse or extremely low voltage conditions.

Results of the analysis show that the proposed North Appleton-Morgan project addresses all Category B, C.3, C.5, and maintenance-plus Category B contingencies in the planning area. It addresses all the contingencies in the Highly Likely scenario and most of the contingencies in the Highly Likely Adjusted scenario, with the Presque Isle Power Plant in Marquette (Presque Isle) offline, and the Expected scenarios for 2016 and 2021, with and without mitigation. While the Gardner Park-Plains 345 kV Alternative performs very well from a reliability standpoint, it is more costly and requires a long implementation time due to anticipated routing and siting concerns. The Two North Appleton-Morgan 138 kV lines Alternative does not provide a second 345 kV line between North Appleton and areas to the west. A second 345 kV line would relieve current congestion on the existing single North Appleton-Werner West 345 kV line.

3.4.2. Applicant's stated benefit of access to lower cost energy

ATC states that new high-voltage transmission facilities have the potential to reduce the overall cost of providing electricity to customers by increasing the physical deliverability from lower-cost suppliers outside the local service area (meaning non-local suppliers.) ATC's analysis shows that, in 2011, the fuel expense (dollar per MWh) difference between the non-local suppliers represented by the generator mix for the MISO energy market and the major local supplier (Presque Isle) is approximately $7.00. This difference indicates that a project like North Appleton-Morgan, which increases import capability into the study area, could provide additional access to lower-cost generation resources. ATC believes that over its planning horizon, this relative fuel-cost difference may likely change and other variables, such as congestion between the non-local resources and the study area, would affect this benefit. For this reason, ATC states it has chosen to present only relative information about this benefit rather than quantify the results in monetary terms.

ATC expects the proposed North Appleton-Morgan project to produce energy-cost savings in the form of reductions in the cost of delivered energy for load-serving entities (LSE) within ATC's service area. The additional transmission lines would reduce congestion charges associated with moving energy from generation sources to load and may increase the quantity of FTRs available to LSEs within ATC. In the MISO market, utilities, and other market participants pay congestion charges when moving energy from low-priced nodes to higher-priced nodes (unless the difference in nodal prices is due only to transmission

[43] Expected: includes changes that are in place or committed to for the next ten years.
[44] Highly Likely: includes changes that are not committed to, but are highly likely such as the availability of Presque Isle, load increases, etc.

system losses). These congestion charges can be hedged through offsetting revenues from FTRs that are allocated to or purchased by LSEs. ATC believes the level of energy-cost savings depends upon several variables, including the extent to which ATC LSEs are subject to cost-based versus market-based rates, and the degree to which this project increases transfer capacity and FTR coverage for ATC LSEs.

As energy is transmitted, some energy is lost in the form of heat. Losses must be replaced, increasing the total amount of generation required to serve load. Energy losses on the transmission system can result in increased costs to utilities and ratepayers because there is a need to generate enough energy to adequately serve loads while accounting for the losses accrued during the transmission of this energy. To the extent that new transmission impacts dispatch and flow patterns, transmission losses also change. If transmission losses decrease, utilities do not have to install as much generation in order to meet their energy needs. Using PROMOD and ATC's loss evaluation tool, energy loss savings associated with the proposed North Appleton-Morgan project have been calculated for all future scenarios and study years. ATC's analysis shows a loss savings for all future scenarios studied when the North Appleton-Morgan project is in service.

3.4.3. Description of PROMOD modeling runs

In its application, ATC states that it used the PROMOD simulation tool for evaluating the potential economic benefits of the project. ATC has used PROMOD in previous transmission dockets and states that PROMOD is recognized by electric utilities as a standard tool for electric system economic planning.

Ventyx, the software vendor, states that PROMOD incorporates:

- Extensive details of operating characteristics for all generating units.
- Hourly load shapes and forecasts for each area.
- A zonal transmission topology and transmission constraints for short-term analysis.

Additional data needed for long-term analysis include:

- Detailed transmission topology from a future power flow case.
- 25-year projections of fuel and emission costs.
- Zonal transmission expansion plans.
- Environmental retrofits and retirements.

PROMOD can be used to forecast locational marginal pricing (LMP), the price of electricity at a specific location at a given time. It can do this by performing security-constrained generating unit commitment and economic dispatch in a manner similar to that used by independent transmission system operators. Transmission lines can carry only a certain amount of power depending on their physical and electrical limitations and the security constraints on them. In a congested network, expensive but advantageously placed generation might be used to meet the demand. The process of matching supply and demand while maintaining transmission system reliability is referred to as "commitment" and "dispatch," which is simply the process of deciding which individual generators can most cost-effectively meet the anticipated demand.

PROMOD is also used to perform a Multi-Area Reliability (MARELI) analysis, which helps determine the extent to which different areas within a system can or will support one another by virtue of the system's interconnections.

ATC calculated the economic benefits for the transmission projects over a range of four plausible futures for the electric industry in 2022 that were developed through a stakeholder process at MISO, the regional transmission operator.

In the North Appleton-Morgan project, ATC used PROMOD to perform economic benefits evaluation using different future scenarios, as defined in the MTEP12 process in consultation with stakeholders at MISO Planning Advisory Committee. Based on its analysis, ATC concluded that the North Appleton-Morgan project would provide substantial economic benefits along with reliability benefits for most or all of the future scenarios. As such, it would be a robust project that would provide economic benefits.

These future scenarios are:

- Business As Usual (BAU)
- Combined Policy
- Historical Growth
- Limited Growth.

ATC states that the four futures are based on key drivers such as load growth, generation retirement and expansion, fossil-fuel costs, use of renewable energy, and increased environmental regulation. MISO, in consultation with stakeholders, assigned a range of plausible outcomes for each of these factors based on available data and estimates and then postulated a credible future scenario composed of these selected values. The purpose of these future scenarios is to create bounds for the range of conceivable outcomes:

- The BAU future scenario considers the status-quo with the prevailing economic conditions during the MTEP12 analysis period. This future scenario assumes that current policy framework continues throughout the study period as reflected in the key variable assumptions.
- The Combined Policy future scenario studies the impact from multiple policy drivers such as the federal Renewable Portfolio Standards, U.S. Environmental Protection Agency (EPA) regulations, a Smart Grid, and electric vehicles.
- The Historical growth future scenario considers quick recovery from the recent economic conditions and assumes higher demand and energy growth rates as seen in the past for the entire study period. This will be considered as the high side variation of the BAU future.
- The Limited growth future scenario considers very low growth rates, with no change in EPA regulations and no carbon cost. This can be considered as the low side variation of the BAU future.

ATC states that it made several changes to the model beyond what is identified in the original MISO PROMOD models. These changes include:

- Escanaba Steam Units were assumed retired with the Holmes-Old Mead Road 138kV transmission line in service as a result of their System Support Resource (SSR) designation.
- Inclusion of the Distributed Resources within ATC's footprint.
- Updated maintenance schedules for ATC area generators.
- Verified and updated ATC Utility Generation Ownership.
- Additional ATC-identified contingencies in the event file.
- Retirement of Kewaunee nuclear unit and removal of the nearby proposed Barnhart-Branch River transmission project.
- Updated known generation retirements outside of ATC territory.
- Addition of several PJM-approved ComEd transmission projects in Northern Illinois.

- Converted Valley Power Plant units in Milwaukee to steam gas.
- Ludington pumped-storage revision to align with current and projected practices.
- Adjusted PROMOD model to align current generator capacity factors and LMPs.

To evaluate the futures set out above, simulations need to be run. The simulations require all the transmission and generation data along with items like reserve margins, forecasted fuel costs, and so forth. Most of the generator input data is contained within PowerBase, which is the database provided for use with PROMOD. PowerBase contains generator data that comes from Ventyx, including summer and winter capacities, heat rates, and forced outage rates. Ventyx in turn gets most of its data from the Platts database and public information sources like the EPA Continuous Emission Monitoring System and NERC's Generating Availability Data System (GADS) databases. Planned future generation is also added to PROMOD. Ventyx gets plant-specific fuel forecasts for coal-fired units from the Platts database. The transmission data is updated by ATC and MISO. These updates include all known transmission and generation changes for the study year, including new and upgraded transmission lines and new and retired power plants.

ATC analyzed the major potential economic impacts of the North Appleton-Morgan Project and measured those impacts on an annual-benefit basis for 2022 and on a present-value basis. The ATC Customer Benefit Metric discussed in Section 3.4.4 was used as the basis for determining benefits. The ATC Customer Benefit Metric measures the impact of a transmission project on the total energy and congestion-related cost of service of ATC customer utilities, taking into account the existing market structure and regulatory environment in the UP and in Wisconsin. Also, the ATC Customer Benefit Metric accounts for the value of imports and exports for the ATC system.

3.4.4. PROMOD modeling results

ATC states that it used its Customer Benefit Metric as the basis for determining the economic benefits of the proposed North Appleton-Morgan project. It believes that the Bay Lake Project would produce significant economic benefits for ATC customers in multiple scenarios.

ATC estimated the total of annual economic benefits for 2022, which is made up of a number of individual benefits, including energy-cost savings for customers, reduced congestion costs, financial impacts due to changes in losses, and a system-failure insurance benefit. The aggregate annual 2022 benefit of the North Appleton-Morgan project estimated for the BAU future scenario is $1.49 million. For the Combined Policy future it is $20.14 million. For the Historic Growth future it is $6.20 million. For the Limited growth future it is $1.16 million.

The 40-year present-value savings, assuming the same in-service date for all projects and using a 3.0 percent annual inflation factor and a 6.7 percent annual discount rate, is estimated at $20.85 million for the BAU future scenario, $282.24 million for the Combined Policy future, $86.84 million for the Historical Growth future, and $16.25 million for the Limited Growth future.

3.4.5. Commission staff's analysis of the applicant's PROMOD modeling

The applicant's stated need for the proposed project is primarily reliability. However, the applicant also states that the proposed North Appleton-Morgan 345 kV and 138 kV lines provide economic benefit to the system. To evaluate the stated economic benefit, Commission staff analyzed the applicant's PROMOD analysis. To test the analysis, Commission staff reviewed the PROMOD modeling performed by the applicant using the data, generation outage, and transmission outage files supplied as part of the project application.

The applicant supplied these files for the Business as Usual (BAU), Combined Policy, Historical growth, and Limited Growth model runs described above. Commission staff used PROMOD software and the data sets supplied by the applicant and successfully recreated the modeling performed by the applicant. Commission staff then used PROMOD's Report Agent to extract certain data from the output file for each model run and compared its results to those of the applicant. To test the applicant's stated monetized benefits of the proposed project, Commission staff reviewed the energy cost savings spreadsheet calculation used by the applicant to derive the PROMOD portion of its customer benefit metric. Commission staff then developed its own spreadsheet based on the energy cost savings calculation used by the applicant. Commission staff randomly chose the BAU 2022 future to recreate. Commission staff recreated the output for this future with and without the proposed North Appleton-Morgan 345 kV/138 kV project. This output was used as input for its energy cost savings spreadsheet. The results of the Commission staff energy cost savings calculation matched that of the applicant to a difference of less than .15 percent for each BAU future, with and without the proposed North Appleton-Morgan 345 kV/138 kV project.

Based on this review, Commission staff concludes that the results set out by the applicant in its application accurately represent the results of the applicant's PROMOD modeling.

3.5. POTENTIAL SYSTEM SOLUTIONS

3.5.1. No Build Option

The applicant states that a no-build option or base case scenario would not be sufficient in addressing the reliability issues associated with the project transmission study area. ATC states that this is not a possible option as it believes this would leave the study area in violation of NERC criteria[45] for electric system reliability which states that the transmission system must be able to avoid a cascading blackout resulting from any single contingency. Under the criteria, maintenance cannot be counted as a contingency itself[46]. This means that the transmission system must be able to survive any single contingency that may occur during a line maintenance. ATC does not believe that the existing transmission system in the project study area is robust enough for the company to perform required maintenance properly while remaining in compliance with NERC criteria. Thus, ATC states that a no-build option is not a viable choice for this project.

3.5.2. Non-Transmission Options

3.5.2.1. Generation

The applicant states that a generation-only solution would not be sufficient for resolving the reliability issues within its study area. ATC projects a minimum need of 400 to 550 MW of new generation in order to meet the study area's reliability needs.[47] The study shows that the main issue that leads to a blackout is voltage collapse due to reactive losses on a constrained transmission system. With the study results, ATC has indicated that it does not believe that merely adding generation will solve the voltage collapse issues

[45] North American Electric Reliability Corporation (NERC) criteria are federally set operating procedures overseen and enforceable by the Federal Energy Regulatory Commission (FERC).
[46] NERC criteria and general planning methodologies are mentioned in NERC standard 51-Transmission System Adequacy and Security dated February 8, 2005.
http://www.nerc.com/pa/Stand/Version%200%20Relaibility%20StandardsRD/Planning%20Standards%20Clean.pdf
[47] ATC CPCN Application, Section 2.6 on p. 33. PSC REF#: 204071.

within the study area. ATC does not believe that adding generation is a cost-effective or technically feasible measure to address all of the reliability issues in the study area.

3.5.2.2. Load reduction

The area studied for the project is unique due to the significant amount of mining and paper mill electricity use, or load. These industries traditionally run 24 hours a day and thus have very flat load patterns. In many other situations, load reduction can be a viable way of meeting reliability criteria in the case of a contingency. However, the typical load in the study area requires a constant and stable source of electricity. The machines used in these industries cannot simply be shut down and started up again without costly damage to either the machines or the product, so an unexpected loss of electric service to these industries can be particularly damaging. ATC estimates that, if the largest mine load (Empire Mine) were able to be shut off entirely, an additional 300 MW of load reduction would still be required to alleviate the system constraints.[48] Alternatively, if Empire Mine were to stay online for the foreseeable future, then ATC estimates that 500 MW of load reduction would be required. Thus, ATC states that it does not believe that load reduction is a feasible or viable option in order to address the reliability issues within the study area.

3.5.3. Transmission system alternatives

ATC submitted three alternative solutions to the study area problem. Its first alternative is the proposed North Appleton-Morgan project. This first alternative involves the following upgrades and construction:

- A new North Appleton-Morgan 345 kV line
- A new North Appleton-Morgan 138 kV line on a separate structure from the new 345 kV line
- Significant expansion and refit of the North Appleton Substation
- Expansion of the Morgan Substation to accommodate the new lines
- Expansion of the Stiles Substation
- A new 150 MVAR SVC near the Amberg Substation, to be called the Benson Lake Substation

ATC's analysis of the proposed project determined that this North Appleton-Morgan project would address all NERC category B, category C.3, category C.5, and maintenance plus category B contingencies in the study area.[49] As a result, ATC states that it believes the North Appleton-Morgan project will enhance the system reliability within the study area for expected scenarios.

The second alternative, called the "Gardner Park to Plains Solution Package" involves the following upgrades:

- A new Gardner Park-Plains 345 kV line
- A new North Appleton-Morgan 138 kV line
- Upgrades to the Morgan-Stiles 138 kV line
- Expansion of the Morgan Substation for two additional 138 kV line positions
- Expansion of the Gardner Park 345 kV Substation
- A new 150 MVAR SVC near the Amberg Substation, to be called the Benson Lake Substation

[48] ATC CPCN Application, Section 2.5.2 on p. 32. PSC REF#: 204071.
[49] Current NERC criteria on transmission system planning performance requirements, p. 4, http://www.nerc.com/files/tpl-001-2.pdf.

ATC's analysis determined that the performance of its Alternative 2 (Gardner Park-Plains) was robust and reliable. It also found that Alternative 2 performed as well (in some cases slightly better and in some cases slightly worse) as the proposed North Appleton -Morgan project. However, ATC cites Alternative 2 as being much more difficult to site and construct because the project would have to be navigated through or around the Chequamegon-Nicolet National Forest.[50] In addition, the total projected cost of Alternative 2 is $548.5 million compared to a projected cost for the proposed project (North Appleton-Morgan) of $260.1 million.[51] This is a significant difference in cost, with Alternative 2 more than double the cost of Alternative 1.

The third alternative that ATC has investigated for the study area solution is called the "Two North Appleton to Morgan 138 kV lines Alternative", designated as the "low-voltage" alternative. This alternative does not involve the construction of any additional 345 kV lines. The low-voltage alternative involves the following upgrades:

- A new North Appleton-Morgan 138 kV line
- A second new North Appleton-Morgan 138 kV line
- Upgrades to the Morgan-Stiles 138 kV line
- Expansion of the North Appleton Substation for two additional 138 kV positions
- Expansion of the Morgan Substation for three additional 138 kV positions
- A new 150 MVAR SVC near the Amberg Substation, designated as the Benson Lake Substation.

ATC's analysis of the low-voltage alternative found it to have significantly fewer reliability benefits compared to the other alternatives. While it claims that this alternative addressed most or all of the NERC Category B, Category C.3, and Category C.5 contingencies in the Green Bay, Marinette/Menominee, Iron Mountain, Marquette, and surrounding areas in Wisconsin and the UP, ATC does not believe it addressed certain maintenance plus C.5 contingencies that may have been addressed in Alternatives 1 and 2.[52] In addition, Alternative 3, the low-voltage alternative, does not provide a second 345 kV path from the North Appleton Substation. ATC states that it believes that this is important because ATC is currently experiencing real time operating constraints that overload the existing 345 kV path from North Appleton to Werner West.

3.6. REASONING FOR THE PROPOSED SYSTEM SOLUTIONS

3.6.1. 345 kV component of project need

ATC tested various transmission and generation combinations during the planning process and found that a single 138 kV line from the North Appleton Substation to the Morgan Substation, among the other proposed upgrades, still resulted in violations of TTLs for various contingencies in both peak and off-peak situations. In addition, two separate 138 kV North Appleton to Morgan lines, combined with various other upgrades (three 300 MVAR SVCs at various important bus locations), still resulted in TTL violations for NERC category C.5 contingencies (a single event that results in the loss of two transmission system

[50] ATC Transmission Study. Project Scoping Document, Section 4.2.14 on p. 164 of Appendix D. PSC REF#: 201022.
[51] ATC Transmission Study. Project Scoping Document, Section 5.1 on p. 221 of Appendix D. PSC REF#: 201022.
[52] ATC Transmission Study. Project Scoping Document, Section 4.3.14 on p. 199 of Appendix D. PSC REF#: 201022.

components) [53] for both peak and off-peak.[54] Thus, ATC found that 345 kV support was necessary in order to address reliability issues within the project study area.

3.6.2. Additional 138 kV line need

ATC's analysis found that a single 345 kV line between the North Appleton and Morgan Substations was able to address all of the TTL violations that occurred after NERC C.5 contingencies, yet TTL violations still occurred for C.3 contingencies (one distinct event resulting in the loss of a transmission system component, followed by another loss of a transmission system component) at peak load. As NERC requires that the system must be robust enough to handle these contingencies, ATC concluded that another 138 kV line would also be needed to fully address the NERC criteria regarding the system reliability within the project study area.[55]

3.6.3. Separate structures on same right-of-way

As discussed in Sections 3.2.1, 3.5.3, and the beginning of Section 3.6, planning analyses determined that two transmission lines were required to meet the reliability issues in the area. It was also determined that one of the lines would need to remain in service at all times to avoid widespread outages in the area. This requires the circuits to be on separate structures if on a common ROW. The situation arose from a series of developments that included:

- Statutory routing priorities, first to consider using existing transmission corridors for new transmission routing, and then other public ROW corridors, with the last priority being to create new "greenfield" transmission ROWs.[56]
- Mandatory NERC reliability planning and operating standards.[57]
- The unique electrical load, generation, and network topology of the study area.
- The particular geographic and environmental features of the study area.

NERC planning criteria include many combinations of single electric outage events and several combinations of two or more electrical elements being out of service, including sequential events during on- and off-peak load periods. One example event that is part of the planning criteria is where one line is off for planned maintenance and then another circuit or structure is forced off in real-time. This example was the actual initiating event in May 2011 that resulted in 500 MWs of load lost with a collapse of the system.

The NERC contingencies study of all the different initiating events and outcomes includes three of ATC's planning zones. The simulations in Table 3.6-1 include, in summary form, the Category A, B, C, and D outages for both on- and off-peak models. [58] ATC's planning studies include sequential and multiple events over various time frames to recognize operators' ability or lack of ability to reconfigure generation as responses beyond the automatic controls of system protections and the automatic control systems of generating plants. The planning studies show the impending overloads and/or voltage collapses depending on the variety of initiating situations for the study area. Figure Vol. 2-7 shows the study area.

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[53] Current NERC criteria on transmission system planning performance requirements, p. 4, http://www.nerc.com/files/tpl-001-2.pdf.
[54] ATC Transmission Study, Project Scoping Document, Section 4.1.13 on p. 132 of Appendix D. PSC REF#: 201022.
[55] ATC Transmission Study, Project Scoping Document, Section 4.1.13 on p. 132 of Appendix D. PSC REF#: 201022.
[56] Wis. Stat. § 1.12(6). See Section 1.2.2.3 in Chapter 1 of the EIS.
[57] See http://www.nerc.com.
[58] Recreated from Table A.3, NERC Contingencies Studied. ATC Transmission Study, Public Scoping Document, Appendix D, Exhibit 1b, pp. 8-9 of 327. PSC REF#: 215226.

Table 3.6-1 NERC Category A, B, and select C and D outages, initiating events and contingency elements and descriptions of simulated contingencies

Category	Contingencies Initiating Event(s) and Contingency Element(s)	Description of Contingencies Simulated
A No contingencies	All Facilities in Service	All ATC transmission facilities were monitored for overloads and voltage limitations within the study area.
B Event resulting in the loss of a single element	Single Line Ground (SLG) or 3-Phase (3Ø) Fault, with Normal Clearing: 1. Generator	All B.1 contingencies within Z1, Z2 and Z4 were simulated for this study. Includes all element and event based contingencies.
	2. Transmission Circuit	All B.2 contingencies within Z1, Z2 and Z4 were simulated for this study. Includes all element and event based contingencies.
	3. Transformer	All B.3 contingencies within Z1, Z2 and Z4 were simulated for this study. Includes all element and event based contingencies.
	4. Single Pole DC Line	Not a true B.4, but ATC listed the Flow Control Device at Mackinac (BTB-HVDC) here for completeness.
C Event(s) resulting in the loss of two or more (multiple) elements	SLG Fault, with Normal Clearing: 1. Bus Section 2. Breaker	All C.1 or C.2 contingencies 69 kV and above within the study area were simulated for this study.
	SLG or 3Ø Fault, with Normal Clearing: 3. Category B contingency, manual system adjustments, followed by another Category B contingency	Select C.3 contingencies within the study area were simulated for this study. Includes element and event based contingencies.
	Bipolar Block, with Normal Clearing: 4. Bipolar (DC) Line Fault (non 3Ø), with Normal Clearing	No C.4 contingencies will be studied, no HVDC lines in the study area or ATC footprint
	5. Any two circuits of a multiple circuit towerline	All C.5 contingencies within the study area were simulated for this study.
	SLG Fault, with Delayed Clearing (stuck breaker or protection system failure): 6. Generator	No C.6 contingencies were studied because from a steady state simulation perspective they are no more severe than category B.1, C.1, or C.2 contingencies.
	7. Transformer	No C.7 contingencies were studied because from a steady state simulation perspective they are no more severe than category B.3, C.1, C.2 or C.3 contingencies.
	8. Transmission Circuit	No C.8 contingencies were studied because from a steady state simulation perspective they are no more severe than category B.2, C.1, or C.2 contingencies.
	9. Bus Section	No C.9 contingencies were simulated for this study, because from a steady state simulation perspective they are no more severe than the category D.8 contingencies or many of the category C.1 and C.2 contingencies that were studied.

Category	Contingencies Initiating Event(s) and Contingency Element(s)	Description of Contingencies Simulated
D Extreme event resulting in two or more (multiple) elements removed or cascading out of service	3Ø Fault, with Delayed Clearing (stuck breaker or protection system failure): 1. Generator	No D.1 contingencies were studied because from a steady state simulation perspective they are no more severe than category B.1, C.1, or C.2 contingencies.
	2. Transmission Circuit	No D.2 contingencies were studied because from a steady state simulation perspective they are no more severe than category B.2, C.1, or C.2 contingencies.
	3. Transformer	No D.3 contingencies will be studied because from a steady state simulation perspective they are no more severe than category B.3, C.1, C.2, C.3, D.8, or D.9 contingencies.
	4. Bus Section	No D.4 contingencies were studied because from a steady state simulation perspective they are no more severe than category C.1, C.2, C.9, D.8, or D.9 contingencies.
	3Ø Fault, with Normal Clearing: 5. Breaker (failure or internal fault)	No D.5 contingencies were studied because from a steady state simulation perspective they were no more severe than category C.2 contingencies.
	6. Loss of towerline with three or more circuits	No D.6 contingencies were studied because there are no D.6 contingencies more severe than C.3 or C.5 contingencies within the study area.
	7. All transmission lines on a common right-of-way	No D.7 contingencies were studied because the most severe D.7 contingencies were no more severe than specific prior maintenance plus C.5 contingencies within the study area.
	8. Loss of a substation (one voltage plus transformers)	Select 100 kV and above D.8 contingencies within the study area were studied.
	9. Loss of a switching station (one voltage plus transformers)	No D.9 contingencies were studied because these are the same as D.8 contingencies.
	10. Loss of all generating units at a station	Presque Isle was studied as a sensitivity to test robustness.

For this project, as with other projects, ATC states that it considered a combination of factors including reliability, construction situations, cost, operations, and the maintenance of all the electrical facilities. It was determined that a new North Appleton-Morgan 138 kV line and a new North Appleton-Morgan 345 kV line would be serving the same customers with limited back-up resources to account for the contingencies that need to be considered in the NERC planning criteria.

ATC's conclusion to request co-location of the two circuits on separate structures for this project avoids unacceptable levels of risk to reliability for the study area and meets the NERC reliability objectives. ATC has determined that:

- The new North Appleton-Morgan 345 kV line and the new North Appleton-Morgan 138 kV line can be co-located with the existing area transmission lines.
- The new North Appleton-Morgan 345 kV line *cannot* share structures with the new North Appleton-Morgan 138 kV line or existing area transmission lines.
- The new North Appleton-Morgan 138 kV line *cannot* share structures with the new North Appleton-Morgan 345 kV line or existing transmission lines.

In other words, between two substations, a planned common ROW with a triple-circuit structure, or double-circuit structure and single-circuit structure, would not meet the NERC planning criteria in this project area.

The exceptions to separate structures could include: 1) the existing entrance to a substation, or 2) a situation that would be otherwise physically impossible for a limited distance. In other places within the ATC footprint, ATC has not concluded that the risk was high enough to warrant electric circuits arranged on separate structures in a corridor.

3.6.4. Substation modifications: New Benson Lake SVC and Morgan-Stiles conductor reconfiguration

ATC is proposing to expand the North Appleton 345 kV Substation and the Morgan 345 kV Substation in order to accommodate the new lines it proposes to build between them. In addition, ATC asks to place a new SVC near the Amberg Substation in a new, separate enclosure that would be called the Benson Lake Substation. The purpose of an SVC is to provide "reactive power support," which helps stabilize the transmission system against a potential voltage collapse in the case of a contingency. This is especially important in the cases of long and constrained transmission lines because reactive losses increase rapidly with increases in the length of the line.

In addition to the upgrades to the North Appleton and Morgan Substations, ATC is proposing a reconfiguration/expansion to the 138 kV bus within the Stiles Substation. As ATC is performing construction on both the Morgan and Stiles Substations, ATC is planning on reconfiguring the Morgan-Stiles 138 kV conductors. The work ATC is proposing to do on the current Morgan-Stiles 138 kV line does not involve any new construction outside of the substations or away from the existing transmission structures, or any new ROW considerations. ATC is merely re-configuring the conductors along this line to better improve the line's performance in handling power flow. This is a standard practice for a transmission company and work along this line is not expected to have any significant impacts.

3.7. RESULTS OF STAFF ANALYSIS IN REGARD TO RELIABILITY BENEFITS OF THE NORTH APPLETON TO MORGAN PROJECT

Commission staff performed a contingency analysis for off-peak and on-peak periods using the PowerWorld simulator for transmission reliability. The purpose of this action was to examine the robustness of the project study area's electric infrastructure. This examination is important because enhancing the transmission system in the area is the main driver of need for this project.

The Commission received public comments concerning the project need in an area with a load growth that is flat or declining. Commission staff analysis took a flat load growth into consideration and in the end agrees with ATC's conclusion that the North Appleton-Morgan project would greatly enhance the project study area's electric system in response to critical NERC Category B and Category C contingencies that have previously led to blackouts and significant losses of load.[59] Under the no-build option, Commission staff found that the area is vulnerable (even under a flat load projection) to blackouts because

[59] Section 3.4.1 of the EIS describes the incidents that have plagued the project study area since November 2001 and which led to blackouts and loss of load.

of voltage collapse and thermal overloads resulting from various NERC contingencies. In addition, Commission sstaff examined the impact of this line under a few scenarios regarding the replacement of the Presque Isle Power Plant in Marquette, Michigan. In these scenarios, a new 250 MW natural gas combined-cycle power plant was added in various locations in the Upper Peninsula of Michigan. One scenario added a plant near the iron mine load and one scenario added a plant near the existing natural gas pipeline near the Arnold Substation. The result remained the same. The North Appleton -Morgan project provided significant enhancement to the electric system in the project study area and alleviated the transmission system's exposure to a large number of NERC Category B and Category C contingencies.

CHAPTER

4

4. Utility Routing and Siting Process

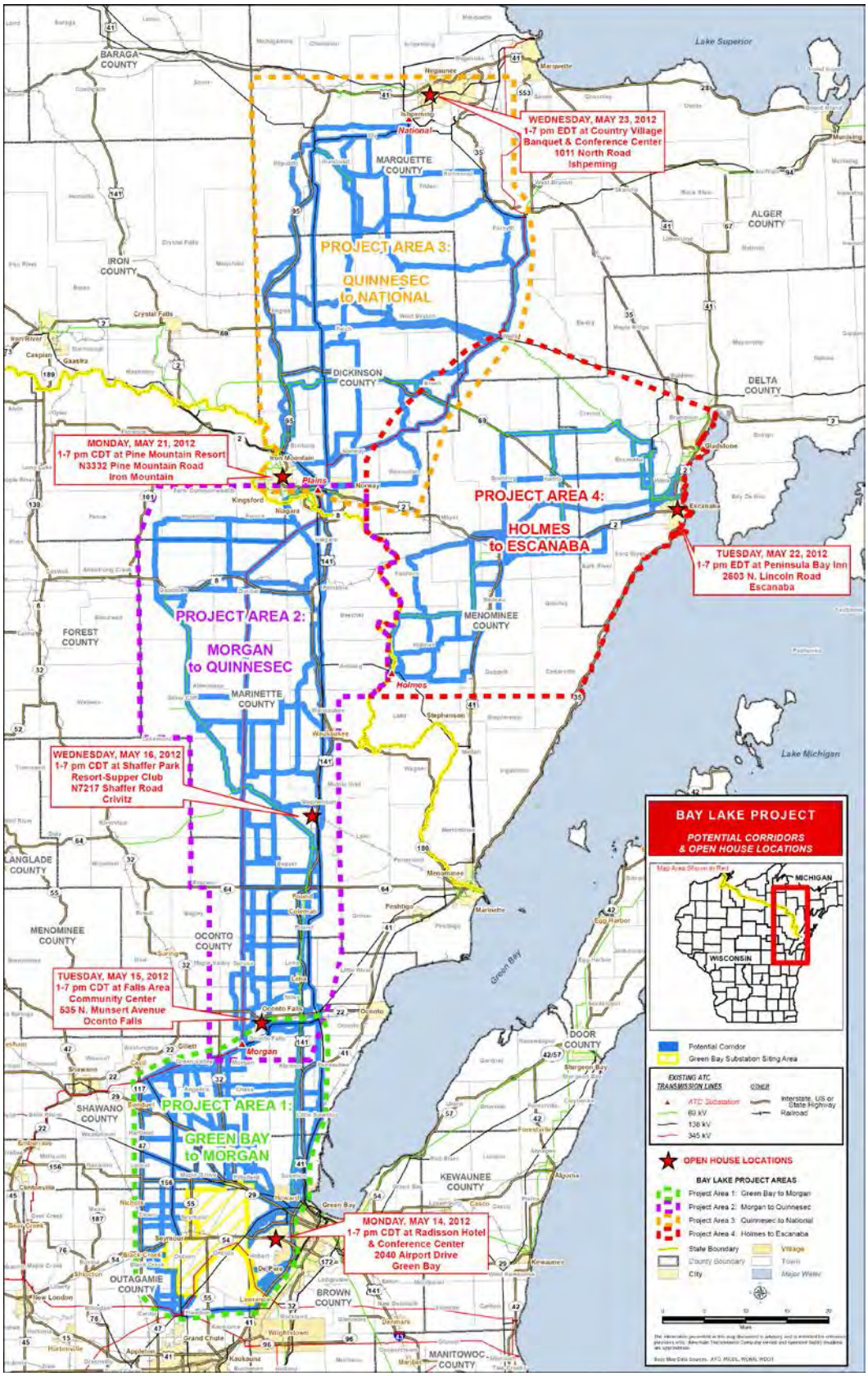
4.1. NORTH APPLETON-MORGAN VERSUS BAY LAKE

This project is officially the North Appleton-Morgan Project, but it is often called the "Bay Lake" project in meetings and public documents. The latter name has its origins in a much larger and geographically wider project conceived by ATC to address reliability concerns between Green Bay and Lake Superior in ATC's "Zone 2," in the UP and northeastern Wisconsin. The scope of this original project concept is shown in Figure 4.1-1. The figure shows that the overall Bay Lake Project area was actually four project areas stretching from just north of Appleton to just south of Marquette, Michigan and east to Escanaba.

As developments and events occurred that affected the area electrically, the original project was scaled back. The status of the power plants at Presque Isle and Kewaunee changed, and the mining operations in the UP, who are large electrical customers, went through some adjustments. The portion of the Bay Lake Project that has been described and proposed in the CPCN application for PSC docket 137-CE-166 is the North Appleton-Morgan Project, which extends from a point just north of Appleton (the North Appleton Substation) to a point just southwest of Oconto Falls (the Morgan Substation).

This chapter describes briefly how ATC arrived at the transmission construction it has proposed and how it selected the structure designs and routes it seeks authority to build.

Figure 4.1-1 Potential route corridors for Bay Lake project



4.2. SELECTION OF ROUTES TO PROPOSE TO COMMISSION

Once it determined that it could and should create a transmission solution to its more specific transmission problem (see Chapter 3), ATC used a "multi-phase routing and siting process"[60] to develop and identify the route alternatives that it would propose to the Commission in its CPCN application. This process included the required pre-application consultation process with Commission and DNR staff plus consulting with other regulatory agencies and local governments, as well as the Oneida Nation. As part of its process, ATC also held a series of public open houses, and participated in local meetings and other events where it could: 1) introduce the project and explain the project need for local landowners and other potential public stakeholders, and 2) obtain feedback about local concerns.

The route development work with the public was done in three basic stages:

- "Phase I" – Potential corridors
- "Phase II" – Preliminary routes
- "Phase III" – Selection and communication of route selections

In the corridor development phase, ATC did public outreach to describe its potential project and why it believed it is needed, identify a project study area, and offer potential route corridors within that study area. The original routing segments in the North Appleton-Morgan project area are shown Figure Vol. 2-6. From these, a smaller set of segments was later offered for public comment and, finally, the routes to be proposed were presented.

Commission staff tracked the outreach work and attended the last of the public open houses held by ATC to learn more about the project and be available to explain the Commission's construction review process.

4.2.1. Phase I and routing factors

The project study area was developed by ATC starting with two end points. The northern end point was the existing Morgan Substation. The southern end point began as a "Green Bay Substation Siting Area" focusing on an area north of the existing North Appleton-Kewaunee 345 kV transmission line. This area was located in the southern portion of the map shown in Figure 4.1-1. It was a rectangular area with the southern boundary along the existing North Appleton-Kewaunee line. Potential routing corridors would be developed using locations along this rectangle as their southern terminus.

The area connecting two endpoints generally is expanded to each side to allow for a diversity of route options for early consideration. In this case, ATC used STH 47 as the eastern boundary and U.S. Highway (USH) 41/141 and county roads and a recreational trail/railway corridor east of that highway as the eastern boundary. See Figure Vol. 2-6. Potential routes were identified at first using the routing criteria set in Wis. Stat. § 1.12(6), meaning essentially that existing transmission line corridors and highway or railway corridors were identified. See Section 1.2.2.3 in Chapter 1 of the EIS for a discussion of the corridor siting priorities. Smaller utility corridors for electric and natural gas distribution systems were generally not included because the incremental ROW expansion needed would be so great for the 138 kV and 345 kV lines that they essentially would be like new corridors, and because distribution systems are often located very close to densely developed areas, including homes.

[60] CPCN Application, Section 5.1, p. 48.

Approximately 550 potential route segments were analyzed for this project according to the applicant. The originally considered corridor width for initial locational purposes was about 3,000 feet. The area involved four counties: Outagamie, Brown, Shawano, and Oconto.

Potential corridors in the early stages of ATC's project development were:

- A west corridor generally following STH 47 and STH 117 north and then northeast beyond the intersection with the existing double-circuit Highway 22/White Clay-Morgan 345/138 kV lines into the Morgan Substation.
- A west-central corridor following an existing 138 kV line north to join the existing double-circuit Highway 22/White Clay-Morgan 345/138 kV lines northeastward to the substation.
- Additional central corridors north along STH 55, STH 32, a pipeline, and county roads.
- An eastern corridor following the existing double-circuit Pulliam-Little Suamico/Pulliam-Stiles 138 kV lines and the existing Little Suamico-Stiles/Pulliam-Stiles 138 kV lines eastward and then north to the Morgan Substation.
- Other eastern north-south corridors along USH 41 and an abandoned railroad corridor converted to a recreational trail.

The main factor used to identify the initial route opportunities were the routing priorities in Wis. Stat. § 1.12(6). ATC states that the identified corridors were then reviewed for impacts to densely developed land, environmentally sensitive areas, agricultural lands, and recreational lands. The number of potential corridors was whittled to minimize impacts on these resources considering:

- Economic considerations
- Engineering considerations
- Reliability of the electric transmission system
- Protection of the environment

As discussed above, utility corridors at the distribution level were generally not considered by ATC for transmission route opportunities because of the potential incremental impact. Several state and federal highways exist in ATC's North Appleton-Morgan project area, and they, along with railroad corridors and other major local roads, were examined by the utility. There are recreational trails in the area also, and ATC examined them. Finally, to ensure enough routing opportunities for consideration, ATC included some potential route corridors following section lines, quarter section lines, property lines, and fence lines.

ATC states that it also considered the following factors commonly considered in PSC and DNR project reviews as "sensitivities" to be considered as it selected from the variety of corridors to develop routes to propose. These sensitivities were not automatically rejected locations for routes, but they needed to be considered in order to try to find routes that created the least impact. They also needed to be considered in light of ATC's conclusion that it should propose side-by-side 138 kV and 345 kV transmission lines in a combined corridor as this would likely create less impact overall than two transmission corridors in different locations. The sensitivity factors included:

- Agricultural lands of statewide importance, Prime Farmlands, center-pivot irrigation systems, confined animal feeding operations (CAFO)
- Airports, airport obstruction-free zones, and approach flight paths
- Archaeological sites, memorial parks and cemeteries, and Designated or Registered National Historic Districts

- Conservation easements and Reserve program lands
- County parks and recreation areas, county forests and forest management areas, municipal parks, and parks owned or administered by other governmental offices
- Existing residential areas, occupied buildings in other areas, municipalities' population centers, and planned residential areas or other planned development
- Federal, state, and county land not otherwise protected
- Floodways and floodplains
- Geologically unstable or highly erosive areas
- Hospitals, nursing homes, licensed daycares, schools, and playgrounds
- Landfills and dumps, and mines, quarries, or gravel pits
- Military installations
- National and state wilderness areas and National Forests, National Landmarks, National Monuments, National Recreation Areas, National Wild and Scenic Rivers, and National Wildlife Refuges
- Native American Tribal lands
- Nature Conservancy preserves
- Open water expanses greater than 1,000 feet in the potential direction of the transmission line, and other wetlands
- Places of worship
- Scenic travel routes, scenic areas, and hill crossings at crests
- State and National Recreation Trails, State Forests and Forest Management Areas, State Natural Areas, State Parks and Recreation Areas, State Scientific Areas, State Wild and Scenic Rivers, and State Wildlife Refuges, Wildlife Areas, and Game Management Areas
- Threatened and Endangered Species Critical Habitat Areas, waterfowl nesting or rearing areas, and unique habitats such as oak savannas, fens, prairies, etc.
- VORTAC (co-located VHF omnidirectional range (VOR) beacon and a tactical air navigation system (TACAN) beacon tower sites
- Wellhead protection areas
- Wetlands considered Areas of Special Natural Resource Interest (ASNRI)

4.2.2. Phase II

At this phase, ATC examined comments from the Phase I open houses and elsewhere to refine the corridors and reduce the number of route options for its CPCN proposal. According to ATC, the winnowing also included more detailed environmental considerations where possible and constructability reviews.

Some route corridors that ran through the Oneida Reservation in Phase I were dropped in Phase II because the Oneida Nation (Oneida) did not support them. See Section 1.7 in Chapter 1 of the EIS. Beyond the Oneida's opposition to routing the transmission project through the Reservation, any real estate transactions affecting Tribally-owned lands must be approved by the Oneida and also the federal Bureau of Indian Affairs (BIA) in the U.S. Department of the Interior. If a route was approved through the Reservation, there could be situations where the real estate issues required regular approvals from the Oneida and the BIA with the risk of having to stop and remove facilities with limited notice.

With the removal of the Oneida Reservation from consideration, the area for potential southern substation sites was reduced and broken into nine smaller sites. Route possibilities focused then on those nine sites. Some route segment possibilities were also eliminated because of high concentrations of homes, constructability challenges, congested roads, environmental damage potential, and homes unavoidably within the ROW.

In summary, for Phase II, ATC did the following:

- Removed all potential corridors and substation siting areas within the Oneida Reservation.
- Removed potential corridors that were located in essentially the same geographic area so that the routes submitted to the Commission would be more diverse in nature.
- Consolidated western routes to head north along the existing North Appleton-White Clay 138 kV line instead of continuing north along STH 47 to the village of Bonduel.
- Added route segments back into the mix in the central part of the project area to better connect to the North Appleton-White Clay corridor.

4.2.3. Phase III

In its third phase, ATC narrowed its project down to fewer routes using comments from a second round of public open houses and stakeholders. Preliminary engineering was done as part of this process.

ATC settled on an expansion of the existing North Appleton Substation as its southern endpoint for the transmission lines for the following reasons:[61]

- The land is owned by ATC.
- It is close to the existing North Appleton-Kewaunee 345 kV line.
- It is close to many of the preliminary routes considered in Phase II.
- There are fewer homes immediately adjacent to the site.
- Only limited impacts are expected to the immediate vicinity.

The decision to expand the North Appleton Substation drove ATC's route sorting process in part. Some routes were removed at least partly on this account. Removals included:

- The eastern-most route along USH 41 – longer, less room along USH 41 for side-by-side transmission ROWs, a crossing of Oneida land, and other constructability challenges.
- A central-western route close to Five Corners Airways Airstrip – longer, buildings within the corridor, and the airstrip's Airport Obstacle Free Zone.
- Routes along STH 55 – potential impacts to the city of Seymour.
- Northwestern-most route that followed existing North Appleton-White Clay 138 kV line north to the existing double-circuit Highway 22-Morgan/White Clay-Morgan 345/138 kV line – orientation not convenient.
- Western-most route in north – longer, increasing building congestion near existing line.
- Western-most route in south – longer, less ROW sharing with other facilities.

[61] CPCN Application, p. 56.

- Eastern routes traversing open fields in a stair-step pattern – potential impacts to city of Seymour and not needed because route following Guardian natural gas pipeline was added.

ATC states that the Guardian natural gas pipeline route segment was added in response to public comment because it also minimizes impacts compared to other routes by following the existing ROW. It became part of the final two routes ATC proposed in its application.

The routes were shared with the public at the Phase III open houses in May 2013. After the public open houses, ATC made some further refinements based on conversations with property owners and other stakeholders:

- Addition of an extra route section in the northwestern corner in response to landowner comments that, if another transmission line was to go across their property, they would rather have them all in one corridor.
- Adjustment of a central route east of Pulaski to address concerns raised about the potential impacts of the line on residents' health in a group home for adults with autism.

With these changes and adjustments, ATC developed its CPCN application describing the route possibilities in terms of its route conceptions, an organization using routing areas, and route sections within the routing areas.

4.3. BENSON LAKE SUBSTATION

The new Benson Lake Substation would be located to place the SVC near the existing Amberg Substation. See Section 2.2.3 in Chapter 2 of the EIS for background. The reason for using the Amberg Substation site relates to ATC's conclusion that, from a power flow perspective, the best location for the SVC substation is at the existing Amberg Substation in east-central Marinette County. See Figures Vol. 2-2, 2-3, and 2-7 for the approximate location and relationship to the existing transmission system.

Options examined by the utility before its application filing included a site at the WPSC's existing Dave's Falls Substation, near the existing Holmes Substation, or at a new site. The two existing substation sites were rejected for a variety of reasons relating to constructability, electric reliability, and potential environmental impact.

ATC determined to create a new SVC-purposed substation, to be called Benson Lake, near the existing Amberg Substation on substation property. Two potential sites have been offered, to the east and the southeast of the existing substation. Each would result in some impact to local woodlands and wetlands. See Section 6.3.3 in Chapter 6 of the EIS. Moving the new substation location to the north off the property but still close to the substation would have resulted in widening an existing transmission ROW, or a new ROW, across the Pike River, which is one of only five state-designated Wild and Scenic Rivers in Wisconsin.

4.4. CHANGES TO EXISTING EASEMENTS

One of the considerations in route selection would be how the easements for the existing facilities would change as a result of a new, co-located transmission project. ATC may not rely on existing transmission line easement rights. In areas where a new negotiated easement overlaps the existing easement and the existing facilities do not have to be modified, ATC states that the existing easement likely would remain in place because it would be necessary for the continued operation and maintenance of the existing facilities.

However, while ATC attempted to overlap the existing ROWs as much as practicable while planning and designing the proposed facilities, the existing easements do not cover the new facilities or new ROWs.

New transmission easements would need to be negotiated and signed with the landowners along the approved route whether there is an existing ROW or not. If an existing transmission line was to be modified or relocated, the new easement would cover that line, as well as the new lines.

Some route sections share ROW with existing ANR Pipeline Company (ANR) or Guardian natural gas transmission pipelines. ATC has an encroachment agreement signed with Guardian and a Letter of Understanding signed with ANR. However, new electric transmission easements would need to be negotiated with the landowners involved.

CHAPTER

5

5. Typical Environmental Impacts and Construction Methods for Transmission Line Projects

This chapter provides general background information about the range of analyses used to evaluate proposed electric transmission projects. It discusses how impacts are assessed and how they might be mitigated,[62] including specific statutory rights of landowners. It also describes phases of construction of a transmission line. The majority of the chapter is a discussion of the environmental and community effects that might occur during construction or operation of a transmission line. The list of potential environmental and community issues is organized alphabetically. For each issue, the most common methods to minimize and mitigate the associated impacts are discussed.

5.1. ASSESSING TRANSMISSION LINE IMPACTS

5.1.1. Quantifying potential impacts

The impact from the construction of a transmission line can be measured in several different ways. Useful measurements of impacts may be area (acreage), distance (miles or feet), or the number of transmission structures.

The effect of a new transmission line on an area may depend on the topography, land cover, and existing land uses. In forested areas for example, the entire ROW width is cleared and maintained free of tall-growing trees for the life of the transmission line. The result is a permanent change to the ROW land cover. In agricultural areas, heavy construction vehicles traverse the ROW and temporarily suspend the use of the land for crop production. After construction ends and the fields are properly restored, however, the land beneath the line can be cropped or pastured. For this reason, the area permanently affected by the line is usually much smaller than the area temporarily affected during construction. Where transmission lines are routed through areas that are valued for their scenic qualities, the visual impacts of the line (the area affected) may extend well beyond the ROW.

[62] Mitigation is a common term used in utility construction reviews. It means to lessen an impact's force or intensity, to moderate the impact, or to make the impact less severe.

5.1.2. Determining the degree of potential impacts

In general, the degree of impact of a proposed transmission line is determined by the quality or uniqueness of the existing environment along the proposed route. The quality of the existing environment is influenced by several factors.

- **The degree of disturbance that already exists**
  The significance of prior disturbances can be evaluated by comparing how close the area resembles pre-settlement conditions. This can be determined by examining such items as recent and historical photographs, historical sources, or conversations with local residents. Many areas have been substantially altered by logging, the installation of drain tiles, residential developments, or conversion to cropland.
- **The uniqueness of the resource**
  Proposed transmission line routes are reviewed for the presence of species or community types that are uncommon or in decline in the region or state. The environmental review evaluates whether the land along a proposed route possesses features that would make it unique, such as its size, species diversity, or whether it plays a special role in the surrounding landscape.
- **The threat of future disturbance**
  The resource is compared to surrounding land uses that may affect the quality of the existing resource over time. Considerations include whether the current and likely future land uses or management practices might threaten some aspect of the resource or whether the resource is valued by the adjacent community and likely to be preserved.

5.1.3. Identifying the duration of potential impacts

The construction of a transmission line involves both long-term and temporary impacts. Long-term impacts can exist as long as the line is in place and might include land use restrictions, loss of woodland, and aesthetic impacts. Temporary impacts occur during construction or at infrequent intervals such as during line repair or ROW maintenance. They can include noise or crop damage during construction. Short-term impacts can become long-term impacts if not properly managed or mitigated.

Both short-term and long-term impacts are considered in this EIS.

5.2. MITIGATING POTENTIAL IMPACTS

5.2.1. General

It may be possible to lessen or mitigate potential environmental, landowner, and community impacts by adjusting the proposed route, choosing a different type of pole structure, using different construction methods, or implementing any number of post-construction practices. The Commission can require the project applicants to incorporate specific mitigation methods into the project design, construction process, and/or maintenance procedures. Examples of common mitigation techniques are listed in Table 5.2-1.

Table 5.2-1 Examples of mitigation strategies

Project Phase	Feature	Example Design Phase Mitigation Methods
Design Phase	Route	Using corridor-sharing to minimize new ROW requirements.
	Transmission Structure	Choosing a different transmission pole with different construction requirements and aesthetic appeal. • H-frame structures, while requiring wider ROWs, have longer span lengths which may make it easier to cross rivers, wetlands, or other resources with fewer impacts. • The darker color of oxidized steel structures may blend in better with forested backgrounds. • Low profile poles, while necessarily closer together with possibly wider ROWs, can be used near airports to avoid interference with flight approaches.
	Pole Placement	Making minor adjustments in pole locations to avoid archeological sites or minimize effects on agricultural operations.
	Add-ons	Adding flight diverters to conductors to minimize bird collisions with the wires.
Construction Phase	Timing	Alter the timing of the construction periods. • Constructing when the ground is frozen and vegetation is dormant to minimize impacts to wetland habitat. • Delaying construction in agricultural areas until after harvest to minimize crop damage.
	Specific Construction Equipment	Using wide-track vehicles and matting to reduce soil compaction and rutting in sensitive soils and natural areas.
	Erosion Control	Installing and maintaining proper erosion controls during construction to minimize run-off of top soil and disturbances to natural areas.
Post-Construction Phase	Invasive Species Management	Annual surveying for new populations of invasive species (*e.g.* purple loosestrife) caused by construction disturbances. Early detections of invasive species increase the likelihood of successful outcomes.
	Restoration	De-compacting agricultural soils so that impacts to crop yields are minimized. Re-vegetating ROWs in natural areas with DNR-approved seed mixes.

Three of the above features are discussed in more detail in the subsections below: corridor sharing, structure design, and construction timing. The other features are discussed below in particular categories of impacts, or in particular route chapters of this EIS where they might apply.

5.2.2. Corridor sharing

It is the policy of the state (Wis. Stat. § 1.12(6)) to site new transmission lines, to the greatest extent feasible and consistent with economic and engineering considerations, reliability of the electric system, and protection of the environment, utilizing corridors in the following order of priority: a) existing utility corridors; b) highway and railroad corridors; c) recreational trails with limitations; and d) new corridors.

When properly evaluated as part of routing decisions, corridor sharing can be a useful method in mitigating environmental, property, and community impacts of a new transmission line. Transmission line ROWs can be shared all or in part with other electric transmission lines, roads or highways, gas or oil pipelines, or railroad corridors. ROW-sharing with some of these types of corridors has more advantages than others. The more the ROW overlaps an existing ROW, the more benefits are possible. Side by side

placement of ROWs with no overlap has fewer benefits than true corridor sharing. Some types of corridor sharing are not beneficial in reducing impacts, and some actually can create additional impacts.

Sharing corridors with existing facilities may reduce impacts by:

- Reducing the amount of new ROW required;
- Concentrating linear land uses and reducing the number of new corridors that fragment the landscape;
- Creating an incremental rather than new impact.

Often, the most preferred type of corridor sharing is with an existing transmission line. An existing line may be double-circuited with a new transmission line and therefore require little or no expansion of the existing ROW. However, in some situations corridor sharing has drawbacks. Some examples of these disadvantages are described below in Table 5.2-2.

Table 5.2-2 Examples of possible disadvantages of corridor sharing

Existing ROW	Examples of Corridor Sharing Drawbacks
Railroads	• Some railroad ROWs have long distances between road crossings, and additional access roads would be needed for the construction of a transmission line. • Railroad corridors that pass through wetlands are generally berms that are too narrow to support transmission structures. Structures would have to be located off the berm, resulting in additional impacts to wetlands. • Some railroad companies require corridor-sharing transmission to be located at the edge or outside of the railroad ROW, which might be wide enough to put structures so far away that they create a new corridor environment (possibly eliminating the potential benefits of corridor sharing).
Gas Pipelines	• Pipeline ROWs often run cross-country with little or no visual or agricultural effects. However, transmission lines constructed cross-country can interfere with farm operations and produce a negative visual impact. • For reasons of safety, gas pipelines often require a transmission line ROW to parallel the pipeline ROW with no or very minimal overlap. This minimizes the potential benefits of corridor sharing.
Rural Roads	• Along local roads, large trees may form a scenic canopy over the road. The construction of a transmission line ROW that overlaps the road ROW would require the clear cutting of these trees and negatively impact aesthetic views and residential properties. • Where wind-blown soil is a problem, a transmission ROW requiring clear cutting of windbreak trees could lead to soil loss and traffic hazards from "brown-outs," or "white outs" in the winter. • Rural roads typically do not have sufficient ROW available so additional ROW must be obtained from adjacent landowners, with associated impacts.
Existing Transmission Lines	• Locating a new transmission line ROW parallel with an existing line on separate structures can increase impacts to natural landscapes, farmlands, or residential communities. • New double-circuited structures may be taller than the existing transmission structure and create increased hazards for bird or airport flyways. • Increasing the width of an existing corridor can increase edge effects and barriers to wildlife.

Corridor-sharing with an existing utility may require some modification to the proposed transmission structures resulting in additional costs to the project. For example, corridor sharing with a railroad may require the installation of underground communication circuits for the railroad. Sharing a corridor with a gas pipeline may require the installation of cathodic protection to prevent pipeline corrosion caused by induced currents. Transmission structures located within a highway ROW must be moved at the ratepayers' expense if a highway improvement project requires that the transmission line be relocated.

One additional drawback to corridor sharing is that landowners who have an easement for one facility may be burdened by the addition of more facilities. Additional utility easements may further limit their rights and the use of their property, and it would be expected that they would feel this is unfair. This potential situation is discussed in further detail in Section 5.3.3 of the EIS.

5.2.3. Structure design

Transmission line structures can be designed with alternate designs, heights, materials, and colors. Different design solutions will result in different costs and impacts.

Structures can consist of a single pole or multiple poles (such as an H-frame with two poles). Single-pole structures are generally taller and narrower than two-pole structures for similarly sized conductors. Two-pole structures with conductors mounted in a single plane can be used in situations where structure height is a concern, such as near an airport or along important bird migratory flight paths. Single-pole structures may be more desirable when crossing agricultural fields or in wetlands because two-pole structures disturb and take up more surface area than single-pole structures and require wider ROW. See Figures Vol. 2-11 and 2-12.

The pole material (*i.e.*, wood, laminated wood, steel) and the type of insulators and conductors used can affect the appearance of the transmission line. Steel poles can be unpainted galvanized steel (gray), painted (often light blue), or unpainted steel that is designed to oxidize to a brown color. Poles can be directly embedded into the soil surface or bolted onto buried concrete foundations.

The spacing of the conductors on a pole can affect the magnetic field levels produced by the line and how quickly those levels dissipate with distance.

5.2.4. Construction timing

The seasonal timing of construction can determine the severity of construction impacts to cropland, wetlands, high-quality natural areas, endangered and threatened species, and the potential spread of invasive species and plant diseases (*e.g.* oak wilt). Limiting construction to winter months or to times of year when plants are dormant and the ground is frozen can reduce many adverse impacts. On the other hand, the urgency of some projects, the need to perform construction during scheduled electric outages, and the availability of skilled labor cannot always accommodate winter scheduling, especially on long or complex projects.

Some limitations on construction activity, however, may still be necessary. One way to avoid impacts to threatened or endangered species is to avoid construction during the active nesting or spawning period. To protect fish habitat during spawning seasons, activities such as bridge placement or dredging that would occur below the ordinary high water mark are restricted for trout streams and navigable tributaries to trout streams. DNR has developed construction protocols that minimize or eliminate construction-related impacts on certain protected species. These measures include seasonal restrictions, movement barriers, and other methods. Each project and each species must be evaluated in the context of the entire project and project schedule to ensure protection of resources.

5.2.5. Environmental and agricultural monitors

Independent third-party environmental monitors (IEM) could be required by the Commission to monitor construction of the transmission line. The IEM typically reports directly to PSC staff rather than the applicants or construction subcontractors. Construction activities subject to monitoring and reporting by the IEM could include activities that could impact wetlands and bodies of water, habitats and occurrences

of protected species, archeological sites, agricultural fields, state and federal properties, or private properties with specific issues such as organic farming practices or the disposition of cleared trees. The IEM would be responsible for reporting incidents or stopping work, if appropriate, when construction practices violated any applicable permit, approval, order condition, or agreement with regulatory agencies, or were likely to cause unanticipated impacts to the environment or private properties.

For some transmission construction projects, it could be appropriate for an agricultural monitor to be retained as well. The monitor could be an independent third party similar to the IEM but, more typically, could be hired and funded by the applicant with input from DATCP. The monitor would report to the applicant, DATCP, and the Commission. The agricultural monitor would be responsible for auditing the applicant's compliance with agreements developed between the applicant and DATCP and compliance with the Commission order. Additionally, the monitor would work to minimize potential impacts of transmission line construction on agricultural lands and facilitate communication between the property owner and the utility transmission builder.

5.3. EASEMENTS AND RIGHTS-OF-WAY

5.3.1. Landowners' rights specified in Wisconsin statutes

Landowners whose property is directly affected by the construction of high-voltage transmission lines greater or equal to 100 kV, longer than one mile, and built after 1976 have rights which are specified in Wis. Stat. § 182.017(7)(c) through (h). Many of these rights relate to potential mitigation measures to reduce impacts and are expressed as utility requirements.

The applicable statute is as follows:

(c) In constructing and maintaining high-voltage transmission lines on the property covered by the easement, the utility shall:
   1. If excavation is necessary, ensure that the topsoil is stripped, piled, and replaced upon completion of the operation.
   2. Restore to its original condition any slope, terrace, or waterway which is disturbed by the construction or maintenance.
   3. Insofar as is practicable and when the landowner requests, schedule any construction work in an area used for agricultural production at times when the ground is frozen in order to prevent or reduce soil compaction.
   4. Clear all debris and remove all stones and rocks resulting from construction activity upon completion of construction.
   5. Satisfactorily repair to its original condition any fence damaged as a result of construction or maintenance operations. If fence cutting is necessary, a temporary gate shall be installed. Any such gate shall be left in place at the landowner's request.
   6. Repair any drainage tile line within the easement damaged by such construction or maintenance.
   7. Pay for any crop damage caused by such construction or maintenance.
   8. Supply and install any necessary grounding of a landowner's fences, machinery or buildings.

(d) The utility shall control weeds and brush around the transmission line facilities. No herbicidal chemicals may be used for weed and brush control without the express written consent of the landowner. If weed and brush control is undertaken by the landowner under an agreement with the utility, the landowner shall receive from the utility a reasonable amount for such services.

(e) The landowner shall be afforded a reasonable time prior to commencement of construction to harvest any trees located within the easement boundaries, and if the landowner fails to do so, the landowner shall nevertheless retain title to all trees cut by the utility.
(f) The landowner shall not be responsible for any injury to persons or property caused by the design, construction or upkeep of the high-voltage transmission lines or towers.
(g) The utility shall employ all reasonable measures to ensure that the landowner's television and radio reception is not adversely affected by the high-voltage transmission lines.
(h) The utility may not use any lands beyond the boundaries of the easement for any purpose, including ingress to and egress from the right-of way, without the written consent of the landowner.

5.3.2. Waiving landowner rights during easement negotiations

Easements are private contracts between the utility and the property owner. As contracts, they should be written in legally precise language. The landowners' statutory rights listed above are generally included by the utility as part of the offered contract and labeled as an "Exhibit." The offered contract may state that marked or crossed out rights are "waived." When negotiating the easement contract, a landowner may agree to waive one or more of these rights if asked but is not required to do so. All parts of the easement contract except those required by law are negotiable. The landowner may negotiate additional stipulations from the utility which may include specific clearing or remediation obligations, notifications, timing of activities, or payments.

ATC's easement contract boilerplate can be examined in Appendix D of this EIS. The landowner statutory rights are listed verbatim in the contract's "Exhibit A," and there is a statement in the main portion of the contract that says, "The parties hereto do hereby agree to the terms and conditions set forth in Exhibit 'A', … attached hereto and incorporated by reference herein."

5.3.3. Existing and new easements

In Section 5.2.2 of the EIS, on corridor sharing, it is mentioned that landowners along an existing infrastructure corridor, particularly an existing transmission line, might be burdened by the addition of more facilities. Those landowners would have the opportunity to negotiate the easement conditions under which the additions would be made because new easement contracts would likely be needed by the utility.

Under Wis. Stat. § 182.017(7)(a), any easement for a high-voltage transmission line must include:

- The length and width of the ROW.
- The number, type, and maximum height of all structures to be placed on the property in the ROW.
- The minimum height of the transmission cables above the landscape.
- The number and maximum voltage(s) of the line(s).

If a new transmission project (like the one proposed in this docket) was to be built on a property that already included an existing transmission line, it would not be likely that the existing easement for the property would include the new line being proposed. If that line were approved, a new easement would need to be negotiated and obtained by the transmission utility. Details about the line would be specified in the easement contract as shown in the boilerplate in Appendix D of this EIS.

5.4. CONSTRUCTION PHASES

This section describes in general the construction phases of a transmission line. The figures referenced in this section are Figures Vol. 2-13 through 2-43. Specific construction methods and conditions of routes proposed for this project are described in Chapters 7 through 9 of this EIS.

5.4.1. Pre-construction activities

Different locations and soil conditions will require different construction equipment and techniques as well as a variety of mitigation measures. Soil conditions and stability are tested prior to the start of actual construction using preliminary bore holes. Local variations in some conditions, such as the depth to bedrock, depth to the water table, or volume of rainfall, may require specific engineering or environmental solutions and mitigation measures during project construction.

Most state and federal permits must be acquired prior to the start of construction. Conditions of these approvals usually require a number of pre-construction environmental surveys. Environmental surveys include the finalization of wetland boundaries, the presence or absence of specific protected species, the presence or absence of invasive species, or archeological site boundaries that are likely to be impacted by construction activities.

To ensure that the company has a complete and intact route, most negotiations with landowners will have to be concluded prior to the start of construction.

5.4.2. Right-of-way marking and clearing

All erosion control measures needed to maintain stable site conditions (*e.g.* silt fences, slope breakers) are installed. ROW boundaries are staked and any special land use or environmental features, (*e.g.* recreational trails, streams, wetlands, and general locations of protected species or other sensitive resources) are flagged prior to the start of clearing activities. Clearing in upland shrubby grasslands and cropped fields is done with a mower. ROW in sedge meadows and shrub/scrub wetlands might also be mowed as needed to provide a stable work surface.

In upland and wetland forests, several types of equipment might be used to clear the ROW. Whole tree processors that are capable of cutting a standing tree at its base, removing all limbs, and sawing the tree trunk into consistent log lengths or poles are a very efficient way to clear open mature woodlands (Figure Vol. 2-13. In woodlands that have a thick cover of immature or understory trees, hand clearing with chainsaws may be done to open the forest and provide space for the tree processors to clear the larger trees. Chainsaws may also be used to clear smaller diameter trees adjacent to stream channels as shown in Figure Vol. 2-14.

Generally, any pole timber or saw logs are stacked on the edge of the ROW in upland locations, and the smaller diameter limbs and branches (often referred to as slash) are chipped or burned on the ROW. These activities are illustrated in Figures Vol. 2-15 and 2-16. According to the landowner's wishes, the wood chips may be spread on the ROW,[63] piled to allow transport by the landowner to specific locations, or chipped directly into a truck and hauled off the ROW. Local permits may be required for burning slash on the ROW.

[63] Except in wetland areas unless approved by DNR and USACE.

During the clearing process, matting may be installed as needed to ensure stable work conditions in wetlands or to provide temporary bridges across waterways.[64] Mats also can reduce rutting and excessive soil disturbance, and impede the spread of invasive species. Timber mats are the most common type of matting used, although new plastic composite mats are also available. The mats are portable and can be installed and picked up as needed. In many cases, these mats would be left in place through all phases of construction, *i.e.* ROW clearing, foundation installation, tower erection, and wire stringing. The matting would be removed at the completion of the project. After re-contouring the ground as necessary, the underlying perennial vegetation usually reestablishes within one growing season.

If the new transmission line follows an existing transmission ROW, existing transmission structures might need to be removed before new ones can be installed. The construction company would utilize bucket trucks, cranes or digger derricks, backhoes, pulling machines, pole trailers, dumpsters, and drill rigs as needed. Existing wood poles would be cut into segments. On uplands, the underground portions of the poles would be pulled from the ground and the holes backfilled. In wetlands, these holes would normally close as the pole is removed or after a freeze/thaw cycle. Sometimes in sensitive or high quality wetlands, the old poles are cut off even with the ground to avoid the additional disturbance caused by equipment needed to remove the pole bases. Pulled or cut poles would be removed from the site and either recycled, taken to a landfill, or given to the landowner with a waiver of liability. Steel structures would be removed in a similar way. If the steel structures have concrete foundations, the foundations would be removed down to a depth of about two feet.

5.4.3. Augering and blasting

In most soils, the excavation for the transmission line pole can be augered using a standard drilling rig. See Figure Vol. 2-17. The augered soils are temporarily piled off to the side of the excavation. In wetlands and agricultural fields, the topsoil is segregated from the subsoils. In wetland locations, the subsoils are often piled on timber matting, as shown in Figure Vol. 2-18, or on a geotextile fabric for disposal at a later time. In cropped agricultural fields, the subsoils are often placed on a layer of straw or geotextile fabric separating them from the topsoil in place below. This enables easier removal and disposal without the potential for disturbing or removing topsoil. After a foundation is completed, the excavated topsoil is spread around the base of the foundation to ensure optimal conditions for re-vegetation.

If the water table is encountered during the augering process, de-watering may be needed. Options for dewatering include pumping the water from the excavation to a suitable upland area and allowing it to percolate slowly into the soil, pumping water into silt-cells or bags to allow silt to drop out, or pumping the water directly into a tanker truck and transporting it to a suitable upland for release onto the soil surface.

When subsurface soils consist of unconsolidated materials, such as gravel or cobbles, the excavation might need to be continually flooded to prevent the side walls from collapsing. See Figure Vol. 2-19. The water pressure keeps the walls of the excavation intact during the augering process. When the appropriate depth is reached, a casing is inserted into the excavation and the water is pumped out. Depending on the location of the excavation and the soil characteristics, the water may be slowly released into a drain field and left to percolate into the soil surface, pumped into silt-cells or bags to allow silt to drop out, or pumped into a tanker truck and removed to an upland location where it would be allowed to slowly

[64] Examples of mats can be viewed in the illustrations in Figures Vol. 2-14, 2-16, 2-18, 2- 20, 2- 22, 2- 23, 2-33, 2-42, and 2-43.

percolate into the ground. It should be noted that, in agricultural fields, flooding can have long-lasting adverse effects and should be avoided or specifically controlled.

When bedrock is close to the soil surface or when subsoils primarily consist of large boulders and large cobbles, blasting might be required to complete the tower excavation. Explosives are placed in holes drilled into the rock and the tower site is covered with blasting mats to keep the rock and debris loosened by the blast from scattering over a wide area. Following the blast, the blasting mats and loosened debris are removed and the drilling rig is used to auger through the broken rock until the appropriate depth is reached. In cropped agricultural fields and wetlands, the topsoil would be stripped from the area around the tower site and stockpiled off to the side. When the excavation was completed and the foundation poured, the topsoil would be replaced around the tower site. This practice would prevent the subsoil from mixing with topsoil and would preserve the rootstocks of native vegetation, enhancing the success of post-construction restoration in wetland locations. Photographs in Figures Vol. 2-20 through 2-22 illustrate some of the steps in the blasting process.

5.4.4. Foundation installation

The excavated hole might be cased and a rebar framework installed to stabilize and strengthen the concrete that fills the hole (see Figures Vol. 2-23M through 2-25). Depending on the depth and diameter of the excavation, multiple loads of concrete might be needed. Once the concrete is poured, a series of bolts are embedded in the foundation to secure the tower structure when it is installed on top of the foundation.

When the foundation is completed, the tower site is cleaned up (see Figure Vol. 2-26). If the tower is in a cropped agricultural setting or a wetland site, the spoils are moved to an upland location designated by the landowner or to a suitable upland site where permission to dispose of the soils has been obtained by the contractor. In other upland locations, subsoils may be spread across the soil surface around the tower site and graded to ensure drainage away from the tower. In non-agricultural upland areas, the disturbed soils are usually mulched and/or seeded with annual oats or rye grass which germinate quickly and help to stabilize the soil surface giving native vegetation an opportunity for reestablishment (see Figure Vol. 2-27).

Several alternative foundation designs have been successfully used where conventional drilling, the deposition of concrete, the generation of spoils, or dewatering would cause significant impacts to large wetlands or wetlands that are deemed environmentally sensitive. In addition, these foundations can be constructed with specially equipped helicopters or marsh buggies to further prevent impacts that are traditionally caused by extensive matting used for the movement of heavy construction equipment and personnel to and from the transmission structure foundation sites.

In wet environments, hollow steel caissons can be installed with a high frequency vibration hammer (see Figure Vol. 2-28). The caisson is installed to a predetermined height above the ground and becomes the platform for the transmission structures. The vibratory hammer can be transported to and from the site by helicopter. Another alternative foundation uses helical pier systems which can be installed with adapted marsh buggies (see Figure Vol. 2-29). A central hollow larger pile supported by several smaller inclined hollow piles are augered into the subsurface and capped with a plate designed to accommodate the above-ground structure.

5.4.5. Tower erection and wire stringing

The tower sections are transported to the foundation locations from a "laydown area" or "staging site" in the project area where they are initially stored. The establishment of staging and laydown sites along the

approved ROW is a typical step in the construction of a transmission line. Often these sites are on agricultural lands that are temporarily taken out of production (with compensation to the landowner) for the purpose of temporarily storing tower sections, reels of conductor, and other necessary components.

Steel transmission structures are erected in sections (see Figures Vol. 2-30 and 2-31). Cranes are often used to lift the tower sections into place. First, the lower section is lifted into place and bolted onto the concrete foundation. The upper sections of the tower, with the arms already attached, are then lifted onto the lower tower section. Sometimes large pulleys that facilitate wire stringing are also attached to the tower arms before they are raised into position. Alternatively, the pulleys can be attached after the tower erection is completed.

In areas where ground-based cranes are not suitable because of soft or wet ground, steep terrain, or environmentally protected areas, helicopters can be used to transport and erect the steel structures. See Figure Vol. 2-32. This may reduce the need for extensive access roads or matting and their resulting environmental impacts.

Large reels of rope are staged on the ROW, and the individual ropes are drawn through the pulleys from tower to tower. The wire conductor is then attached to the ropes and pulled into place. See Figure Vol. 2-33. The pulleys are removed and the conductors are attached to the insulators and properly tensioned. If the conductors are double-bundled, spacers may be inserted at appropriate distances along the wires.

Helicopters can be used to string ropes to help with conductor installation, and then later to clip the conductors to the insulators. See Figure Vol. 2-34.

Sometimes when it is necessary to maintain reliability during construction, temporary transmission lines and poles may be constructed on one side of an existing ROW. Temporary lines are typically supported by wood poles directly embedded into the ground, with post insulators. These lines and poles are removed when the new line construction is complete and they are no longer needed.

5.4.6. Site restoration

During site restoration, disturbed soils are graded so that the topography and slopes are matched to surrounding conditions. All ruts and depressions are restored. Stockpiled topsoils and subsoils are put back in place wherever soils had been stripped and segregated. New topsoil is brought in and spread at agricultural locations where topsoil has been lost or seriously mixed with subsoils. Compacted agricultural soils are decompacted to return the soil structure to its original condition.

Areas such as roadsides, pastures, old fields, upland woods, and wetlands, where crops are not present, may be seeded with native seed mixes (or other appropriate seed mixes approved by the landowner) and mulched with certified weed-free mulch. In some cases, where it is reasonable to allow the natural ground cover to re-establish itself, annual grasses may be sown to minimize the potential for erosion while re-establishment is occurring. In wetlands, excavated surface soils or the organic layer containing the plant parts and rootstocks of native wetland vegetation might be spread around the foundation enhancing the re-establishment of the original wetland vegetation.

Any drainage tiles or other agricultural features that were damaged by the construction activities need to be repaired or replaced, or the landowner compensated. Also, all landowner protections listed in Wis. Stat. § 182.017(7)(c) must be met unless waived by the landowner in the easement contract. See Section 5.3.

In residential and urban areas where all vegetation has been removed, negotiated easements may require replacing the vegetation with landscaping and low-growing shrubs and grasses. This could enhance the appearance of the property and reduce the potential for property value impacts related to the new transmission line. These plantings need to comply with the utilities vegetation management plans,

however, and must not impede maintenance activities for the new line. Any driveways, curbs, or roads damaged during the construction of the line need to be repaired or replaced.

Erosion control and ROW monitoring continues until there is sufficient vegetative growth in the ROW. Following completion of restoration and re-establishment of vegetation within the ROW, all temporary restoration erosion control devices not designed to be left in place (*e.g.*, erosion control blankets, silt fencing) are removed and properly disposed. All temporary bridges are removed. All construction-related materials are removed.

5.4.7. Vegetative maintenance of right-of-way

Vegetation maintenance in a transmission line ROW is governed by standards set by NERC and by "vegetation management plans" submitted by individual transmission utilities and approved by NERC.

NERC has established reliability standards (FAC-003-3) for ROW vegetation management for transmission systems that apply to all transmission owners in North America. The standards are established to help maintain a reliable transmission system by managing vegetation located within transmission line ROWs and minimizing encroachments from vegetation located adjacent to the ROW to prevent vegetation-related outages that could lead to cascading transmission grid failure.[65] NERC standards in FAC-003-3 establish minimum clearance distances between transmission lines and vegetation, and apply to transmission lines that carry 200 kV and higher, as well as transmission lines that are designated by the Planning Coordinator.[66] ATC has applied its vegetation management plan program to all of its transmission lines, which range in voltage from 69 to 345 kV.[67]

The NERC standards are based on many assumptions about the probability of flashover, transient overvoltage and more. A study funded by the federal Department of Energy brings to attention the inconsistencies in the "Gallet equation" on which the NERC standard is based. There appears to be no support for supposing that a tree could safely be as close to a line (less than six feet) as proposed in the NERC standard. The study suggests that the necessary clearance values might be double the values mentioned in FAC-003-3.[68] This is still not a great distance compared to that between the conductors and the ground surface.

Although there has not been much reliable research on required vegetation clearances, there has been much more study on safe distances between two transmission towers. Tower-to-tower clearance values are more suggestive of the safe clearance distance. For example, in the Transmission Line Reference Book the values for tower clearance for a line at 500 kV range from 8.3 feet to over 17 feet. However, distances between vegetation and conductors are dependent on a number of factors, such as the type of vegetation, the shape of the tree branches, the shape of the tree's leaves, and the height of the vegetation. Some trees are known to grow until they reach the "flashover" threshold created by the electrical field corona and then branch away from or grow perpendicular to that threshold without creating a flashover risk. For example, oak trees with round-edged leaves and blunt branch buds appear to grow to the flashover threshold without noticeable tip burning from the electrical field corona. The main concern for line

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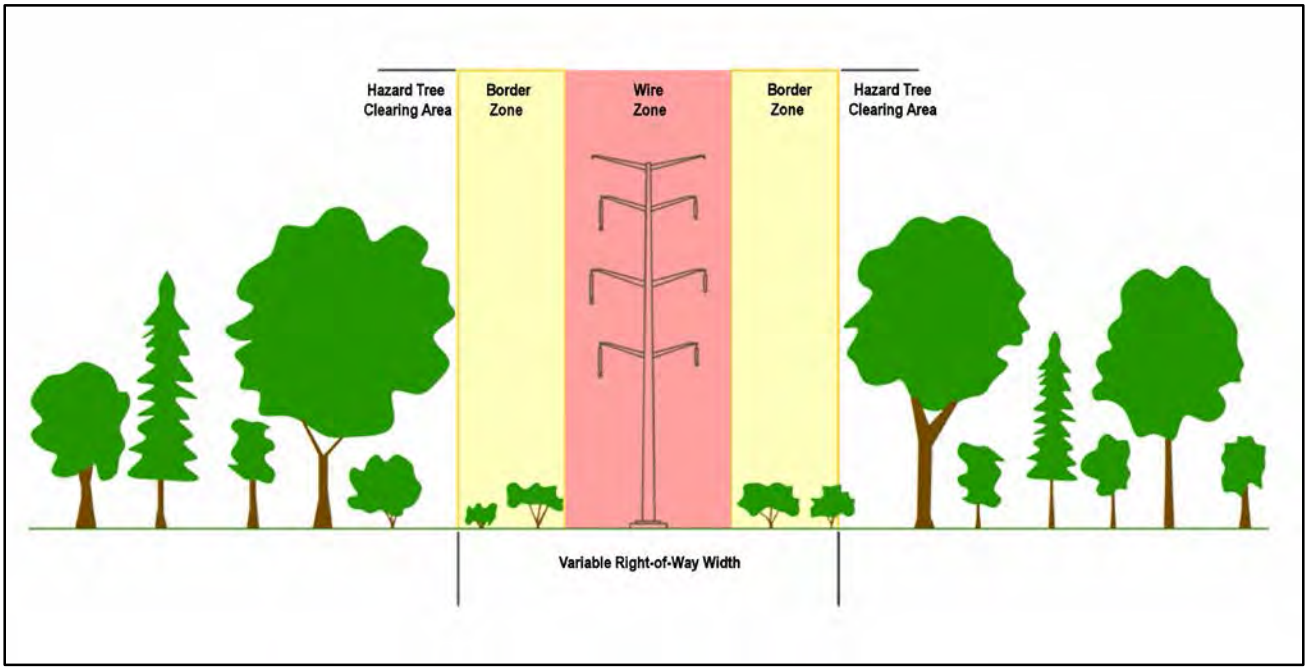
[65] Transmission Vegetation Management. North American Electric Reliability Corporation's vegetation management standard FAC-003-3.
[66] The Minimum Vegetation Clearance Distance (MVCD) in FAC-003-3 is a calculated minimum distance stated in feet (or meters) to prevent spark-over for various altitudes and operating voltages, based on the "Gallet equations." The (MVCD) for alternating current voltages at 500-1,000 feet above sea level (Pulaski, Wisconsin, lies at an elevation of about 800 feet) for a 345 kV transmission line is 3.26 feet, and for a 138 kV transmission line it is 1.78 feet. These values were extracted from FAC-003-Table 2 Minimum Vegetation Clearance Distances found in FAC-003-3, http://www.nerc.com/files/FAC-003-3.pdf.
[67] Vegetation Management Q&A. American Transmission Company. Accessed at http://www.atcllc.com/wp-content/uploads/2012/11/VegMan-QnA-2012.pdf
[68] Applicability of the "Gallet Equation" to the Vegetation Clearances of NERC Reliability Standard FAC-003-2. Pacific Northwest National Laboratory, 2012.

reliability in terms of vegetation clearance is flashover, not catching fire from the conductor's radiated heat. Thus, it appears that not all woody vegetation actually poses a threat to the lines. Some vegetation with certain shape or growth characteristics avoid flashover. Once a branch dies, however, the dead branch (or dead tree) can be a fire threat.[69]

As required by FAC-003-3, ATC submitted a vegetation management plan for its transmission facilities and FERC approved its plan. The plan is described as follows on ATC's website:[70]

> "ATC conducts right-of-way vegetation management approximately every five years with the goal of removing all woody vegetation from the easement. Interim work to trim or remove vegetation is sometimes needed as a result of periodic inspections. A transmission line right-of-way typically includes land directly beneath the wires (wire zone) and land between the wire zone and the edge of the right-of-way (border zone). Refer to Figure 5.4-1. In all cases, woody vegetation within the wire zone will be cleared regardless of height. Tall-growing trees and vegetation, woody brush and invasive species will also be cleared from the border zone, but some small, low-growing shrubs and plants may be permitted. While many property owners will use the easement area for gardens, prairie plantings, wild flowers, along with other non-vegetation uses, anything planted in the easement is at risk for removal should conditions or circumstances relating to the operation or maintenance of our facilities warrant it. ATC forestry crews use manual, mechanical, and herbicide control methods to achieve a clear and safe right-of-way. Beyond the edges of the right-of-way, large trees that are dead, dying, diseased, or leaning that pose a threat to transmission lines and structures are removed or pruned."

Figure 5.4-1 Typical ROW vegetative management zones



[69] Transmission Line Reference Book – 345 kV and Above, Second Edition, Electric Power Research Institute, 1982.
[70] Vegetation Management. American Transmission Company, http://www.atc-projects.com/learning-center/trees-vegetation/.

In addition, in response to a Commission staff request for information, ATC stated that:

> …for purposes of construction, the right-of-way (ROW) is removed of all trees, brush, and bushes to facilitate the construction of the line.[71]

See Section 5.4.2 in this EIS chapter for more detail. ATC also states:

> Under the terms of ATC's standard easement, all vegetation in the easement area may be removed without additional compensation.[72]

The type of vegetation allowed to regrow in the new ROW and ATC's right to manage the vegetation are part of each property owners' easement contract. Refer to Appendix D for an example of easement contract boilerplate that ATC plans to use in the North Appleton to Morgan Project.[73] This easement specifies hazard-tree rights as well as the right of the utility's agent to work outside of the ROW to address hazard trees. ATC provides no additional compensation for individual trees at the time a hazard tree is cut because the compensation for that right is included in the compensation paid at the time the easement is signed.[74] In response to a Commission staff data request, the applicant has stated that, generally speaking, the terms of the easement that ATC would acquire to construct, maintain, and operate its transmission facilities in a safe and reliable manner are not negotiable. The applicant acknowledges, however, that unique situations may exist and if these situations arise they will be addressed on a case-by-case basis.[75]

ATC also states that, during the easement negotiation process, its ROW agents would discuss the preparation of the property for construction with the landowner, including the removal of trees, brush, and bushes in the easement strip (ROW). After the easement has been acquired, ATC's construction contractor (who performs the tree clearing) would contact the landowner when the contractor is ready to start removing trees and preparing the ROW for construction.

As discussed in Section 5.3.1 of this EIS, landowners whose properties are directly affected by a project like this have certain rights under Wis. Stat. § 182.017, and these rights are reflected in the easement process and the easement contract boilerplate (See also Appendix D).

Regarding herbicide use, ATC states that the landowner will have the opportunity to request a one-time payment particularly in exchange for granting ATC the right to apply herbicides for up to two years in the easement area. If the landowner does not request or accept this payment, no herbicides will be used. ATC goes on to state that, upon request, ATC's vegetation maintenance contractors will provide landowners with information about types, amounts, and rates of herbicide used.[76] If herbicides are applied to the ROW, application standards must be followed. For example, in aquatic environments, an herbicide approved for use in aquatic environments must be used.

It should be noted that herbicide applications may not always be needed to comply with vegetation management plans and ROW regulations. By avoiding herbicide use and only cutting ROW vegetation,

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[71] Data Request No. 05.10 Response, PSC REF#: PSC REF#: 224331
[72] Data Request No. 05.11 Response, PSC REF#: PSC REF#: 224332
[73] Data Request No. 05.06 Responses, PSC REF#: 224322, PSC REF#: 224326
[74] Data Request No. 05.12 Response, PSC REF#: 224333
[75] Data Request No. 05.07 Response, PSC REF#: 224327
[76] Data Request No. 05.09 Response PSC REF#: 224329

low growing vegetation, such as grasses and shrubs, could remain and provide ecosystem functions, such as wildlife habitat.

Vegetation management within transmission line ROWs can significantly impact existing and future land use of the ROW, as well as that of adjacent properties and habitat. During the application review for this project (137-CE-166), PSC staff received multiple comments from landowners about the concerns and hardships experienced with ATC's vegetation management practices on the existing transmission ROWs already located within the project area, as well as concerns about the potential effects of ATC's vegetation management for the proposed facilities that would be constructed for the North Appleton to Morgan project. One landowner who is an intervenor raised concerns about vegetation management practices conducted by ATC that could be discussed in the hearing record as an issue in this docket. [77]

5.5. IMPACTS ASSOCIATED WITH TRANSMISSION LINES

This section describes many of the usual environmental, landowner, and community impacts related to the construction and operation of transmission lines. The issues are listed in alphabetical order. This section is meant to provide background information for the route-specific impacts described in later chapters of this final EIS and may be referenced in some of those chapters.

5.5.1. Aesthetics

5.5.1.1. Potential aesthetic impacts

The overall aesthetic effects of a new high-voltage transmission line are likely to be negative to most people, especially where proposed new lines would cross natural landscapes and private properties. New tall steel or wide H-frame structures may seem out of proportion and not compatible with agricultural landscapes or residential neighborhoods. Landowners who have chosen to bury the electrical distribution lines on their property may find transmission lines bordering their property particularly disruptive to scenic views.

Some people, however, do not notice transmission lines or do not find them objectionable from an aesthetic perspective. To some, the lines or other utilities may be viewed as part of the infrastructure necessary to sustain everyday lives, work, and activities.

Aesthetic impacts depend on:

- The physical relationship of the viewer and the transmission line (distance and sight line);
- The activity of the viewer (*e.g.,* living in the area, commuting through, sightseeing);
- The contrast between the transmission structures and the surrounding environment, such as whether the line stands out or blends in.

The transmission line can affect aesthetics by:

- Removing a resource, such as clearing fencerows or woodland;
- Degrading the surrounding environment (*e.g.*, intruding on the view of a landscape);

[77] Concerns and losses or damage to the owner's landscape might be considered as hardship in the Commission's determinations about whether a CPCN should be issued under Wis.Stat. §196.491 (3)(d)3.

- Changing the context of the view shed (*e.g.*, evoking an image of development in a previously rural area).

5.5.1.2. Mitigation of aesthetic impacts

Electric transmission lines sometimes can be routed to avoid areas considered scenic. Routes can be chosen that pass through commercial/industrial areas or along land use boundaries.

The form, color, or texture of a line can be modified to somewhat minimize aesthetic impacts. There are some choices available in transmission structure color and/or construction material. For example, structures constructed of wood or of rust brown oxidized steel may blend better with wooded landscapes. Stronger conductors can minimize line sag and provide a sleeker profile.

ROW management can also mitigate some of the visual impacts of transmission lines. Some of these techniques include planting vegetative screens to block views of the line, leaving the ROW in a natural state at road or river crossings, and placing or piling brush from the cleared ROW so that it provides wildlife habitat. The Wisconsin Public Trust Doctrine identifies natural scenic beauty as viewed from a waterway. Wisconsin Stat. ch. 30 allows for the analysis of impact to natural scenic beauty as viewed from a navigable waterway. Utility compliance with the recent NERC standard is, of course, now an enforceable necessity. See Section 5.4.7.

In the end, aesthetics are to a great extent based on individual perceptions. Siting, design, construction materials, and ROW management can mitigate some of the adverse aesthetic effects of a line. It is in the interest of the applicant and the affected landowners to discuss and consider these measures early in the planning and design process. Comments by local residents or visitors during EIS preparation or public hearings can help decision-makers understand local concerns about the existing landscape and potential aesthetic impacts.

5.5.2. Agricultural lands

5.5.2.1. Potential impacts to agricultural lands

Transmission lines can affect farm operations and increase costs for the farm operator. Potential impacts depend on the design of the transmission line and the type of farming. Transmission lines can affect field operations, irrigation, aerial spraying, wind breaks, and future land uses. For new transmission lines 100 kV or greater and longer than one mile, state law requires the utility to repair much of the damage that can occur during construction and/or provide monetary compensation. See Section 5.3.

The placement of transmission structures can cause the following agricultural impacts:

- Create obstacles for turning field machinery and maintaining efficient fieldwork patterns;
- Increase soil erosion by requiring the removal of windbreaks that were planted along field edges or between fields;
- Create opportunities for weed and other pest encroachment;
- Compact soils or damage drain tiles;
- Result in safety hazards due to pole and guy wire placement;
- Hinder or prevent aerial spraying or seeding activities by planes or helicopters;
- Interfere with moving irrigation equipment;
- Hinder consolidation of farm fields or residential development of the farmland.

Windbreaks consist of rows of trees that can help reduce wind erosion by providing a barrier on the windward side of a field. Depending on soil conditions and supporting practices, a single row of trees protects for a distance downwind of approximately 10 to 12 times (or more) the height of the windbreak. The removal of windbreaks because of transmission line construction, especially in agricultural soils highly susceptible to wind erosion, could result in reduced crop productivity due in part to a permanent loss of top soil and the potential for additional non-point pollution of downwind streams.

In recent years there has been discussion about the potential for construction projects to spread farm pests and diseases or to otherwise affect the health of farming operations. Concerns have been raised about Johne's disease, soybean cyst nematode, the spreading of ginseng diseases to plots reserved for future ginseng production, and pesticide contamination of soils on organic farms. Issues of biosecurity can be a concern to many farm operators.

Soil mixing, erosion, rutting, and compaction are interrelated impacts commonly associated with transmission construction and can greatly affect future crop yields. Soils may be mixed during the excavation of pole foundations or during the undergrounding of electrical lines. The excavation depth for transmission structure foundations can vary greatly, but in some projects may be more than 50 feet deep. Excavated parent material or subsoils should not be mixed with topsoils and spread on the surface of the ROW. Significant rutting can occur when soils become saturated or in areas of sensitive soils. Rutting might impact agricultural lands by increasing the mixing of soils, allowing topsoils to erode during rain events, and compacting soils. Compacted soils inhibit percolation of rainwater and, in turn, inhibit seed germination and crop root growth. The degree to which soils are compacted by heavy construction equipment again depends on the type of soil and its saturation level. Ineffective erosion controls may wash valuable topsoils downhill and impact wetlands and waterways. Agricultural soils that have been improperly protected or mitigated may suffer decreased yields for several years after the construction of the transmission line is completed.

5.5.2.2. Prime farm land

Important agricultural land to protect from unnecessary adverse impact should include what is called "prime farmland." [78]

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding.

Users of the lists of prime farmland map units should recognize that soil properties are only one of several criteria that are necessary. Other considerations include:

[78] NSSH Part 622.03(a)(1) Farmland Classification: Prime Farmland. USDA Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/nedc/training/soil/?cid=nrcs142p2_054226

- Land use – Prime farmland is designated independently of current land use, but it cannot include areas of water or urban or built-up land. Map units that are complexes or associations containing components of urban land or miscellaneous areas as part of the map unit name cannot be designated as prime farmland.
- Frequency of flooding – Some map units may include both prime farmland and land that is not prime farmland because of variations in flooding frequency.
- Water table – Some map units include both drained and undrained areas. Only the drained areas meet the prime farmland criteria.

5.5.2.3. Agricultural Impact Statement

An AIS is required when the builders of a public construction project have the power to condemn property (eminent domain) and will acquire more than five acres of land from any one farm operation. Wisconsin Stat. § 32.035 specifies what DATCP is required to include in an AIS. The AIS is prepared to help farmers determine appropriate compensation for their losses. Easement agreements should include a discussion of anticipated damages and mutually agreed-upon reparation.

5.5.2.4. Mitigation of agricultural impacts

The utility should work with agricultural landowners as early in the design process as is appropriate to help identify potential impacts, well in advance of construction. Landowners and utilities may work out solutions that include minor changes in pole heights, specific pole locations, construction timing, and other significant land use concerns. By incorporating these solutions in written agreements, agricultural impacts can be prevented or minimized.

Agricultural monitors are sometimes retained. For more information about the use of agricultural or independent environmental monitors, see Section 5.2.5.

A utility working with landowners can:

- Avoid or minimize construction through sensitive farmland;
- Identify, address, and document concerns before construction begins;
- Find resolutions for anticipated impacts (*e.g.*, payments to temporarily suspend farming activities or the installation of a temporary fence).

Problems with pole placement can be mitigated to some extent if the utility works with farmers to determine optimal pole locations. The following approaches might be useful:

- Using single-pole structures instead of H-frame or other multiple-pole structures so that there is less interference with farm machinery, less land impacted, and fewer weed encroachment issues.
- Locating the transmission line along fence lines, field lines, or roadsides to minimize field impacts.
- Using transmission structures with longer spans to clear fields;
- Orienting the structures with the plowing pattern to make farm equipment less difficult to use.
- Minimizing the use of guy wires and, where necessary, keeping the guy wires out of crop and hay lands and placing highly visible shield guards on the guy wires.
- Minimizing pole heights and installing markers on the shield wires above the conductors in areas where aerial spraying and seeding are common.
- Locating new transmission lines along existing transmission line corridors.

- Using special transmission designs to span existing irrigation systems or, if necessary, reconfiguring the irrigation system at the utility's expense.

Problems with the spread of farm pests or diseases and contamination of soils can be reduced by:

- Having the farmer avoid spreading manure or pasturing livestock in the transmission line ROW prior to construction. (This is the most cost-effective method to prevent the spread of animal disease.)
- Avoiding access through or construction in areas that may contain manure.
- Learning about individual farm activities such as planting, tillage, and crop rotations so that construction methods and timing can be adapted to the timing of crop work.
- Installing exclusion fencing to keep livestock away from construction activities or installing markers to identify where construction is occurring, in consultation with the farmer, so that field activities and construction do not overlap.
- Putting barriers between equipment and manure or disease-contaminated soil.
- Physically removing manure or contaminated soil from equipment in compliance with existing farm disease control efforts.

Protection of organic farm certifications or prime farmland requires critical communication with the farmer and a thorough understanding of his or her operations along the ROW.[79]

Mitigation of farm impacts includes prevention of mixing topsoils with subsoils and the underlying parent material. Wisconsin Stat. § 182.017(7)(c) requires utilities that construct transmission lines that are 100 kV or larger and longer than one mile to ensure that topsoil is stripped, piled, and replaced upon completion of the construction operation. See Section 5.3.

If construction activity occurs during wet conditions and soils are rutted, repairing the ruts as soon as possible can reduce the potential for impacts. However, if improperly timed, mitigation work on rutted soil could compound the damage already present. Allowing a short time for the soil to begin drying and then using a bulldozer to smooth and fill in the ruts is a common mitigation approach. The Atterberg field test should be used to determine when the soil is friable enough to allow rutting to be remediated safely. Figures Vol. 2-35 through 2-38 illustrate how ruts made by heavy equipment can be repaired.

To minimize soil compaction during construction in low-lying areas, saturated soils, and/or sensitive soils, low-impact machinery with wide tracks can be used. DATCP has recommended that such machinery and tires also be used across agricultural land if it must be worked during wet conditions.

When construction of the line is complete, the soil in the ROW in fields that were accessed by heavy construction traffic should be checked for compaction with a soil penetrometer and compared to penetrometer readings on soils outside of the ROW. If compaction within the ROW is detected, appropriate equipment should be used to restore the soil tilth. A soil with good tilth has large pore spaces for adequate air infiltration and water movement. (Roots only grow where the soil tilth allows for adequate levels of soil oxygen.) DATCP can provide guidance on the best methods or equipment to be used.

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[79] An organic farmer or owner of prime farmland is also protected during ROW maintenance by the requirements in Wis. Stat. § 182.017(7)(c) through (h), particularly those related to soil management and pesticide use.

Problems with potential damage to soil productivity from the impacts of soil mixing, soil compaction, and soil erosion can be lessened by:

- Identifying site-specific soil characteristics and concerns from the landowner and farm operator before construction begins.
- Avoiding areas where impacts might occur by altering access routes to the construction sites.
- Using existing roads or lanes utilized by the landowner.
- Using construction mats, ice roads, or low ground pressure or tracked equipment to minimize compaction, soil mixing, rutting, or damage to drainage systems.
- Segregating top soils or soil horizons during excavation and construction to minimize soil mixing.
- De-compacting soils following construction with appropriate equipment until the degree of soil compaction levels on the ROW is similar to soils off the ROW.
- Avoiding construction and maintenance activities during times when soils are saturated.
- Avoiding the removal of critical windbreaks and replanting windbreaks with lower growing woody species to minimize soil erosion due to wind.

5.5.2.5. Wisconsin Statute § 182.017(7)(c)

This statute describes a number of restoration practices that the utility must employ when building a high-voltage transmission line on private property. See Section 5.3. This statute includes requirements, such as: removing rock and all construction debris; restoring all disturbed slopes, terraces, and waterways to their original condition; repairing drainage tile lines and fences damaged by construction; and paying for crop damage. Unless landowners waive their rights in an easement agreement, the utility is required to implement these mitigation practices. If a route that passes primarily through agricultural land is selected, DATCP has recommended that, to aid enforcement of the statute requirements, detailed Best Management Practices (BMP) should be incorporated into the project construction manuals and agricultural specialists should be available to consult with the environmental monitors employed to oversee the contractors and ensure that these protections are implemented.

5.5.2.6. U.S. Department of Agriculture Conservation Reserve Program lands

There are farmlands in Wisconsin enrolled in U.S. Department of Agriculture (USDA) Farm Service Agency (FSA) programs established to preserve wetlands, grasslands, and farmlands. Federal easements on these lands may have restrictive land uses not consistent with the construction of a transmission line. For example, a finding of incompatibility by the FSA could affect Conservation Reserve Program (CRP) payments to the landowner.

CRP is a federal voluntary program established to protect cropped lands that are vulnerable to erosion. CRP provides participants with an annual per-acre rent plus half the cost of establishing a permanent land cover (usually grass or trees). In exchange, the participant retires highly erodible or environmentally sensitive cropland from farm production for 10 to 15 years. Sensitive lands would also include land converted from crops to wildlife habitat or special shallow water areas, filter strips along surface waters, and grass covers for erosion control.

Federal funding for the program is limited. Offers for CRP contracts are ranked according to an index which includes the following factors:

- Wildlife habitat benefits resulting from covers on contract acreage;
- Water quality benefits from reduced erosion, runoff, and leaching;
- On-farm benefits from reduced erosion;
- Benefits that will likely endure beyond the contract period;
- Air quality benefits from reduced wind erosion;
- Cost.

Each transmission structure located in CRP land would require that one-tenth of an acre be removed from the contract. A repayment of past payments, damages, and interest on the removed area would need to be made by the landowner. If the transmission line requires the removal of trees and the CRP contract requires that the trees remain, the area where the trees would be removed would also need to be removed from the contract and previous CRP payments, damages, and interest repaid. If the CRP land is acquired through eminent domain, the repayment would not be required.

Since the applicant does not contact the landowner prior to obtaining a CPCN that describes an approved route, it would not know until then whether the affected farmland is in the CRP.

5.5.3. Airports and airstrips

Transmission lines are a potential hazard to aircraft during takeoff and landing. To ensure safety, local ordinances and FAA guidelines limit the height of objects in the vicinity of the runways. Utilities can route transmission lines outside of the safety zone, use special low-profile structures, construct a portion of the line underground, or install lights or other attention-getting devices on the shield wire or OPGW.

Large brightly colored balls or markers may be installed on overhead transmission line shield wire or OPGW to improve their visibility to pilots and lessen the risk of collision. These markers are often employed near airports or airstrips, in or near fields where aerial applications of pesticides or fertilizers occur, and in areas where tall machinery, such as cranes, are frequently operated.

5.5.4. Archeological and historic resources

Archeological and historical sites are protected resources. They are important and increasingly rare tools for learning about the past. They may have religious significance. Transmission line construction and maintenance can damage sites by digging, crushing artifacts with heavy equipment, uprooting trees, exposing sites to erosion or the elements, or by making the sites more accessible to vandals. Impacts can occur wherever soils will be disturbed, at pole locations, or where heavy equipment is used.

WHS has the primary responsibility for protecting archeological/historical resources. WHS manages a database that contains the records of all known sites and is updated as new information becomes available. Inclusion in the WHS database is an indication that a site has the potential to be evaluated for the National Register of Historic Places (NRHP) unless WHS specifically states otherwise. The database is searched for any sites that might be located along any of the proposed transmission line facilities.

The PSC is required to notify WHS if the construction of a transmission line has the potential for encountering any archeological resource. Archeological surveys might be required in these areas. WHS has indicated that the surveys most likely acceptable would be those conducted under the leadership of someone on the Wisconsin list of professional archaeologists. This is a list of archaeologists who have indicated interest in conducting contractual archaeological research in Wisconsin and who certify that they

are qualified archaeologists under the U.S. Secretary of the Interior's professional qualification standards.[80] The results of the surveys are reported to WHS. WHS will then make recommendations for avoiding and minimizing impacts to the sites. It is the responsibility of the PSC to ensure that construction practices follow all WHS recommendations. Route changes are seldom necessary. Judicious transmission pole placement can often be used to span resources and avoid impacts to the sites.

If during construction an archeological site is encountered, construction at the site must immediately stop and WHS and the PSC must be notified by the utility. WHS will then make recommendations on how construction should proceed so that impacts to the resource are managed or minimized.

5.5.5. Cultural concerns

Protection of archeological and historic resources is often discussed in terms of "cultural resource" impacts. However, there are other cultural factors that occasionally surface during a transmission project review. A cultural concern can occur when an identifiable group or community has practices or values that may conflict with a new transmission line.

An example of a cultural concern that has been addressed in past transmission line cases is the routing of a proposed transmission line through an Amish community. Because the Amish do not use electric service, wish to remain non-confrontational, and tend not to become involved in government processes, a concerted effort was made to avoid impacts on this community.

Cultural impacts may also be related to property impacts and general social concerns such as fairness. These issues are discussed under "Property Owner Issues" in Section 5.5.11.

5.5.6. Electric and magnetic fields

5.5.6.1. Sources of fields

Electricity produces two types of fields, electric and magnetic. These fields are often combined and referred to as electric and magnetic fields (EMF). Whereas common objects such as trees, fences, and walls easily provide a shield from electric fields, magnetic fields pass through most non-metallic materials. Therefore, most scientific studies concentrate on magnetic fields and not electric fields. Magnetic fields are created whenever electric current flows through any line or wire, including the electrical wiring in a home. Sources of magnetic fields include electrical appliances such as power tools, vacuum cleaners, microwaves, computers, electric blankets, fluorescent lights, and electric baseboard heat. Because there are so many common sources of magnetic fields, everyone is exposed to many magnetic fields every day.

5.5.6.2. Results of electric and magnetic field research

Starting in the late 1970s, researchers began to investigate the possibility that exposure to magnetic fields might have an adverse effect on human health. Since then, scientists have conducted many studies designed to determine whether or not exposure to magnetic fields affects human health. Scientists have uncovered only weak and inconsistent epidemiological associations between exposure to transmission line EMF and adverse health effects. Several epidemiological studies have shown a weak statistical association with the risk of childhood leukemia. However, other epidemiological studies have found no link to leukemia. Cellular studies and studies exposing test animals to magnetic fields have shown no link

[80] The Secretary of the Interior's professional qualification standards are listed on the WHS's "Archaeologist Professional Self-Qualification Form for Placement on the List of Professional Archaeologists," found at http://www.wisconsinhistory.org/Content.aspx?dsNav=N:4294963828-4294963805&dsNavOnly=N:1215&dsRecordDetails=R:CS4122, and found in 36 CFR 61, Appendix A.

between magnetic fields and disease. Taken as a whole, the biological studies conducted to-date have not been able to establish a cause-and-effect relationship between exposure to magnetic fields and human disease, nor have scientists been able to identify any plausible biological mechanism by which magnetic field exposure might cause human disease. For the past decade, there is a growing consensus within the scientific community that exposure to magnetic fields is not responsible for human disease.

A common method to reduce magnetic fields is to bring the lines (conductors) closer together. The magnetic fields interfere with one another, producing a lower field. The conductors can be brought closer together by using different types of structures or double-circuiting two lines on the same structures. However, there are electrical safety limits to how close together conductors can be placed. Conductors must be far enough apart so that arcing cannot occur and so that utility employees can safely work around them. Additionally, the closer conductors are to one another, the closer together poles must be constructed. Increasing the number of poles per mile increases private property land impact and costs.

A more detailed review of EMF research and human health can be found in Appendix B. Details about the expected magnetic field levels associated with the proposed transmission line project can be found in in later, route-specific chapters of this EIS.

5.5.6.3. Pacemakers and implantable medical devices

Implantable medical devices are becoming increasingly common. Two such devices, pacemakers and implantable cardioverter defibrillators (ICD), have been associated with problems arising from interference caused by EMF. This is called electromagnetic interference (EMI).

EMI can cause inappropriate triggering of a device or inhibit the device from responding appropriately. Documented sources of EMI include radio-controlled model cars, slot machines, car engines, cell phones, anti-theft security systems, radiation therapy, and high-voltage electrical systems. It has been estimated that up to 20 percent of all firings of ICDs are inappropriate, but only a very small percentage are caused by external EMI.

ICD manufacturers' recommended threshold for modulated magnetic fields is 1 gauss. One gauss is five to ten times greater than the magnetic field likely to be produced by a high-voltage transmission line. Research shows a wide range of responses for the threshold at which ICDs and pacemakers responded to an external EMI source. The results for each unit depend on the make and model of the device, the patient height, build, and physical orientation with respect to the generated field.

Transmission lines are only one of a number of external EMI sources. Exposure to magnetic fields produced by the proposed power line generally will not affect pacemakers and implantable defibrillators. All pacemakers and ICD patients are informed of potential problems associated with exposure to EMI and must adjust their behavior accordingly. Moving away from a source is a standard response to the effects of exposure to EMI. Patients can shield themselves from EMI with a car, building, or the enclosed cab of a truck. Individuals concerned with potential issues associated with their implantable medical devise should consult their physician.

5.5.7. Endangered/threatened and protected species

5.5.7.1. Wisconsin's Endangered Species Law

Endangered resources include rare or declining species, high quality or rare natural communities, and unique or significant natural features. For the purposes of this document, rare species are defined as federal- or state-listed threatened and endangered species, federal candidate and proposed species, and

state special concern species. These species are not common, which means they are low in numbers or restricted to small geographical areas (*i.e.*, difficult to find). Endangered species are any species whose continued existence is in jeopardy. Threatened species are species that are likely to become endangered. Special Concern species are those species about which some problem of abundance or distribution is suspected but not yet proved. The main purpose of the Special Concern category is to focus attention on certain species before they become threatened or endangered. Special concern species are not covered by Wisconsin's Endangered Species Law, but they may be protected by other state and federal laws.

The state's Endangered Species Law, Wis. Stat. § 29.604, makes it illegal to take, transport, possess, process, or sell any wild animal that is included on the Wisconsin Endangered and Threatened Species List. In addition, it is illegal to remove, transport, carry away, cut, root up, sever, injure or destroy a wild plant on the Wisconsin Endangered and Threatened Species List on public lands. However, forestry, agricultural, utility, and bulk sampling practices are exempted from the taking prohibitions of listed plant species.

The Wisconsin Endangered Species law allows DNR to authorize the taking of a threatened or endangered species if the taking is incidental to the carrying out of an otherwise lawful activity and the taking meets the requirements outlined in Wis. Stat. § 29.604. Authorization generally occurs through an Incidental Take Permit. If the activity is conducted by DNR itself or if another state agency conducts, funds, or approves the activity, authorization would occur through an Incidental Take Authorization.

The DNR Bureau of Natural Heritage Conservation manages the Natural Heritage Inventory (NHI) database, which lists current and historical occurrences of rare plants, animals, and natural communities. The database includes the location and status of these resources. However, most areas of the state have not been surveyed extensively or recently, especially on privately-owned lands, so the NHI database should not be relied upon as a sole information source for rare species. The Wisconsin NHI database has information on rare species only for areas that have been previously surveyed for that species or group during the appropriate season and the observation has been recorded. Therefore, potential impacts on rare resources along segments dominated by private properties may be incomplete.

5.5.7.2. Federally protected birds

Almost all bird species are protected by the federal Migratory Bird Treaty Act (MBTA). Under the MBTA, it is unlawful to take, capture, kill, or possess migratory birds, their nests, eggs, and young. This may apply to birds nesting in or adjacent to the ROW if construction disturbance results in nest abandonment. Avoidance of impacts to nesting birds can be achieved if construction activities are scheduled in habitat areas outside the breeding and nesting season from approximately March through August.

The bald eagle is a state special concern species and federally protected through the Bald and Golden Eagle Protection Act. While this species was not found within the vicinity of the project using the NHI Database, there is suitable habitat (large trees in proximity to lakes and rivers) along these segments for the species to be present and nesting. Therefore, additional bird surveys may be recommended.

5.5.7.3. Potential impacts to rare species and their habitats

Construction and maintenance of transmission lines might destroy individual plants and animals or might negatively alter their habitat so that it becomes unsuitable. Potential impacts may include:

- Destroying individual plants or animals or their habitat by crushing or digging with heavy equipment, blasting for construction of foundations, surface disturbance of soil and vegetation during clearing, drilling, or from traffic.
- Degrading water quality through soil erosion and siltation into rivers and wetlands that provide habitat for rare plants or animals.
- Introducing and encouraging the growth of invasive or common species resulting in a reduction in species diversity.
- Clearing trees used as perching or nesting sites by rare birds and creating an open area out of a closed canopy that allows more predation or the expansion of invasives.
- Disturbing habitats during the active nesting or spawning period of protected species.
- Degrading woodland or wetland quality through removal of trees and brush and increasing edge effects, making the area unsuitable for rare plants or animals.

5.5.7.4. Pre-construction surveys

If preliminary research and field assessments indicate that rare species or natural communities may be present in the project area, specific, appropriately-timed surveys may be conducted prior to construction. Pre-construction surveys may be used to make relative comparisons of the nature and magnitude of impacts to rare species among different routes. They may also be used to identify whether a particular species is present in the affected area or to what extent suitable habitat for a species is present along a route. If a threatened or endangered species is observed during the surveys, measures such as those described in the next section may be employed to avoid or minimize impacts to the species and its habitat. These strategies may include, among others, altering the construction schedule to avoid critical life cycle events, relocating or modifying the width of the ROW at that location, or installing exclusionary devices.

5.5.7.5. Mitigation of impacts to rare species and their habitats

Impacts to rare and protected species can usually be avoided or minimized by modifying the route, changing the design of the transmission line, reducing the workspace at a particular location, employing special construction techniques, or utilizing exclusionary devices. The PSC has the authority to order transmission construction applicants to conduct surveys, require an expert be present during construction activities, and implement mitigation measures.

An example of a common avoidance measure is fencing in areas where habitat is likely to support rare turtles or sometimes snakes. During times when the animal may be present or enter into the construction zone, fencing is installed to exclude these animals. The fencing prevents the animal from entering into harm's way. Immediately before work begins in suitable turtle habitat, a ground survey is conducted and any individuals found in the area are relocated to a nearby suitable habitat. Figure Vol. 2-39 shows an area fenced to keep rare turtles away from the construction zone. This fencing is removed when construction and restoration in the area is completed.

Bird flight diverters (BFD) are another common mitigation method used to mitigate impacts to protected species. BFDs may be installed on shield wires when overhead transmission lines are built in areas heavily used by rare and/or common birds or in specific areas within known migratory flyways. The purpose of BFDs is to make the line more visible, so birds can see it and fly around or over the conductors to avoid colliding with them. Several designs of BFDs are available. They are typically attached to either the conductors or the static wire. See Figure Vol. 2-40. Ideally, BFDs should be noticeable by birds, but should not draw unwanted attention by people. Installed BFDs need to be inspected periodically and replaced when necessary.

An applicant can also apply for an Incidental Take Permit if it is possible that construction activities could result in the harm or "take" of a threatened or endangered species. If granted, the permit would allow the applicant to take certain actions that may be harmful to a threatened or endangered species, within the conditions and limitations of the permit.

The utility should consult with DNR so that the appropriate methods to avoid impacts to rare species are incorporated into an avoidance plan and properly conducted during construction. If impacts to a species cannot be avoided using construction practices or timing, the applicant may be required to undergo additional consultation to minimize impacts as part of the Incidental Take Authorization process.

5.5.7.6. Positive impacts to habitats

In some limited cases, transmission line ROWs have been managed to provide or improve habitat for some rare species or communities. For example, some ROWs in Wisconsin are being actively managed to provide habitat for the Karner blue butterfly, a federally-listed species. Close cooperation between the utility and DNR is necessary to protect listed species and their habitat.

5.5.8. Highway impacts

Wisconsin Stat. §§ 86.07 and 86.16 allow utilities to locate their facilities along and across highway ROW with the written consent of the highway maintaining jurisdiction, subject to any conditions that may be placed on the installation.

Wherever the line would need to share ROW or cross a state or federal highway, a permit must be obtained from WisDOT. The line would need to comply with the WisDOT Utility Accommodation Policy.[81] The policy emphasizes that permitted use and occupancy of highway ROW for non-highway purposes like an electric transmission line is subordinate to the primary interests and safety of the traveling public. WisDOT could permit utility facilities on a state highway if the following three conditions are met:

1. Such use and occupancy would not adversely affect the primary functions of the highway or materially impair its safety, or operational or visual qualities.
2. There would be no conflict with the provisions of federal, state or local laws or regulations.
3. The occupancy would not significantly increase the difficulty or future cost of highway construction or maintenance.

A WisDOT utility permit is required for utility work within state highway ROWs. Utility work includes surveying, excavating, placement of fill material, grading, installation of the line, and traffic control for any new or upgraded utility line or to replace a significant portion of an existing line.

The Federal Highway Administration allows transmission facilities to be located within interstate and freeway ROWs under state procedures provided they do not adversely affect the safety, efficiency, and aesthetics of the highway, interfere with its present use or future expansion, or require access for future maintenance directly from the highway lanes or shoulder.

[81] WisDOT Bureau of Highway Maintenance. Facilities Development Manual, December 2010. Chapter 9, "Right-of-Way Use and Permits." Section 15, "Utility Accommodation." See also Section 7-55-1, "Scenic Easements," and Real Estate Program Manual, Section 6.8, Scenic Easements.

5.5.9. Invasive species

5.5.9.1. Potential impacts by invasive species

Non-native plants, animals, and microorganisms found outside of their natural range can become invasive. Many non-native species are harmless because they do not reproduce or spread abundantly in their new surroundings. Some non-native species have been introduced intentionally, such as the Norway maple *(Acer platanoides)* for landscaping and the ring-necked pheasants for hunting. However, a small percentage of non-native species are able to become quickly established, are highly tolerant of a wide range of conditions, and are easily dispersed. The diseases, predators, and parasites that kept their populations in check in their native range may not be present in their new locations. Over time, non-native, invasive species can overwhelm and eliminate native species, reducing biodiversity and negatively affecting both ecological communities and wildlife habitats.

Human actions are the primary means of invasive species introductions. Transmission line construction causes disturbance of ROW soils and vegetation through the movement of people and vehicles along the ROW, access roads, and laydown areas. These activities can contribute to the spread of invasive species. Parts of plants, seeds, and root stocks can contaminate construction equipment and essentially "seed" invasive species wherever the vehicle travels. Infestation of invasive species can also occur during periodic transmission ROW maintenance activities, especially if these activities include mowing and clearing of vegetation. Once introduced, invasive species will likely spread and impact adjacent properties with the appropriate habitat.

Some common invasive species and their habitats are listed in Table 5.5-1.

Table 5.5-1 Common exotic and invasive plant species found in Wisconsin

Common Name	Scientific Name	Habitat
Bella Honeysuckle	*Lonicera x bella*	Forest Savanna Prairies
Bull Thistle	*Cirsium vulgare*	Disturbed Areas
Common Reed	*Phragmites australis*	Wetlands
Common Buckthorn	*Rhamnus cathartica*	Disturbed Areas, Forests, and Prairies
Common Tansy	*Tanacetum vulgare*	Sunny Disturbed Areas
Garlic Mustard	*Alliaria petiolata*	Forests and Savanna Prairies
Glossy Buckthorn	*Rhamnus frangula or Frangula alnus*	Forests and Wetlands
Morrow's Honeysuckle	*Lonicera morrowii*	Forest Savanna Prairies
Multiflora Rose	*Rosa multiflora*	Varied
Purple Loosestrife	*Lythrum salicaria*	Wetlands
Reed Canary Grass	*Phalaris arundinacea*	Wetlands
Spotted Knapweed	*Centaurea maculosa*	Sunny Disturbed Areas
Tartarian Honeysuckle	*Lonicera tatarica*	Forest Savanna Prairies
Wild Parsnip	*Pastinaca sativa*	Varied - Prefers Sunny Areas

5.5.9.2. Best management practices

To better address the control of invasive species, an Advisory Committee for the Wisconsin Council on Forestry was formed in 2008 and included representatives from public and private organizations, including highway departments, electric and gas utilities and pipelines, and state technical staff. They produced in 2010, the "Invasive Species Best Management Practices for Transportation and Utility Rights-of-Way." This best practices manual can be found online at: http://www.wisconsinforestry.org/initiatives/other/invasive-species-bmps/forestry-bmps. It identifies effective and realistic voluntary practices that can be integrated into ROW construction and maintenance activities.

As of September 2009, Wis. Admin. Code ch. NR 40 became effective and established a classification system for invasive species and prohibits activities that result in the spread of invasive species in certain categories. It also establishes preventive measures to help minimize their spread.

5.5.9.2.1. During construction

The BMPs manual identifies many methods that can be used during construction to limit the introduction and spread of invasive species. These measures include:

- Prior to the start of construction, survey and mark locations of invasive species so they can be avoided during construction.
- Prior to the start of construction, remove or control isolated populations of invasive species.
- Schedule construction activities during periods of the year when invasive species are less likely to be encountered or spread.
- Choose construction access points and staging areas so that ground disturbances are minimized.
- Properly dispose woody material from ROW clearing to avoid and/or minimize the spread of invasives.
- Clean equipment that may have become contaminated with invasives so that invasives are not spread.
- Properly dispose soils, seeds, plant parts, or invertebrates found during inspection and cleaning.
- Use soil and aggregate material from sources free of invasive species.
- Use effective erosion control and storm water management practices to stabilize exposed soils, as soon as possible.
- Use non-invasive or native seed cover crops for the re-vegetation of areas disturbed by construction activities.

5.5.9.2.2. Post-construction

Because construction measures may not be completely effective in controlling the introduction and spread of invasives, post-construction activities might be required, with the permission of the landowner. Sensitive areas such as wetlands and high quality forests and prairies should be surveyed for invasive species following construction and site re-vegetation. If new infestations of invasive species are discovered, then measures should be taken to control the infestation. Each exotic or invasive species requires its own protocol for control or elimination. Techniques to control exotic/invasive species include the use of pesticides, biological agents, hand pulling, controlled burning, and cutting or mowing. DNR should be consulted to determine the best methods for control of encountered invasive species.

5.5.10. Noise and light impacts

5.5.10.1. During construction

During each phase of construction of the transmission line, noise will be generated by the construction equipment and activities. Initially, vegetation in the ROW is mowed or cut using whole tree processors and/or chainsaws. Wood brush and logs may be chipped or burned in the ROW. Trucks are used to haul away material that can't be stockpiled or disposed of on-site and to bring in necessary construction materials. Typical construction vehicles include bucket trucks, cranes or digger derricks, backhoes, pulling machines, pole trailers, dumpsters, or drill rigs.

Transmission structures are constructed by first using a standard drill rig to bore a hole to the required depth. If water is encountered, pumps will be used to move the water to either adjacent upland areas or to waiting tanker trucks for proper disposal. When bedrock is close to the surface or when subsoils primarily consist of large boulders and large cobbles, blasting may be required. Concrete trucks carry concrete to the boreholes to construct the foundations of the transmission structures. Cranes then erect the towers on the foundations. Finally, the wire is strung between the towers using large pulleys. After the construction is completed, the ROW is graded, agricultural soils are de-compacted, and the ROW cleaned up.

All of these operations produce noise that may impact adjacent landowners. However, normal work schedules and local ordinances usually restrict noise producing activities to daytime hours.

5.5.10.2. During operation

Vibrations or humming noise can be noticeable and is most often associated with older transmission lines. It is usually the result of conductor mounting hardware that has loosened slightly over the years and can be easily repaired by the utility. This is a maintenance issue that can be identified and repaired.

The other types of sounds caused by transmission lines are sizzles, crackles, or hissing noises that occur during periods of high humidity. These sounds are usually associated with high-voltage transmission lines and are very weather dependent. They are caused by the ionization of electricity in the moist air near the wires. Though this noise is audible to those very close to the transmission lines, it quickly dissipates with distance and is easily drowned out by typical background noises. The potential for this type of noise is greatest in foul weather conditions when other factors, like high winds and precipitation, would increase overall background noise as well.

Ionization of transmission lines in foggy conditions can also cause a corona, which is a luminous blue discharge of light usually where the wires connect to the insulators. A corona indicates the loss of power where it occurs, which indicates inefficiency and economic loss, and so power transmission equipment is designed to minimize the formation of corona discharge. Corona emissions can cause small amounts of radio-frequency interference (RFI), primarily to AM radio signals. However, this effect is low even in proximity to the ROW and meets reception guidelines of the Federal Communications Commission (FCC).

Corona could also indicate areas of wear and damage on the transmission line, again a good reason for utilities to identify, examine, and repair any damage if observed. In other situations, the attachment of bird deflectors can sometimes increase the angular edges on the transmission lines and in turn increase corona emissions. Birds might also be deterred from landing on lines that are experiencing corona emissions because of the resulting noise and ultraviolet light.[82] [83]

Substation noise and light may impact residential properties located in close proximity to those facilities.

5.5.11. Property owner issues

5.5.11.1. Right-of-way easements

Property owner issues are often raised by individuals or communities along proposed transmission line routes. One concern relates to how some property owners bear the burden so that everyone else can use

[82] Hurst, Neil. 2004. Corona Testing of Devices Used to Mitigate Bird Collisions. EDM International, Inc. California Energy Commission, PIER Energy-Related Environmental Research. 500-04-086F.
[83] Hayes, Brian. 2005. Infrastructure – a Field Guide to the Industrial Landscape, WW Norton & Company, New York.

the electricity, pitting property owner rights versus public good. Another concern relates to who should be considered as affected by the new line.

There is often a feeling of unfairness between those that use electricity and those that bear the impacts of the facilities required to support that use. The money paid to landowners for ROW easements is meant to compensate them for having a transmission line cross their property. These easement payments are negotiated between the landowner and the utility. Some landowners do not regard the payments as sufficient to truly compensate for the aesthetic impacts and the loss of full rights to their own land. This is especially true if the landowner is not compensated for the "highest and best use" of the affected parcel.

The policy of corridor sharing favors the placement of new transmission lines within or next to existing infrastructure, causing some landowners to be burdened by multiple easements. These individual hardships must be balanced against the additional environmental or social impacts that would be caused by the development of new transmission corridors.

Property owners who live near the line but not on the ROW might be affected but are not compensated. Subsequent owners of the property in the ROW, although they purchased the property knowing that the easement already existed, would not be compensated directly either because the easement payment is most commonly a one-time payment paid at the time of the easement acquisition.

Compensation is paid to towns, municipalities, and counties through which a 345 kV or higher voltage transmission line is constructed via payment of one-time environmental and/or annual impact fees. Wisconsin Stat. § 196.491(3g)(a). The amount can be considerable and is proportional to the percentage of the line constructed within a specific political subdivision and the cost of the project. No portion of it, however, is paid directly to the property owner.

5.5.11.2. Property value studies

The potential change in property values due to the proximity to a new transmission line has been studied since the 1950s by appraisers, utility consultants, and academic researchers. It is very difficult to predict how a specific transmission line will affect the value of a specific property. Of issue are changes to the "fair market" value of a property and not the "assessed" value. To date, no study has shown how the construction of a new transmission line negatively affects the "assessed" value of a property. Additionally, studies have been conducted mostly on residential or undeveloped properties and not commercial properties.

A power line may increase, decrease, or have no effect on an individual's perception of a property's worth. This perception is indicative of how much one is willing to pay for the property (the fair market value) when it is put up for sale. The marketability of a property includes the final sale price and the amount of time required to sell the property.

Initial property value studies were primarily surveys or attitudinal studies of small numbers of homeowners. However, substantial differences could exist between people's perceptions about how they would behave and their actual behavior when confronted with the purchase of property supporting a power line.

Because of this uncertainty, attitudinal studies were replaced by "valuation" studies involving the comparison of sales prices for properties similar in most respects, except for proximity to a power line. There are two major shortcomings in conducting this type of study: 1) the subjective nature of identifying a pair of properties that were considered "identical" for the purpose of the study; and 2) the restrictive

nature of finding "identical" property pairs, which would result in a data set too small for meaningful statistical analysis.[84]

A third type of research involves large sample sizes, a high number of variables, and multiple regression analysis. These studies, which can better account for numerous variables that affect sales, provide the best information to-date on the effects of power lines on property values. Individuals buying property are likely to consider many factors, such as schools, community services, scenic beauty, recreational opportunities, or distance to work. The relative importance of each of these factors varies greatly among individuals. Likewise, the importance of a nearby power line varies greatly among people. The presence or potential presence of a transmission line could lead potential buyers to perceive a decrease in the property's value or have no affect at all. The statistical analyses might help illustrate which factors best predict differences in marketability.

5.5.11.3. Potential impacts to property values

In some situations, value can be increased. In rural areas, especially in the vicinity of large wooded parcels, a utility ROW might provide improved access to large land tracts for hunting, snowmobiling, or other recreational activities. White-tailed deer and some other animals often use forest openings for foraging and travel. In urban or suburban residential areas, lots on or adjacent to power line corridors are often sized larger than neighboring lots but are similarly priced, allowing residents to benefit from the added buffer and space the ROW provides. Integrating the open space of the utility corridor into a neighborhood and developing it as usable space can also diminish or avoid adverse effects on property values.[85]

Conversely, the perceived value of property may decrease in value because of:

- Concern or fear of possible health effects from electric or magnetic fields.
- The potential noise and visual unattractiveness of the transmission line.
- Potential interference with farming operations or foreclosure of present or future land uses.

While there is no conclusive evidence of the effects of EMF on health, it is recognized that people's concerns about EMF can influence their decisions related to the purchase of a property. In *Criscuola v. Power Authority of the State of New York*,[86] the New York State Court of Appeals ruled that whether the danger of EMF is a scientifically genuine or verifiable fact should be irrelevant to the central issue of its market value impact. The visual profile of transmission line structures and wires can also decrease the perceived aesthetic quality of property. These conclusions have been cited in several court cases and legal opinions.

On farmed properties, installation of a transmission line can remove portions of the land from production, interfere with equipment operation, create safety hazards, and foreclose the opportunity to consolidate farmlands or develop the land for another use. The greatest impact on farm property values is likely to

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[84] Kinnard, W. Jr. and S. A. Dickey. 1995. A Primer on Proximity Impact Research: Residential Property Values Near High-Voltage Transmission Lines. Real Estate Issues. 20(1):23-29.

[85] Ignelzi, Patrice and Thomas Priestley. A Statistical Analysis of Transmission Line Impacts on Residential Property Values in Six Neighborhoods. Southern California Edison, 1991.

[86] *Criscuola v. Power Authority of the State of New York*, 81 NY2d 649, 602 NYS2d 588, 621 NE2d 1199 (1993).

occur on intensively managed agricultural lands, where the new line would interfere with farm operation and management.

5.5.11.4. Research results

While the data from many of the studies reviewed are often inconclusive, some general conclusions among the studies have been made. In 2003, the Electric Power Research Institute (EPRI) conducted an assessment of the researched relationship between electric transmission facilities and property values.[87] Their conclusions do not differ substantially from previous analyses.

- The potential reduction in sale price for single-family homes in the U.S. may range from 0 to 14 percent. For states within the Midwest (Minnesota, Wisconsin, and the UP), the average decrease appears to be between 4 and 7 percent. EPRI reported a potential overall decrease between 0 and 6.3 percent.
- Higher-end properties are more likely to experience a reduction in selling price than lower-end properties.
- Adverse effects on the sale price of smaller properties could be greater than effects on the sale price of larger properties.
- Amenities such as proximity to schools or jobs, lot size, square footage of a house, and neighborhood characteristics tend to have a much greater effect on sale price than the presence of a power line.
- The degree of opposition to an upgrade project may affect the size and duration of the sales-price effects. Furthermore, adverse effects on price and value appear to be greatest immediately after a new transmission line is built and appear to diminish over time and generations of property owners.
- Effects on sale price are most often observed for property crossed by or immediately adjacent to a power line, but effects have also been observed for properties farther away from a line. Homes not directly adjacent to the ROW or beyond 200 feet from the ROW, however, were affected to a much lesser degree than those abutting the line or ROW.[88] [89]
- Setback distance, ROW landscaping, shielding of visual and aural effects, and integration of the ROW into the neighborhood can significantly reduce or eliminate the impact of transmission structures on sales price.
- Where appreciation of property does not appear to be affected, proximity to a transmission line can sometimes result in increased time for the property to sell.
- The value of agricultural property is likely to decrease if the power line structures are placed in an area that inhibits farm operations.

[87] Goodrich-Mahoney, J. Transmission Line and Property Values: State of the Science. EPRI, November 2003.

[88] Kung, H. and C. Seagle, "Impact of Power Transmission Lines on Property Values: A Case Study," Appraisal Journal, July 1992.

[89] Hamilton, S. and G. Schwann. 1995. Electric Transmission Lines and Property Value. Land Economics 71(4):436-444.

5.5.12. Radio, television, and other communications interference

Transmission lines do not usually interfere with normal television and radio reception. In some cases, interference is possible at a location close to the ROW due to weak broadcast signals or poor receiving equipment.

If reception interference does occur because of the transmission line, the electric utility is required to remedy problems so that reception is restored to its original quality as per Wis. Admin. Code § PSC 113.0707(3).

On the broadcast side, there is a potential for impact. The primary types of potential electric transmission interference with communication broadcast signals are: 1) AM broadcast antenna reradiation, 2) transferred voltages to communication facility grounding systems, and 3) microwave line-of-sight signal degradation. These impacts could occur with broadcast facilities within 10 kilometers (km)—6.2 miles—of the transmission line.[90]

As part of CPCN applications, studies are conducted by the applicants to determine the location and the potential for communication signal interference. Additional studies are often necessary after final engineering of an approved transmission line to determine if mitigation is necessary.

5.5.13. Recreation

Recreation areas include parks, trails, lakes, waterways, or other designated areas where public recreational activities occur. Transmission lines can affect recreation areas in several ways:

- Limiting the location of buildings;
- Repelling potential users of recreational areas whose activities depend on the aesthetics of natural surroundings (*e.g.,* backpackers, canoeists, hikers, birdwatchers);
- Altering the types of wildlife found in an area by creating more edge habitat or additional mortality risks to birds;
- Providing paths or better access to previously inaccessible areas for those who snowmobile, ski, bicycle, hike, or hunt;
- Posing potential safety risks by locating new poles or wires in the path of recreational vehicles such as snowmobiles and ATVs without adequate markings.

Some of these effects can be mitigated by locating lines along property edges, using pole designs that blend into the background and reduce aesthetic impacts, or designing recreation facilities to take advantage of already cleared ROWs.

5.5.14. Safety

5.5.14.1. Safety standards

Transmission lines must meet the requirements of the Wisconsin State Electrical Code.[91] The code establishes design and operating standards, and sets minimum distances between wires, poles, the ground,

[90] Data provided to ATC by Power Engineers, Communication Facility Impact Study, Phase 1, January 31, 2014.

[91] Wisconsin adopts the most recent edition of the National Electrical Safety Code with certain changes, deletions, and additions. Volume 1 of the Wisconsin State Electrical Code is found in Wis. Admin. Code. ch. PSC 114, which is administered primarily by the Commission.

and buildings. While the Wisconsin State Electrical Code represents the minimum standards for safety, the electric utility industry's construction standards are generally more stringent than the Wisconsin State Electrical Code requirements.

The National Electric Safety Code (NESC) specifies minimum horizontal clearances required between buildings and 345 kV conductors. Wisconsin Admin. Code § PSC 114.234C1c prohibits the construction of transmission lines over occupied residential dwellings or residential dwellings intended to be occupied. Although they may not be prohibited by code, building other structures within a transmission line ROW is strongly discouraged. ATC's standard easement contract prohibits the building of structures in the ROW without ATC's prior consent. This consent is managed through an "encroachment review process" that reviews any requested structures or modifications to the property, including grade changes, to ensure continued safe operation and access to the facilities for maintenance.

5.5.14.2. Contact with transmission lines

The most significant risk of injury from any power line is the danger of electrical contact between an object on the ground and an energized conductor. Generally, there is less risk of contact with higher voltage transmission lines as opposed to low-voltage lines due to the height of the conductors.

When working near transmission lines, electrical contact can occur, even if direct physical contact is not made, because the electricity can arc across an air gap. The most important safety practice is to avoid placing yourself or any object you may contact too close to a high-voltage overhead line. As a general precaution, no one should be on an object or in contact with an object that is taller than 14 feet while under a high-voltage electric line. Individuals with specific concerns about whether it is safe to operate their vehicles or farm equipment near an electric transmission line should contact their electric provider.

5.5.14.3. Fallen lines

Transmission lines are designed to trip out-of-service (become de-energized) automatically if they fall or contact trees. This is not necessarily true of distribution lines. However, transmission lines are not likely to fall unless hit by a tornado or a vehicle.

5.5.14.4. Lightning

New transmission lines are built with a grounded shield wire placed along the top of the poles, above the conductors. Typically, the shield wire is bonded to ground at each transmission structure. This protects the transmission line from lightning. Transmission poles, like trees or other tall objects, are more likely to intercept lightning strikes, but do not attract lightning. Lightning is not more likely to strike houses or cars near a transmission line. Shorter objects under or very near a line may actually receive some protection from lightning strikes.

5.5.14.5. Induced voltages

Landowners in both rural and urban settings often express concerns about shocks from metal objects in the immediate vicinity of an overhead transmission line. An ungrounded metal object (*e.g.* a tractor or a fence) under or very near an energized transmission line may become charged with low-level voltage caused by an electrostatic induction process. When a person or animal touches the object, a shock may be felt, similar to that felt after crossing a carpet and then touching a metal object. The voltage discharge can be a painful nuisance. Dissipation of such charges occurs when contact is made with the ground. This might happen when people, livestock, or some other conductive material makes an effective electrical contact between ground and the charged object. The magnitude and strength of the charge is directly related to the mass of the ungrounded metal object and its orientation to the line.

Concerns have most often been addressed by grounding the objects in question. For example, fences located directly under and parallel to transmission lines should be grounded to earth. This can be achieved through the use of a simple ground rod with an insulated lead and a wire clamp attached. Energized electric fences with a properly installed fence grounding electrode system should continue to function properly even when subjected to induced voltage. Energized electric fences directly under or parallel to a transmission line may also have filters installed to discharge the induced voltage to earth.

When it is necessary to move or work on such fences, the fences should remain solidly grounded while the work is being done. Additional protection may be obtained by installing an approved lightning protection system on the fence that also provides a means for the discharge of induced voltage. More information may be obtained from a Midwest Rural Energy Council publication, *"Installation and Operation of Electric Fences, Cow Trainers and Crowd Gates"* (http://www.mrec.org/pubs.html).

Tractors or other equipment operated under a transmission line can drag a short metal chain to "ground it" to earth. This is a very low-cost, effective mitigation technique. An equally low-cost alternative is to attach a chain to the metal frame of the equipment and drop that chain to the ground before getting off of the equipment. The chain can be pulled up while the vehicle is moving to reduce the risk of a broken chain causing damage to the equipment. The most direct mitigation measure is to avoid parking this type of equipment under high-voltage power lines.

Refueling vehicles directly under a high-voltage transmission line is not a good practice. A spark from a discharging metallic structure with induced voltages to earth could ignite the fuel. The risk of such ignition is higher with gasoline-powered vehicles than for diesel-powered vehicles.

DATCP's AIS for this project will provide additional information regarding safety issues when farming near transmission lines. See Section 5.5.2.3 in this chapter of the EIS. DATCP AIS staff can provide general published information and references as well. Individuals with specific concerns regarding the operation of equipment or placement of fences under an electric transmission line should contact their electricity provider.

5.5.15. Stray voltage and dairy livestock

5.5.15.1. Causes of stray voltage

Stray voltage and its impacts on livestock and other confined animals have been studied in detail by state and federal agencies, universities, electric utilities, and numerous scientists since the late 1970s. The PSC has opened investigations, encouraged the upgrade of rural distribution systems, established measurement protocols, and compiled a stray voltage database to track investigations, all in order to develop successful strategies for minimizing stray voltage in farm operations.[92] Over the decades, significant resources have been allocated to understand this issue.

Electrical systems, including farm systems and utility distribution systems, are grounded to the earth to ensure safety and reliability, as required by the NESC and the National Electrical Code (NEC). Because of this, some current flows through the earth at each point where the electrical system is grounded and a small voltage develops. This voltage is called neutral-to-earth voltage (NEV). When NEV is measured between two objects that are simultaneously contacted by an animal, a current will flow through the animal. Animals may then receive a mild electrical shock that can cause a behavioral response. At low

[92] Commission stray voltage information can be found on its web site at http://psc.wi.gov/utilityinfo/electric/strayvoltage.htm.

voltages, an animal may flinch with no other noticeable effect. At higher levels, avoidance or other negative behaviors may result. Stray voltage may not be noticeable to humans.

Low levels of alternating current (AC) voltage on the grounded conductors of a farm wiring system are a normal and an unavoidable consequence of operating electrical farm equipment. Some levels of stray voltage will always be found on a farm. For example, a dairy cow may feel a small electric shock when it makes contact with an energized water trough. The issue of concern is stray voltage that occurs at a level that negatively affects an animal's behavior, health, and more specifically, milk production.

Stray voltage can be caused by a combination of on-farm and off-farm causes. One off-farm contributor to stray voltage is the operation of transmission lines in close proximity and parallel to a distribution line. As a means to minimize new transmission line impacts, new lines are often co-located near a distribution ROW or the distribution line is underbuilt on the new transmission poles. This configuration can contribute to stray voltage issues. To minimize the likelihood of stray voltage occurrences, utilities sometimes propose to relocate these paralleling distribution lines further away from the transmission line and/or burying the distribution line underground. Additionally, the PSC may require the utility to conduct pre-construction and post-construction testing of potentially impacted farms and lines.

5.5.15.2. Potential impact of stray voltage

Herd problems can be difficult to diagnose. There are many factors to consider such as the herd's environment, diet, and health. Dairy cow behaviors that may indicate the presence of stray voltage include nervousness at milking time, increased milking time, decreased milk production, increased defecation or urination during milking, hesitation in approaching waterers or feeders, or an eagerness to leave the barn. Some of these symptoms are interrelated. For example, a dairy cow that does not drink sufficient water due to shocks may have decreased milk production. However, these same symptoms can be caused by other factors that are unrelated to stray voltage such as increased mastitis or milk-withholding problems for farms with milking parlors or in barns with milk pipelines. If stray voltage is suspected to be the cause of herd problems, the farm should be tested.

In 1996, the PSCW established a stray voltage "level of concern" of two milliamps (PSC docket 5-EI-115).[93] This level of concern is not intended as a "damage" level, but a very conservative level, below the injury level, below the point where moderate avoidance behavior is likely to occur, and well below where a cow's behavior or milk production would be affected. DATCP and PSC consider that at this level of current, some form of mitigative action should be taken on the farmer's behalf.

The level of concern is further defined with respect to how it should be reduced. If a utility distribution system contributes one milliamp or more to stray voltage on a farm, the utility must take corrective action to reduce its contribution to below the one milliamp level. If the farm electrical system contributes more than one milliamp, the farmer may want to consider taking corrective measures to reduce the level below one milliamp

5.5.15.3. Mitigation of stray voltage

When stray voltage is a concern, electrical measurements in confined livestock areas should be done using established PSCW-approved testing procedures with the appropriate equipment. These testing protocols

[93] The level of concern was established at 2 milliamps, AC rms (root mean squared), steady state or 1 volt AC rms steady state across a 500 ohm resistor in the cow contact area. Steady state is defined by the Institute of Electrical and Electronics Engineers as the value of current or voltage after all transients have decayed to negligible value.

have been developed to collect a reasonable set of data useful in the analysis of the quantity and quality of stray voltage that may be present under a variety of conditions, and the source (including on-farm versus off-farm sources) of the stray voltage.

Field research shows that cow contact current is often dependent on both on- and off-farm electrical power systems. A common on-farm source of stray voltage is the inappropriate interconnection of equipment grounding conductors with the neutral conductors of the farm wiring system. Mitigation of stray voltage can be achieved through a variety of proven and acceptable methods, such as additional grounding or the installation of an equipotential plane.

Farm operators may receive technical assistance from the Wisconsin Rural Electric Power Services (REPS) program (as defined and authorized by Wis. Stat. §§ 93.41 and 196.857). The REPS program is jointly managed by PSC and DATCP.[94] DATCP provides an ombudsman, veterinarian, an energy technical advisor, and a program assistant to the REPS program. REPS staff provides information about stray voltage and power quality issues; work to answer regulatory questions; conduct on-farm and distribution system investigations that can assist farmers in working with the utility or electrician to resolve a power quality concern; provide a format for dispute resolution; and continue to research electrical issues. REPS staff also works with farmers, their veterinarians, and nutritionists to resolve herd health and production problems.

5.5.16. Water resources

5.5.16.1. Potential impacts to rivers, lakes, and streams

Waterways in the form of creeks, streams, rivers, and lakes are abundant throughout Wisconsin. Many of the rivers have been designated as special resources that have state, regional, or national significance. Construction and operation of transmission lines across these resources may have both short-term and long-term effects. The type and significance of the impact is dependent on the characteristics of the water resource and the transmission line design. Waterway use, physical features such as channel width, herbaceous plant cover, and water quality, recreational use, and the scenic quality of the river and its surrounding landscape are important factors in assessing potential impacts.

Water quality can be impacted not only by work within a waterway but also by nearby vegetation clearing and construction activities. The removal of adjacent vegetation can cause river water temperatures to rise and negatively affect aquatic habitats, especially cold-water systems. It can also increase erosion of adjacent soils causing sediment to be deposited into the waterway, especially during rain events. Construction often requires the building of temporary bridges that, if improperly installed, may damage banks and cause erosion or be overtopped or dislodged, and back up water. Overhead transmission lines across major rivers and streams may have a visual impact for river users and pose a potential collision hazard for waterfowl and other large birds, especially when located in a migratory corridor. Recreational use such as sight-seeing, boating, fishing, or bird watching could be adversely affected.

5.5.16.2. Areas of special natural resource interest

Certain waters of the state possess significant scientific value and are identified by DNR as ASNRIs for their protection (Wis. Admin. Code § NR 1.05). ASNRI-identified waters include:

[94] DATCP REPS and stray voltage information can be found on its website under the Wisconsin Farm Center page, http://datcp.wi.gov/Farms/Wisconsin_Farm_Center/Farm_Rewiring/Stray_Voltage/index.aspx

- State natural areas (Wis. Stat. §§ 23.27 through 23.29);
- Trout streams (Wis. Admin. Code § NR 1.02(7));
- Outstanding resource waters (ORW) or exceptional resource waters (ERW) (Wis. Stat. § 281.15);
- Waters or portions of waters inhabited by an endangered, threatened, special concern species or unique ecological communities identified in the NHI;
- Wild rice waters as identified by DNR and the Great Lakes Indian Fish and Wildlife Commission;
- Waters in areas identified as special area management plan or special wetland inventory study (Wis. Admin. Code § NR 103.04);
- Waters in ecological significant coastal wetlands along lakes Michigan and Superior as identified in the coastal Wetlands of Wisconsin;
- Federal or state waters designated as wild or scenic rivers (Wis. Stat. §§ 30.26 and 30.27).

There are approximately 10,000 miles of trout streams in Wisconsin categorized as Class 1, 2, or 3. High-quality trout streams (Class 1) have sufficient natural reproduction to sustain populations of wild trout, at or near carrying capacity. These streams are often small and may contain small or slow-growing trout, especially in the headwaters. Approximately 40 percent of the trout streams are Class 1 trout streams. Class 2 trout streams may have some natural reproduction but not enough to utilize available food and space, and stocking is required to maintain a desirable sport fishery. However, these streams have good survival and carryover of adult trout, often producing some fish larger than average size. Class 2 trout streams comprise about 45 percent of Wisconsin's total trout stream mileage. Class 3 waters are marginal trout habitat with no natural reproduction occurring. They require annual stocking of trout to provide trout fishing. Generally, there is no carryover of trout from one year to the next. Class 3 trout streams comprise 15 percent of Wisconsin's total trout stream mileage. Degradation of trout habitat is caused by siltation from erosion, decreased groundwater flow from irrigation, drained wetlands, and poor watershed management. High oxygen demand from organic pollution, channelization, cattle grazing, and increased temperatures from both man-made (*i.e.* stormwater discharges) and natural sources are other common causes of trout habitat deterioration. State laws protect trout streams from pollution and other harmful effects.

ORWs and ERWs are characterized as being valuable or unique for various features including fisheries, hydrology, geology, and recreation. Regulations require that these shall not be lowered in quality without good justification. By assigning these classifications to specific streams, high quality waters receive additional protection from point source pollution. Of the some 42,000 stream/river miles in the state, over 3,000 stream miles or approximately 8 percent have been designated as ORW and more than 4,500 stream miles or approximately 11 percent have been designated as ERW. Of Wisconsin's 15,000 lakes and impoundments, 103 are designated as ORW.

5.5.16.3. Mitigation of impacts to surface waters

Techniques for minimizing adverse effects of constructing transmission lines in river and stream environments, especially in the vicinity of ASNRI-designated waterways include avoiding impacts, minimizing impacts, and/or effective remediation of the impacts. Impacts to waterways can be avoided by rerouting the line away from the waterway, adjusting pole placements to span the resource overhead, constructing the line under the resource, or constructing temporary bridge structures across the resource. Methods to minimize impacts include avoiding pole placements adjacent to the resource, using DNR-approved erosion control methods, using alternative construction methods such as a helicopter

construction, landscaping to screen the poles from the view of river users, and maintaining shaded stream cover. After construction, some impacts can be remediated.

There are several methods and cable types for constructing a transmission line under a resource. While potentially feasible for the construction of lower-voltage and distribution lines, at higher voltages, there are substantial engineering, cost, and operational hurdles that would need to be overcome to be a feasible alternative to overhead construction.

The use of properly designed TCSBs avoids the necessity of driving construction equipment through streams. See the example in Figure Vol. 2-41. Temporary bridges consist of timber mats that can allow heavy construction traffic to cross streams, creeks, and other drainage features without damaging the banks or increasing the potential for soil erosion. Temporary bridges should be located to avoid unique or sensitive portions of these waterways, *i.e.*, riffles, pools, spawning beds, etc. They span from top-of-bank to top-of-bank and may include a support structure under the bridge, placed on the bed of the waterway, to support heavy vehicle use.

Proper DNR-approved erosion control is necessary for all construction activities, especially those that may affect water resources. DNR BMPs should be employed before, during, and immediately after construction of the project to reduce the risk of excess siltation into streams. Erosion controls must be regularly inspected and maintained throughout the construction phase of a project until exposed soil has been adequately stabilized.

Woodlands and shrub/scrub areas along streams are a valuable buffer between adjacent land uses such as farm fields and corridors of natural habitats. The vegetation maintains soil moisture levels in stream banks, helps stabilize the banks, filters nutrient-laden sediments and other runoff, maintains cooler water temperatures, and encourages a diversity of vegetation and wildlife habitats. The removal of vegetative buffers from ASNRI-designated shoreland zones will raise the water temperature. Cool water temperatures are necessary for good trout stream habitat. Existing vegetative buffers should be left undisturbed or minimally disturbed, whenever possible. For areas where construction impacts cannot be avoided, low-growing native tree and shrub buffers along these streams should be allowed to regrow and/or should be replanted so as to maintain the pre-construction water quality in the streams.

5.5.16.4. Permitting for river and stream crossings

DNR is responsible for regulating public waterways, including stream crossings. For certain protected areas, USACE and/or USFWS might require additional permits and approvals. The discussion below outlines these legal protections and the permitting requirements for activities affecting streams.

- Wisconsin Stat. § 30.29 prohibits motor vehicle crossings of navigable waters (below the ordinary high water mark) but allows DNR to issue permits for special purposes.
- Wisconsin Stat. § 30.025 describes the process for permitting utility projects with respect to wetlands, navigable waterways and stormwater management.
- Wisconsin Stat. § 30.12 requires permits for structures placed on the bed of navigable waterways.
- Wisconsin Stat. § 30.123 requires permits for bridges or culverts in, on, or over navigable waters.
- 33 USC § 403 Section 10 of the Rivers and Harbors Act of 1899 prohibits the unauthorized obstruction or alteration of any navigable waters of the U.S.

- 16 USC §§ 1271-1287 prohibit federal agencies from authorizing a water resources project that would have a direct and adverse effect on the values for which a river protected by the Wild and Scenic Rivers Act was established.

CPCNs granted by the Commission are often contingent upon the applicant's ability to secure all necessary permits from state and federal agencies. Likewise, any permit granted by DNR or USACE could be contingent on the implementation of all mitigation procedures ordered by the Commission in its CPCN authorization.

5.5.16.5. Potential impacts to groundwater

Except for the possibility of spills of lubricants or fuel from construction equipment, impacts to groundwater are not a primary consideration in transmission line construction. Exceptions are the impedance of groundwater discharge due to poor soil management during construction and potential contaminants reaching groundwater in vulnerable areas, such as those with karst geology. Karst geology is characterized by fractures in the bedrock that allow for rapid movement or direct flow of water into groundwater aquifers. It occurs in areas of Wisconsin where the bedrock is soluble in water. Eastern Wisconsin along the Niagara Escarpment contains significant karst geology. Deep foundations and excavations could cause negative impacts on nearby private wells because of rapid flow through bedrock cracks. Understanding the landscape's aquifers and water flow regimes is critical when constructing deep foundations.

In the North Appleton-Morgan project area, karst geology is a concern that has been expressed by the East Central Wisconsin Regional Planning Commission (ECWRPC). The ECWRPC has identified the karst geology in Outagamie County as a feature requiring special care during construction to avoid increasing possibilities of local well contamination from rapid movement of contaminants. Such contaminants could include agricultural chemicals, as well as solvents or fuels.

5.5.17. Wetland resources

5.5.17.1. Types and functions of wetlands

There are many different types of wetlands. Some wetland meadows and marshes consist primarily of grasses, sedges, reeds, and cattails. Some wetlands may contain permanent areas of open water or are wet for only a portion of the year. Shrub-carr wetlands support a mixture of grasses and sedges interspersed with shrubs, such as willows, alders, or dogwood, and may or may not have any open water. Wooded wetlands consisting of conifers or deciduous hardwoods represent another type of wetland common in Wisconsin. Tamarack, cedar, and black spruce swamps and bogs occur in many isolated low-lying areas in northern Wisconsin. These swamps are particularly sensitive to disturbance because conditions do not support rapid growth or recruitment. Forested wetlands of deciduous hardwoods, such as black ash (*Fraxinus nigra*), black willow (*Salix negra*), elm *(Ulmus spp.),* silver maple (*Acer saccharinum*), and red maple (*Acer rubrum*), tend to occur along creeks, rivers, and streams throughout southern Wisconsin, and are also highly sensitive to disturbance because they take significant time to grow and mature. Calcareous fens are one of the rarest wetland plant communities in Wisconsin and often have a disproportionate number of rare, threatened, and endangered plant species.

Certain wetlands are considered sensitive if they are within the boundary of an ASNRI waterway or have a direct hydrologic connection to an ASNRI waterway (Wis. Admin. Code § NR 103.04). Sensitive wetlands include wetlands that are part of:

- Cold water communities including all trout streams and their tributaries and trout lakes;
- Lakes Michigan and Superior and the Mississippi River;
- State- and federally-designated wild and scenic rivers, designated state riverways, and state designated scenic urban waterways;
- Environmentally sensitive areas or environmental corridors identified in an area-wide water quality management plan, special area management plan, special wetland inventory study, or an advanced delineation and identification study;
- Calcareous fens;
- Habitats used by state- or federally-designated threatened or endangered species;
- State parks, forests, trails, and recreation areas;
- State and federal fish and wildlife refuges and fish and wildlife management areas;
- State- and federal-designated wilderness areas;
- State natural areas;
- Wild rice waters;
- ORWs and ERWs.

Wetlands provide vital functions that benefit society. Wetlands detain stormwater runoff, enabling the slow recharge of groundwater resources and lowering downstream peak flood levels. Wetlands filter sediments and pollutants from the air, precipitation, and upstream sources which results in higher water quality downstream. Wetlands provide food, cover, and nesting habitat for many species of fish and wildlife. It is estimated that between one-quarter and one-third of all rare species in Wisconsin are found in wetlands. Wisconsin has lost almost 50 percent of its original 10 million acres of wetlands. Avoidance and minimization of impacts to wetlands followed by proper mitigation is necessary to preserve the remaining 5.3 million acres of Wisconsin wetlands.

5.5.17.2. Potential impacts to wetlands

5.5.17.2.1. Long-term versus short-term impacts

The degree and nature of impacts to wetlands depend on the type of wetland, weather conditions at the time of construction, soil type, and the type of construction activities. Short-term wetland impacts can become long-term impacts if the construction phase is not well managed or mitigation techniques are not properly applied. Examples of long-term impacts include the loss of wetland acres due to the placement of transmission structures in wetlands, the unintended spread of invasive species due to inadequate cleaning of construction equipment, the conversion of forested wetland complexes to sedge meadow complexes, and the fragmentation of wetland types.

Certain wetland types are more susceptible to long-term impacts due to transmission line construction. They can have a more fragile habitat (such as a calcareous fen) that is difficult to re-create, or the requirements of the ROW prevent full mitigation efforts. Forested wetlands are an example of a type of wetland that can never fully recover from the construction process. Line construction and future maintenance operations require that transmission ROWs be maintained free of trees. Following construction of the line, the forested wetlands will be remediated as wet meadows with full sun. This permanently changes the vegetation and species diversity of the wetland in the ROW.

More in-kind recovery is probable for deciduous shrub-scrub wetlands (supporting willows, alders, and sedges) and wet meadows.[95] In a 10-year study of three wetland types following construction of a transmission line in Massachusetts, species diversity and richness were similar to pre-construction levels within one year in a cattail marsh but damage was still apparent after ten years in a bog dominated by leatherleaf shrubs and sphagnum moss.[96]

Other wetland types, such as wet meadows and farmed wetlands, can also be impacted by the construction of transmission lines. Impacts such as soil compaction, rutting, and destruction of vegetation can all occur. Though these impacts are less obvious than tree clearing, they can greatly affect wetland function and should be minimized as much as possible. If proper restoration does not occur, these short-term impacts can easily turn into long-term impacts and permanently degrade wet meadows or farmed wetlands.

5.5.17.2.2. Impacts to function and wetland habitats

Construction and maintenance of transmission lines can damage the ability of wetlands to function as they should. Heavy machinery used for clearing trees and brush, drilling holes, hauling cement, and setting poles can crush wetland vegetation and compact wetland soils. Soil compaction reduces the water-holding capacity of the soil and may result in increased runoff. Wetland soils consist of primarily organic matter (decomposed plant material) which forms very slowly. If disturbed by digging, filling, and compaction, these soils do not readily recover and are not easily repaired. Proper segregation of topsoil and subsoil is essential to minimizing long-term impacts and allowing natural vegetation and hydrologic conditions to recover.

Changes in hydrology (the vertical and horizontal movement of water through the soil) caused by trenching, drilling holes, de-watering soils, installing foundations, and compacting soils can alter the vegetation, reduce plant diversity, and promote the growth of invasive species. Driving equipment in wetlands can stir up sediments, endangering amphibians and other aquatic life. In large wetland areas where access is limited, soil compaction and hydrologic function can be further affected if fill is deposited in the wetland for the construction of roads or bridges.

In wetlands with large areas of open water, such as shallow marshes, or that have floating mats of vegetation, construction equipment access can be very difficult. Movement of construction vehicles within the wetland can result in significant rutting. Rutting and compaction of soils can permanently alter the wetland's soil structure and hydrologic function.

Large open water areas or wetlands with extensive organic matter emit methane, and may not fully freeze during winter months (a result of thermal loading). Construction during winter months in these environments can be dangerous and cause significant damage to the resource and the equipment. Ice and snow that may be used to construct roads may thaw from underneath, leading to equipment getting stuck, delays in construction sequencing, and the need to relocate access roads.

A secondary effect of disturbance is the opportunistic spread of invasive weedy species such as reed canary grass (*Phalaris arundinacea*). These invasive species provide little food and habitat for wildlife.

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[95] Grigal, D. F.1985. Impact of Right-of-Way Construction on Vegetation in the Red Lake Peatland, Northern Minnesota. Journal of Environmental Management. 9(5):pp. 449-454.

[96] Nickerson, N. H., R.A. Dobberteen, and N.M. Jarman, 1989. Effects of Power-Line Construction on Wetland Vegetation in Massachusetts, USA. Journal of Environmental Management. 13(4): pp. 477-483.

5.5.17.3. Mitigation of impacts to wetlands

Techniques for minimizing adverse effects on wetlands especially in ASNRI-designated wetlands include avoiding impacts, minimizing impacts, and/or effective remediation of the impacts. After construction, some impacts can be remediated.

Impacts to wetlands can be avoided, for example, by:

- Routing the transmission line away from wetlands or the edges of wetlands;
- Adjusting pole placements to span wetlands or limit equipment access in wetlands, wherever possible;
- Using DNR-approved erosion control methods on adjacent lands.

Construction methods that can reduce impacts to wetlands include:

- Conducting construction activities when wetland soils and water are frozen or stable and vegetation is dormant;
- Using construction matting and wide-track vehicles to spread the distribution of equipment weight when crossing wetlands during the growing season or when wetlands are not frozen.
- Using alternative construction methods and equipment such as helicopters, marsh buggies, and vibratory caisson foundations (see Section 5.4.4);
- Careful cleaning of construction equipment and mats after working in areas infested by invasive species;
- Using vibratory caisson foundations that eliminate the need for concrete or other fill.

Matting (see Figure Vol. 2-42) can provide a safe, stable work surface and travel lane for cranes, cement trucks, and other equipment needed during transmission line construction. Mats provide protection by spreading the weight of the equipment over a broader area to reduce compaction and prevent deep ruts from forming. While the mats may cause some depression of the underlying soils and crushing of the perennial vegetation, this impact is less than if matting is not used. Matting generally preserves native plant rootstocks so that the pre-construction vegetation can reestablish more quickly after construction is completed. Figure Vol. 2-43 shows a wide track vehicle placing mats in a wooded wetland. Tracked vehicles and high flotation tires can be used in some instances in lieu of mats.

Alternative construction equipment such as marsh buggies and helicopters and alternative foundations can be used to further reduce the impact of construction in wetlands. Helicopters have been successfully used for the construction of the foundations, the erection of the towers, and for wire stringing. See Figures Vol. 2-28, 2-32, and 2-34.

Ice roads can provide some of the same benefits as matting when used in wetlands. Ice roads are intended to create a stable surface for driving heavy equipment. They are usually created by clearing the initial layer of snow. This allows for frost to accumulate deep into the soil. A track vehicle (bombardier, bulldozer, etc.) is repeatedly driven across the ROW to drive the frost deeper into the soil. Sometimes the ROW can be flooded with water to provide an additional ice layer to the surface. Snow that falls on an ice road is usually cleared. However, compressing snow on top of the road can serve as insulation to keep the frost in the soil.

For construction projects which include the replacement of existing transmission structures in wetlands, structure types, construction timing, construction methods, and the wetland types are reviewed to determine the least impact to the resource. While the holes left in wetland soils normally close as the existing transmission pole is removed, it is sometimes more appropriate to cut the pole off at, or just below the ground surface. The utility would need permission from the landowner before leaving a pole stub in the ground.

If a steel structure on a concrete foundation needs to be removed from a wetland, the concrete would be removed to a depth of about two feet and wetland soils from adjacent new foundation locations would be used to backfill the old foundation holes. The wetland soils would then be graded to approximate the original wetland contours.

Although there are activities that can mitigate some of the impacts associated with the construction of a transmission line in wetland areas, some impacts, such as removing tree cover from forested wetlands and constructing structures in wetlands, are unavoidable and require state and federal wetland compensatory mitigation. Compensatory mitigation involves the restoration, enhancement, creation or preservation of wetlands to compensate for unavoidable adverse impacts to other wetlands.

The applicant proposes a suite of mitigation options to compensate for these unavoidable wetland impacts. These proposed compensation requirements include purchasing credits from an existing wetland mitigation bank, or if available, the Wisconsin In-Lieu Fee for wetland compensatory mitigation (currently under development by DNR and USACE). The applicant also proposes, if the prior options are not available, the identification of a potential site or sites for permittee-responsible mitigation.

5.5.17.4. Permitting process for wetlands

Local, state, and federal laws regulate certain activities in wetlands. When fill material is proposed to be placed in a wetland, a permit is routinely required from the USACE under the CWA, Section 404. DNR must determine if the proposed activity is in compliance with applicable state water quality standards (Wis. Admin. Code ch. NR 103 and 299). If the proposal is found to be in compliance with state standards, DNR issues a wetland permit and a water quality certification to the applicant. If the project would result in impacts to wetlands associated with waters of the state, then DNR may have primary authority under Wis. Stat. ch. 30.

The general process for obtaining a permit is:

- The applicant submits a permit application to USACE and DNR.
- USACE reviews the project according to federal guidelines and determines its jurisdiction including consideration of potential impacts on endangered species, cultural resources, and tribal trust concerns.
- USACE determines if the project is exempt from the CWA, or issues a permit decision contingent on DNR providing water quality certification.
- DNR reviews the project for compliance with state water quality standards. The project-specific review may require field work to assess wetland function and values (including surveys for threatened and endangered species, hydrologic conditions, invasive species, etc.) in order to avoid and/or minimize potential impacts from the proposed project. This review can also include the requirement of compensatory mitigation, as mentioned in the previous section.

Both the federal and state processes allow for legal challenge of decisions.

In addition to the protections for water resources provided by law that are described above, the Commission has the authority, in its final order, to require avoidance of specific streams or wetlands, mitigation procedures for specific streams or wetlands, and independent monitoring of construction in all or specific streams and wetlands.

5.5.17.5. Wetlands Reserve Program lands

Some properties in Wisconsin are enrolled in the Wetlands Reserve Program (WRP), a voluntary program overseen by the Natural Resource Conservation Service (NRCS) of USDA. Farmers are provided the opportunity to retire marginal agricultural lands, and reap the economic and social benefits of having wetlands on their property. The program offers a landowner payment for restoring, protecting, or enhancing wetlands on the property in consultation with NRCS, USFWS, DNR, and local conservation districts.

The law allows the purchase of permanent easements, 30-year easements, or 10-year cost-share agreements (without an easement). The landowner maintains ownership of the land and is responsible for taxes on easement lands. Public access is not allowed unless desired by the landowner. Eligibility for enrollment into the program is granted according to: 1) duration of the easement offer; 2) hydrology restoration potential; 3) habitat value for migratory birds and other wildlife; 4) wetland functions and values; 5) location significance; 6) wetland management requirements; 7) physical site condition; and 8) overall cost. Applications with the most environmental benefits and least cost are selected.

After WRP easements are established, use of the land is limited to those uses that would not diminish or degrade the wetland values. WRP easements have significant restrictions. Acceptable uses may include hunting, fishing, timber harvesting, haying, or grazing, depending upon the situation. Cropping or other alterations that would harm the wetlands are not allowed.

WRP easements or cost-share agreements do not necessarily prohibit the construction of a transmission line across a wetland. A biologist or the central NRCS office in Washington would likely decide if a proposed line or access road were a "compatible" land use. Landowners can make "compatible use" requests throughout the life of the easement or agreement.

5.5.18. Woodlands

5.5.18.1. Potential impacts to woodlands

Wisconsin forests provide recreational opportunities, wildlife and plant habitats, and timber. Building a transmission line through woodlands requires that all trees and brush be cleared from the ROW. One mile of 100-foot ROW through a forest results in the loss of approximately 12 acres of trees. Transmission construction impacts can include forest fragmentation and the loss and degradation of wooded habitat, a reduction of aesthetic enjoyment of the resource, and/or the loss of income.

Different machines and techniques are used to remove trees from the transmission ROW depending on whether the woodlands consist of mature trees, have large quantities of understory trees, or are in sensitive environments such as a wooded wetland. These can range from large whole tree processors which can cause rutting and compaction of the forest floor to hand clearing with chainsaws in more sensitive environments. These activities are illustrated in Figures Vol. 2-13C and 2-14.

Wisconsin statutes (Wis. Stat. § 182.017(7)(e)) require that all timber removed for construction of a high-voltage transmission line remains the property of the landowner. Thus, the landowner should discuss with the ROW agent at the time of easement negotiations (see Section 5.3) the disposition of all timber to

be cut. Larger timber might be stacked on the edge of the ROW for the owner. Smaller diameter limbs and branches are often chipped or burned. According to the landowner's wishes, wood chips may be spread on the ROW, piled to allow transport by the landowner to specific locations, or chipped directly into a truck and hauled off the ROW. See Figures Vol. 2-15 and 2-16.

5.5.18.2. Forest fragmentation

Forest fragmentation occurs when large unbroken areas of natural forest are cut into increasingly smaller woodlands. Corridors are cleared for infrastructure such as highways, pipelines, and power lines. Wooded parcels are increasingly cut into smaller pieces and converted to agricultural, urban, and commercial uses. Forest fragmentation results in the increase of linear edge relative to the area of internal forest. As fragmentation continues, a forest will suffer a permanent reduction in its vegetative and wildlife diversity and its ability to function as an ecological unit.

Fragmentation makes interior forest species more vulnerable to predators, parasites, competition from edge species, and catastrophic events. It also causes a permanent reduction in species diversity and suitable habitat for some species which require large undisturbed blocks of interior forest habitat for necessary activities such as nesting or breeding. Because large blocks of undisturbed forest are relatively rare, many of these species are also rare. Further loss of interior habitat and creation of increasingly smaller patches of suitable habitat can greatly affect the long-term survival of some species. For example, in Wisconsin, the pileated woodpecker (*Dryocopus pileatus*) will not breed in woodlands smaller than 250 acres and the cerulean warbler (*Setophaga cerulean*) has been shown to avoid forest blocks smaller than 340 acres.[97] [98] Species that require forest interior for long-term survival include fishers (*Martes pennanti*), pine martens (*Martes americana*), timber wolves (*Canis lupus*), red-shouldered hawks (*Buteo lineatus*), many passerine birds, such as warblers and flycatchers, and a number of woodland plants.

New clearings alter the vegetation and animal life both within the ROW and up to several hundred feet outside of the ROW. Studies of transmission ROW in forested habitat show a decrease in the density of interior forest species with increasing proximity to the ROW, while the density of edge species increased along the forest-edge interface.[99] Increased sunlight and wind penetrate the forest edge and create conditions that favor plant species more tolerant of light and drier conditions. Many of the plants and the animals that prefer edge habitat are very common species that can readily out-compete native plants and animals because of their opportunistic behaviors and greater tolerance to a wide range of environmental conditions. In bird populations, the increase in forest edge has been correlated with increases in nest predators such as blue jays (*Cyanocitta cristata*), raccoons (*Procyon lotor*) , and skunks (*Family Mephitidae*) and an increased nest parasitism from brown-headed cowbirds (*Molothrus ater*). Examples of species which proliferate in edge habitat include raccoons, skunks, cowbirds, blue jays, crows (*Corvus* spp.), white-tail deer (*Odocoileus virginianus*) , garlic mustard (*Alliaria petiolata*), buckthorn, and boxelder trees (*Acer negundo*).

Cleared corridors may also create a barrier to movement for some species. This eventually leads to a decrease in genetic variability, leaving the remaining species and populations more susceptible to disease and less able to respond to change.

5.5.18.3. Other types of woodland impacts

Other woodland impact examples are notable enough to mention here.

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97 Ambuel, B. and S. A. Temple. 1983. Area-Dependent Changes in the Bird Communities and Vegetation of Southern Wisconsin Forests. Ecology 64:1057-1068.
98 Robbins, C. S., and B. A. Dowell. 1989. Habitat Area Requirements of Breeding Forest Birds of the Middle Atlantic States. Wildlife. Monographs No. 103. 34 pp.
99 Kroodsma, R.L. 1982. Edge Effect on Breeding Forest Birds along a Power-line Corridor. Journal of Applied Ecology 19:361-370.

The activities associated with clearing trees and constructing a transmission line through or along the edge of forested areas can destroy and degrade forest habitat by introducing seeds and other propagating parts of non-native plants that are carried into a forest inadvertently by construction equipment. Disturbance caused by construction can then encourage aggressive growth of these invasive species. See Section 4.5.9. Habitat providing food and cover for local wildlife may be altered or lost if these invasive species out-compete existing native plants, resulting in a loss of plant and animal diversity.

In addition, trimming and clearing can promote diseases in specific trees. Several pests and diseases are worth noting here, including the fungi that cause oak wilt and annosum root rot and the emerald ash borer and gypsy moth:

- Red oak (*Quercus rubra*), black oak *(Quercus velutina)*, and northern pin oak (*Quercus ellipsoidalis*) are especially susceptible to oak wilt and will often die within one year of infection. The cause of the disease is a fungus that is carried by sap-feeding beetles or spread through common root systems. In the upper Midwest, pruning or removal of oaks should be avoided from late spring to midsummer, when the fungus most commonly produces spores.

  The entire project area for the North Appleton-Morgan docket is located within areas where oak wilt is known to occur. Oak trees are present and widely distributed along the route sections. Wisconsin Admin. Code § PSC 113.0511 describes timing restrictions for the cutting of oak trees for utility projects in various circumstances. To minimize the spread of oak wilt, ATC states in its CPCN application that cutting and pruning of oak trees would be avoided during the restricted times as required by the administrative code. Other recommended restricted times (*e.g.*, DNR or local restrictions) that fall outside of this window would also be followed if practicable.
- Annosum root rot occurs in red and white pine (*Pinus resinosa* and *P. strobus*) plantations. It is considered among the most important and destructive diseases affecting conifers in the north temperate regions of the world. The infection is caused by the fungus, *Heterobasidion irregular* and spreads easily both above ground and through root contact transmission. Its spores can be carried by the wind over many miles. Cut stumps offer a surface for the spores to land and grow. Symptoms typically appear in nearby trees two to three years after the stumps are infected. The best method of control is prevention by treating stumps of cut pines with recommended fungicides on the day the tree is cut. Recent research indicates that higher numbers of viable spores are in the air in spring and fall.
- The emerald ash borer (EAB) is an insect (*Agrilus planipennis*) that has origins in Russia, China, Japan and Korea. It is not certain how it arrived in the United States, but the transport of wood or wood products on ships may have been a primary cause. In North America, so far, the borer has been found only in ash trees. The canopies of trees that are infested begin to thin above infested portions of the trunk and major branches because the borer destroys the water and nutrient conducting tissues under the bark. One third to one half of the branches can die within one year. Most of the tree's canopy can be dead within two years of when symptoms are first observed. The EAB spreads primarily through the transport of infested wood from infested areas to non-infested areas. EAB adults can fly at least 0.5 mile from the tree where they emerge. In Wisconsin, the USDA Animal and Plant Health Inspection Service and DATCP have implemented and administered "quarantined" areas of the state. These are areas that have been known to contain EAB, and rules have been established to prevent the transport of wood from quarantined areas to non-quarantined areas.
- The gypsy moth (*Lymantria dispar dispar*) is an invasive, leaf-eating insect that can feed on most types of trees and shrubs in North America. When their populations are high, gypsy moth caterpillars can strip an entire neighborhood or forest of leaves in May and June. The moth was

brought to North America in the 1800's and reached Wisconsin in the late 1980s. It is native to Europe, Asia, and North Africa. The caterpillars are very hardy and have been found feeding on over 300 species of trees and shrubs. They spread naturally and mainly when small, young larvae spin silken threads and hang from them, waiting for the wind to blow. The light larvae have long hairs that increase their surface area and allow them to be pulled from their threads and transported by the wind. As with the emerald ash borer, any type of cut wood that contains moth eggs can be a vector for transport. The entire project area for this docket is located within the gypsy moth quarantine area. Standard practices to avoid the spread of the gypsy moth damage include inspections and avoidance of movement of wood products (logs, posts, pulpwood, bark and bark products, firewood, slash and chipped wood from tree clearing) from quarantine areas to non-quarantine areas as per Wis. Admin. Code § ATCP 21.10.

5.5.18.4. Pulp and timber losses

The production of trees for pulp and timber use is an important industry, occurring mostly on land owned by corporations associated with the pulp and paper industry and also on privately held lands. Because transmission line ROWs must be kept clear of tall woody vegetation, the area within a ROW is permanently lost as a site for pulp and timber production.

5.5.18.5. Mitigation of impacts to woodlands

Impacts to woodlands can be minimized by a variety of methods. Example methods include:

- Avoiding routes that fragment major forest blocks.
- Adjusting pole placement and span length to minimize the need for tree removal and trimming along forest edges.
- Allowing tree and shrub species that reach a maximum height of 12 to 15 feet to grow within the ROW.
- Following DNR guidelines for preventing the spread of exotic invasive plant species and diseases such as oak wilt.

5.5.18.6. Managed forest program lands

The Managed Forest Law (MFL) program and the Forest Crop Law (FCL) program work to encourage sustainable forestry on private woodlands in exchange for reduced property taxes. The FCL program was enacted in 1927 and enrollment was closed in 1986. The MFL program was enacted in 1985 and is the only forest tax law program that is now open to enrollment. Both programs encourage healthy and productive management of forest properties through a written management plan which incorporates landowner objectives, timber management, wildlife management, water quality, and the environment as a whole.

When a transmission line is constructed through woodland, all trees within a ROW are removed. Eligibility for the MFL program requires that no more than 20 percent of the land be in a non-productive state (not growing trees). If the amount of productive woodland falls below 80 percent, the property might be dropped from the program when the contract expires, and the property owner may suffer a monetary loss. Participants in these forest programs along a transmission route would therefore be permanently affected by the line. Loss of MFL eligibility could also have a long-term adverse effect on recreation, since landowners that receive the largest property taxes deferrals must open their land for hunting, fishing, hiking, and cross-country skiing.

CHAPTER

6

6. Environmental Analysis: Proposed Substation Modifications

6.1. NORTH APPLETON SUBSTATION

6.1.1. Proposed substation modifications

ATC's plans for expansion to accommodate and rearrange the transmission terminals would result in expanding the fenced substation area by about 10 acres to the north of the existing substation footprint. See Figure 6.1-1 for a representation of the expanded substation. Two alternative layouts for the expansion are proposed in the application, differing mainly in the location of facilities on the property and the location and size of proposed stormwater facilities. Space requirements of the two expansion alternatives are very similar.

Either expansion would involve grading, extending the substation pad, and building a 24-foot high perimeter wall for security purposes that would surround both the new and existing substation portions. The wall would block views of the ground facilities, but the tall structures for lines entering the substation would be visible above it. Two views of the proposed new wall are shown in Figure 6.1-2.

There would also be a new 10-foot high fence around the microwave tower outside of the existing substation, a new access road, and a detention basin.

Figure 6.1-1 Proposed North Appleton Substation expansion alternatives

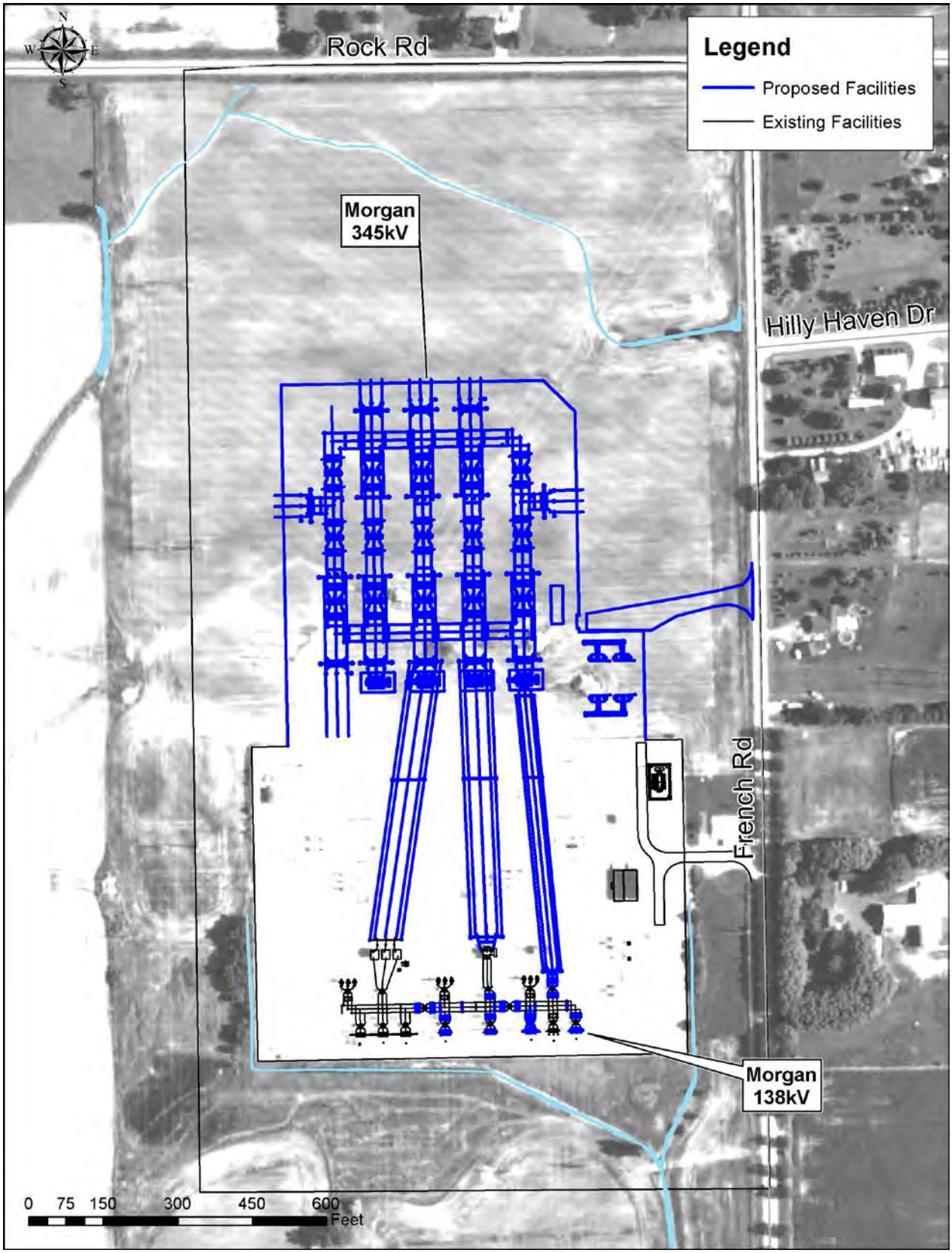
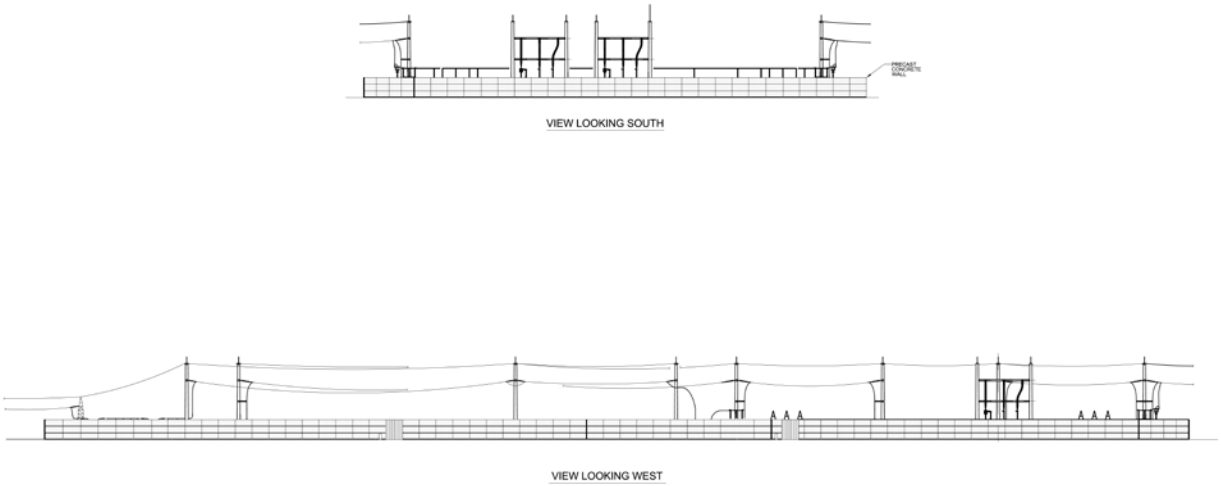


Figure 6.1-2 Two views of the proposed new wall around the North Appleton Substation



6.1.2. Proposed transmission modifications in the vicinity

Additions and removals would be made on several transmission lines that connect to the North Appleton Substation. These are described in some detail in Chapter 2, Section 2.2 of the EIS. All of the structure additions and removals would occur on ATC property in the vicinity of the substation.

6.1.3. Natural resources impacts

The parcel chosen for expansion of the North Appleton Substation is adjacent to and just north of the existing substation; it is relatively level agricultural crop land that was used for corn production in 2013. Expansion Alternative 1 impacts approximately 13.3 acres of crop land while Alternative 2 impacts approximately 13.1 acres.

The majority of the soils on the parcel are a combination of poorly-drained Pella series soils and well-drained soils in the Hortonville and related series, all of which are typically derived from glacial till plains. The northwestern corner of the parcel consists of a deep, somewhat poorly-drained soil type formed under similar glacial conditions.

Under Wis. Admin. Code ch. NR 216, permits from DNR are required for construction sites disturbing more than 1.0 acre. Wisconsin Admin. Code ch. NR 151 requires an erosion control plan including approved BMPs. The two proposed expansion alternatives for the substation have slightly different layouts, placements of facilities on the parcel, and they also have different storm water treatment facility requirements. Alternative 2 extends the substation footprint several feet closer to an unnamed waterway on the property. In general, stormwater treatment requirements for new developments are dependent on the acreage of land impacted, soil infiltration characteristics of the remaining undeveloped land, and proximity to any existing wetlands and waterways.

NHI data search results did not identify the potential presence of any rare species in the vicinity of the proposed substation expansion alternatives. It is unlikely that impacts to rare species would occur if either layout is constructed.

No impacts to forested areas would occur with construction of either layout of the substation expansion.

No wetlands are present within the existing or proposed new North Appleton Substation footprints; however, two waterways are present. One of the waterways, an unnamed tributary to Duck Creek, would require a TCSB during construction activities. More information is needed to confirm that no other regulated activities, such as grading on the bank, are required for the substation expansion. Even though direct impacts to the waterways might not occur, they may be adversely affected by the nearby construction. Proper erosion control during substation construction is essential to minimize impacts.

Pursuant to Wis. Stat. § 44.40, the footprint of the proposed substation expansion has been checked for the presence of previously inventoried cultural resources. Inventoried cultural resources include above-ground structures, archaeological sites, and cemetery/burial sites. No cultural resources were identified within or adjacent to the footprint of either substation expansion alternative. No impacts to cultural resources are expected from the construction of either layout.

6.1.4. Community resources impacts

The North Appleton Substation property is rented to farm operators for cropping. Cropping would be disturbed as the new substation expansion and transmission structures are installed. Over half of the land north of the existing substation would be covered by the expanded substation, so land available to rent for cropping would be reduced.

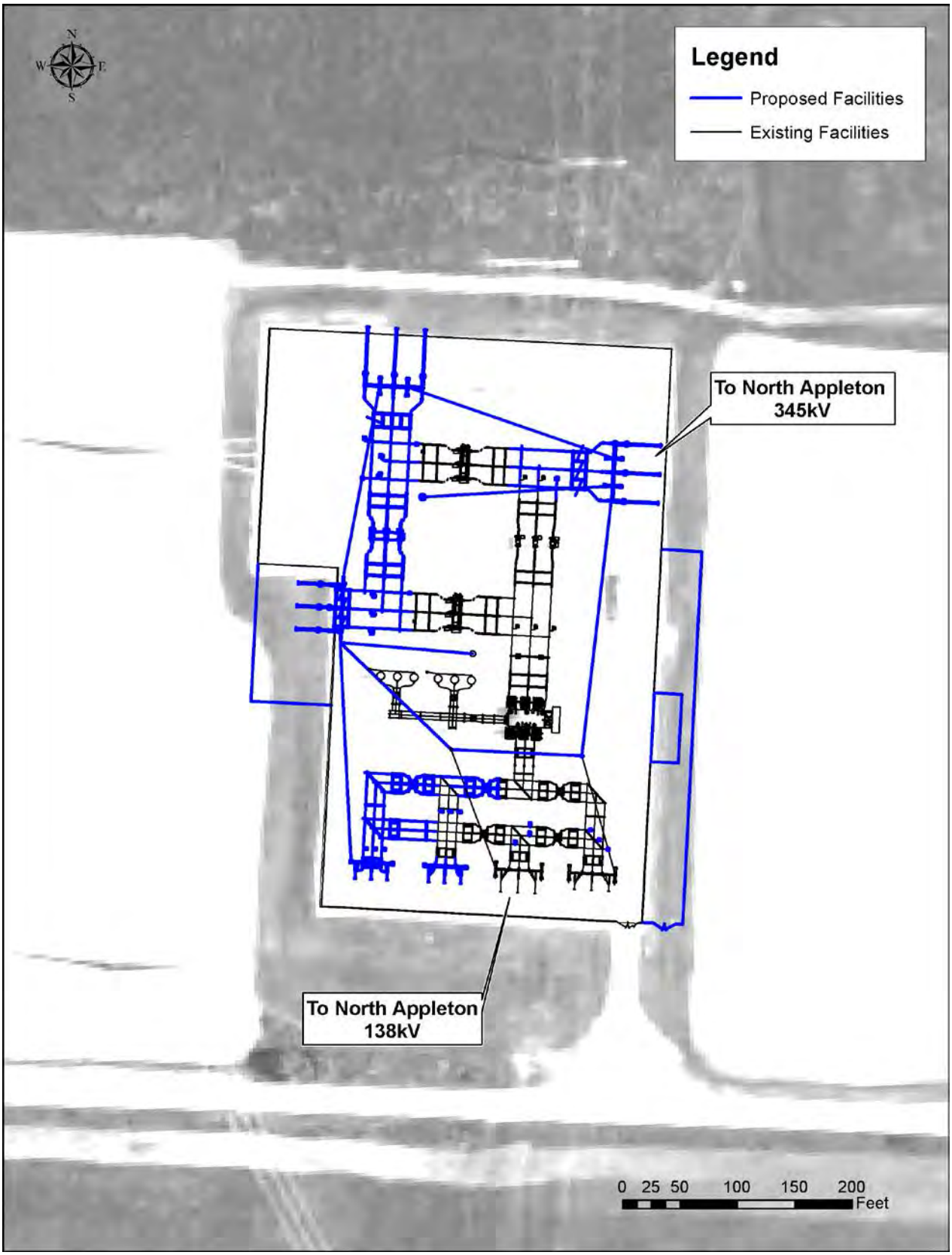
The substation expansion would result in visual impacts in the vicinity, both temporary and permanent. During construction, the property would likely look chaotic and highly disturbed and changing. Dust would need to be controlled and equipment noise would need to be muffled either on the engines or by distance to the nearby roads and homes. After construction ends, the new expansion, the 24-foot high wall, and the microwave tower fence would be new permanent features on the landscape.

6.2. MORGAN SUBSTATION

6.2.1. Proposed substation modifications

The construction work at the Morgan Substation would require an expansion of the substation footprint and resulting fence expansions of about 0.2 acres on the west side and about 0.26 acres on the east side of the existing substation. In addition, the existing access road would be widened. These changes are illustrated in Figure 6.2-1.

Figure 6.2-1 Proposed Morgan Substation modifications



6.2.2. Proposed transmission modifications in the vicinity

There would be additions and removals of structures for some of the existing transmission lines entering the substation. These are discussed in detail in Chapter 2, Section 2.2.2 in the EIS. All of the additions or removals would occur on ATC property.

6.2.3. Natural resources impacts

The land targeted for potential expansion of the existing Morgan Substation footprint is relatively flat agricultural crop land that was used for corn production in 2013. The fence surrounding the Morgan Substation would be expanded approximately 0.2 acres on the west side of the existing substation, as well as approximately 0.26 acres on the east side of the substation.

The majority of the soils on the parcel are deep, well-drained or moderately well-drained soils formed in loamy deposits on ground moraines, end moraines, and drumlins left by glaciers. No detention basins would be required for the Morgan Substation expansion.

NHI data search results did not identify the potential presence of any rare species in the vicinity of the substation expansion. It is unlikely that impacts to rare species would occur if the proposed layout is constructed.

There are no wetlands or waterways present in the proposed substation expansion area.

An investigation of previously inventoried cultural resources, which include above-ground structures, archaeological sites, and cemetery/burial sites within the footprint of the proposed project, identified one archaeological site potentially within or immediately adjacent to the proposed substation expansion area.

The identified site consisted of two artifacts that were collected from somewhere on the farm property that borders the substation to the south. A portion of the site was surveyed for a previous ATC transmission line project, but no evidence from the site was discovered. Regardless, NRHP eligibility of the site has not been evaluated; therefore, the cultural resource sensitivity of the site is unknown. If this project is approved by the Commission, an archaeological survey within the portion of the site that could overlap the substation expansion footprint would be needed to assess the potential effects to the site and ensure compliance with Wisconsin's historic preservation law.

6.2.4. Community resources impacts

There would be visual impacts in the vicinity of the substation, both temporary and permanent. During construction, the property would likely look chaotic and highly disturbed and changing. Dust would need to be controlled and equipment noise would need to be muffled either on the engines or by distance to the nearby roads and homes. After construction ends, the expansion and new transmission structures would be permanent changes to the visual landscape.

6.3. NEW BENSON LAKE SUBSTATION

6.3.1. Proposed substation construction

As discussed in Chapter 2, the installation of the SVC at the ATC Amberg Substation property would involve siting and constructing a new fenced-in area to house the SVC system. The exact area to be used would depend on the specifications of the SVC ordered if the project is approved; the fenced-in dimensions would likely be about 300 feet by 250 feet, or approximately 75,000 square feet (about 1.7 acres).

The Benson Lake Substation project would be separate from the existing Amberg Substation and would require tree clearing and grading.

ATC proposes two potential sites for the Benson Lake Substation, a North alternative and a South alternative on either side of a large delineated wetland on the property. The two sites and their main facilities can be seen in Figure 6.3-1 and 6.3-2.

Figure 6.3-1 Proposed Benson Lake Substation North alternative

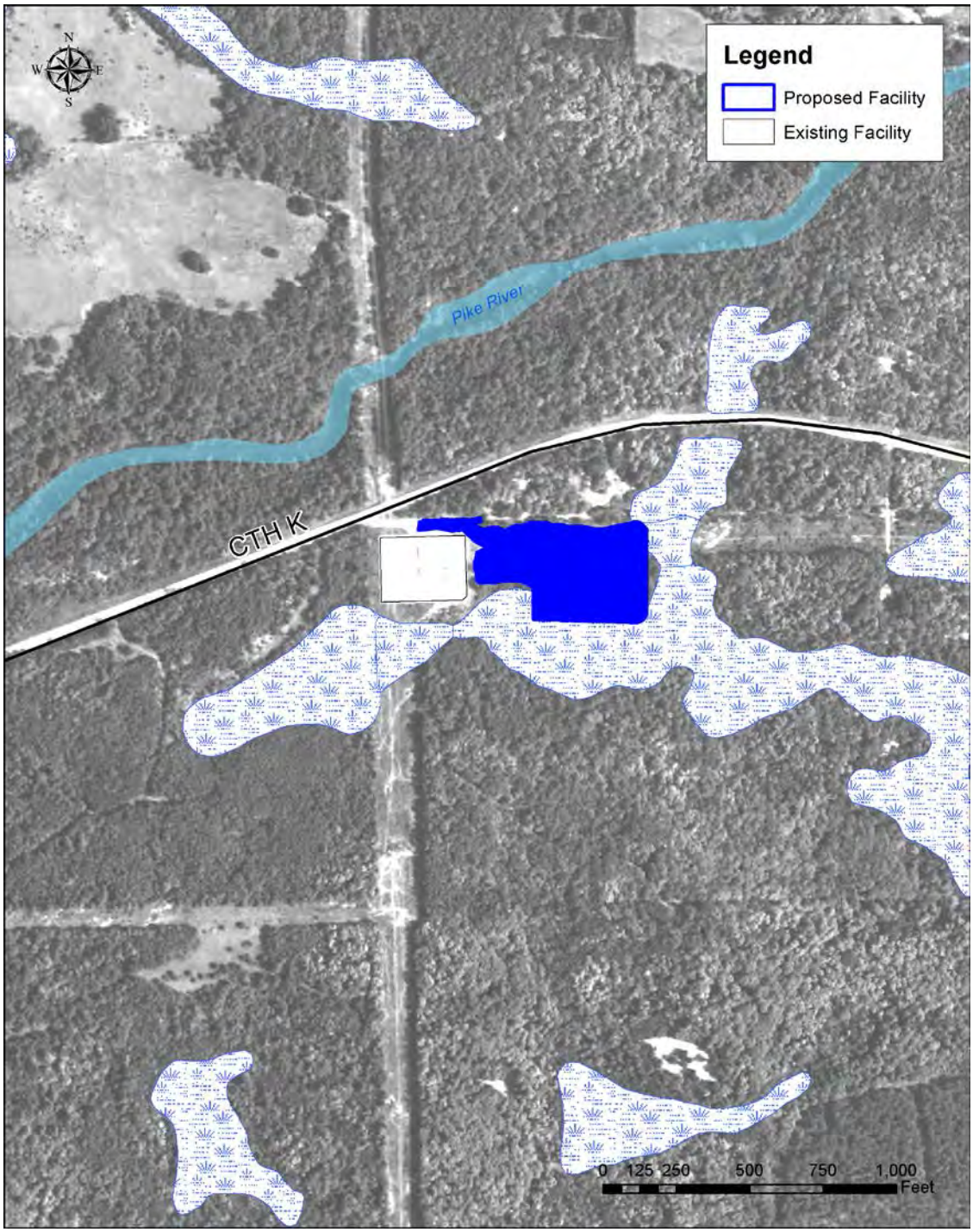
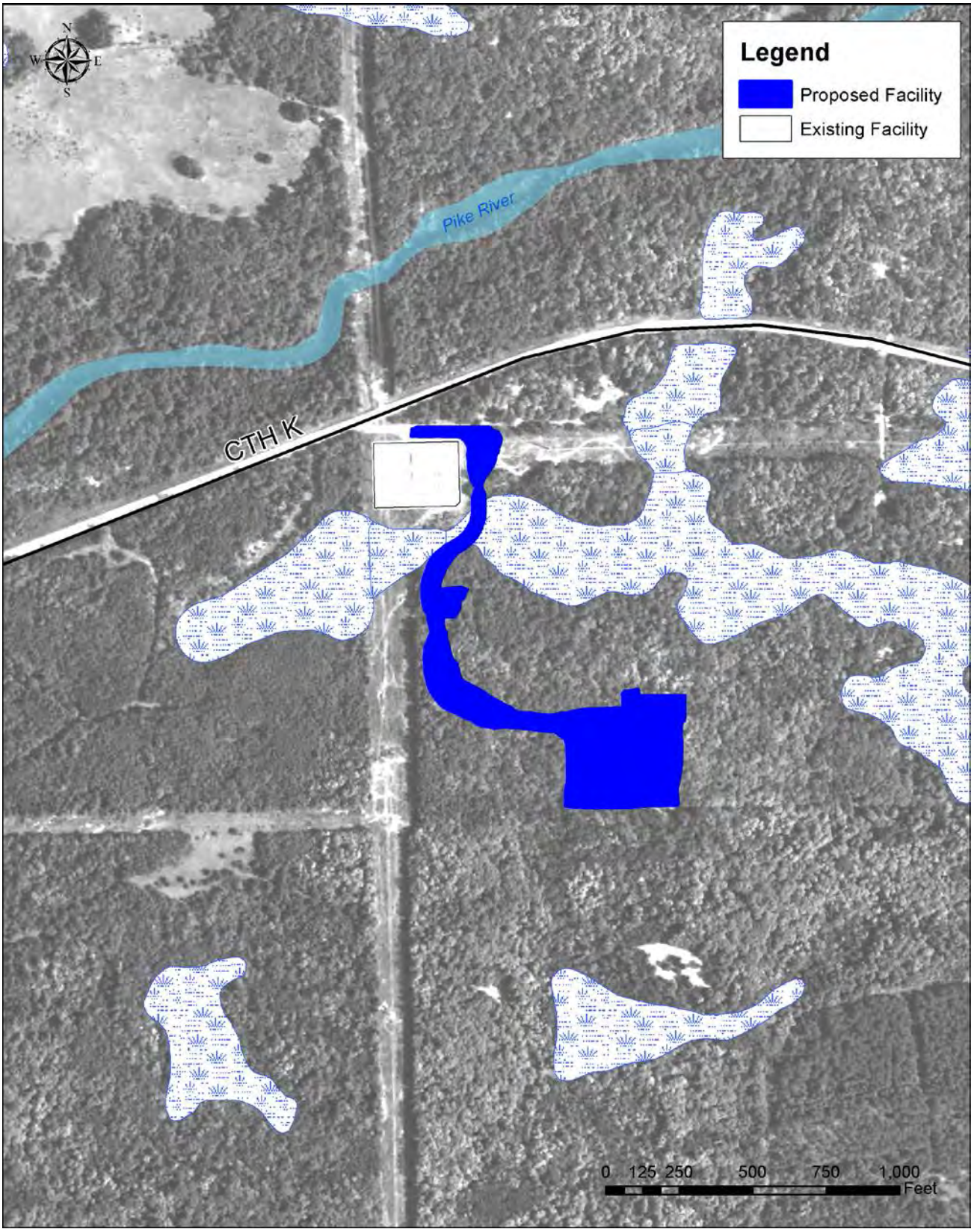


Figure 6.3-2 Proposed Benson Lake Substation South alternative



6.3.2. Proposed transmission modifications in the vicinity

As discussed in Chapter 2, Section 2.2.3, there would be a new Benson Lake-Amberg 138 kV line, and some additions to and removals from the existing Amberg-Holmes 138 kV line. These would all occur on ATC property and are discussed in more detail in Chapter 2.

6.3.3. Natural resources impacts

6.3.3.1. Geography

The majority of the parcel where the new Benson Lake Substation would be placed is undisturbed, forested land with some relief. The parcel is bordered on the north and west sides by existing transmission line corridors. The North alternative and South alternative locations are on slightly different soil types within the parcel:

- Most of the footprint of the South alternative is characterized by well-drained soils in the Ishpeming and Michigamme rock outcrop series, composed of sand, silty sand, or clayey sand underlain with bedrock near the surface and commonly found on the side slopes of ridges on glacial outwash plains or moraines. A portion of the access road would pass over poorly-drained to very-poorly-drained soils formed in sandy deposits on lake and outwash plains, lake basins, and glacial drainageways.
- The majority of the footprint of the North alternative is also characterized by well-drained soils in the Ishpeming and Michigamme rock outcrop series, composed of sand, silty sand, or clayey sand underlain with bedrock near the surface and commonly found on the side slopes of ridges on glacial outwash plains or moraines, while some of the southern edge of the substation would occupy the poorly-drained to very poorly-drained soils described above.

Stormwater basins for the northern layout would be constructed between the new proposed substation and the existing Amberg Substation to the west. For the southern configuration, the basins would be constructed adjacent to the northern boundary of the new substation footprint. There would also be a detention basin constructed along the east side of the access road that heads north to the existing Amberg Substation. Under Wis. Admin. Code ch. NR 216, permits from DNR are required for construction sites disturbing more than 1.0 acre. Wisconsin Admin. Code ch. NR 151 requires an erosion control plan, including approved BMPs.

6.3.3.2. Woodland

Nearly all of the land that would be impacted for construction of the southern alternative, including the access road, is forested. Construction of this alternative would impact approximately 5.03 acres of upland forest comprised of northern dry-mesic and northern mesic forest dominated by white pine *(Pinus strobus*), red oak (*Quercus rubra*), red maple (*Acer rubrum*), and white ash (*Fraxinus americana*). It would also impact 0.45 acres of forested wetland comprised of northern wet-mesic forest.

The North alternative contains a lower percentage of land that is currently forested because of the presence of the existing transmission corridor and some development. This alternative would impact approximately 1.18 acres of upland forest comprised of northern dry-mesic forest dominated by white pine, red oak, and red maple.

6.3.3.3. Endangered and threatened species and communities

The Amberg Substation property, on which the Benson Lake Substation would be built, was surveyed as a whole property. The information discussed in this section does not differentiate between the northern and southern layout options.

The NHI database search resulted in the identification of one threatened turtle, one special concern plant, and one special concern dragonfly within a two-mile radius of the proposed substation. If the Benson Lake Substation were to be constructed on this property, ATC would consult with DNR and implement one or more of the avoidance measures described below.

ATC would be required to take follow-up actions to comply with Wisconsin's rare species laws for the turtle species. A number of construction practices can be implemented where suitable habitat has been identified in order to avoid and minimize impacts. These practices are based on DNR guidelines and experience with previous construction projects. Which avoidance options to implement generally depend on the type of habitat involved and the time of year during which construction takes place. Habitat considerations include work in wetlands or uplands, identifying overwintering areas, and identifying locations of nesting habitat.

One action that can be taken is the avoidance of ground disturbing activities and access with motorized vehicles within 75 to 300 meters of a suitable stream edge from May 15 to October 14. The installation and maintenance of exclusion fencing using the DNR "Amphibian and Reptile Exclusion Fencing Protocol" is an avoidance option that can be used within this zone as long as the fencing is installed prior to May 15 and after October 14. Work can then be conducted within the fenced area at any time of year as long as the fencing is maintained.

If for any reason impacts could not be avoided by implementing the above practices, ATC would need to work with the DNR Natural Heritage Conservation Incidental Take Coordinator to discuss possible project-specific avoidance measures. If a take could not be avoided, an Incidental Take Permit or Authorization would be necessary.

A breeding bird survey was conducted at the Amberg Substation property in late May and late June of 2013. The survey was implemented utilizing standardized breeding songbird survey methods following DNR's NHI Forested State Lands Bird Survey Protocol. While two special concern bird species were encountered, no federal or state listed threatened or endangered bird species were detected during the surveys, and therefore, it is unlikely that impacts to endangered/threatened bird species would occur if the substation were constructed.

A field survey for the identified special concern plant species was conducted in 2013 in suitable habitat areas on the substation property. The plant species was not encountered.

Wetlands would be crossed during construction of the substation. DNR has suggested to ATC that if suitable habitat for the rare dragonfly is encountered, surveys could be conducted at the appropriate time of year to determine presence or absence.

6.3.3.4. Streams and wetlands

Wetlands are present at the Benson Lake Substation site, illustrated in Figures 6.3-1 and 6.3-2.

The Benson Lake North alternative would permanently fill 0.29 acres of emergent marsh by placing the substation pad in the wetland on the site. Because this would be a permanent impact, it must be determined that the substation pad cannot be placed in any other location to avoid these wetland impacts. No practicable alternative site without a wetland must exist.

The Benson Lake South alternative would permanently fill 0.52 acres of forested wetland and 0.02 acres of non-forested wetland by constructing an access road through the western part of the wetland at the site. Again, because this impact would be permanent all other options that would minimize impacts to wetlands must be evaluated.

As shown in Table 6.3-1, in summary, the Benson Lake North alternative would impact less wetland. The wetland type affected would be emergent marsh. The Benson Lake South alternative would impact

wetland consisting of northern wet-mesic forest. This forested wetland on the South alternative is of higher quality than the emergent marsh on the North alternative because the presence of native species and forested wetlands generally provide better habitat and more functions than herbaceous wetlands. However, although the North alternative would impact less wetland, it must be determined that there are no other practical alternatives that could further minimize or avoid all permanent wetland impacts.

Table 6.3-1 Comparison of potential wetland impact between the Benson Lake Substation North and South alternatives

	Forested Wetland				Non-Forested Wetland			Total Wetland Impact (acres)	Wetlands Crossed	Significant/High-quality Wetlands
Segment	Existing Shared ROW Area Not Cleared (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Non-forested Wetland Impact (acres)			
BSN North	0	0	0	0	.2	.09	.29	.29	1	1
BSN South	.04	.04	.48	.52	.02	0	.02	.54	1	1

6.3.3.5. Archaeological resources

Pursuant to Wis. Stat. § 44.40, a review for the potential presence of cultural resource sites was conducted for the substation property. The initial review included archival and literature research to identify if any previously recorded cultural resource sites had the potential to be within the construction footprint at the substation property. No known historical or archeological sites were identified.

6.3.4. Community resources impacts

The site of the Benson Lake construction is relatively isolated south of CTH K in Marinette County but close to two residences. Both the proposed north and south locations are on property ATC currently owns. Construction at either location would result in visual impacts in the immediate vicinity. During construction, the property would likely look chaotic and highly disturbed. Fugitive dust would need to be controlled, and equipment noise would need to be limited to avoid disturbance at the nearby homes.

6.4. POTENTIAL IMPACTS OF OTHER PROPOSED SUBSTATION MODIFICATIONS

There are ten additional substations that ATC is proposing to modify as part of the North Appleton-Morgan project. The substations are located in all of the counties affected by the project, including one substation in Marinette County, one in Winnebago County, one in Kewaunee County, and one in Dickinson County, Michigan. The modifications are discussed in some detail in Chapter 2. Although the work at the Stile Substation would involve a separate access road and culvert and transmission work related to the new Morgan-Stiles 138 kV line, no vulnerable resources would be adversely affected. None of the other substation modifications are expected to result in notable environmental impact.

CHAPTER

7

7. Environmental Analysis: South Routing Area

7.1. ROUTE SECTION COMPARISONS

7.1.1. Route Section S1

7.1.1.1. Detailed route section description

Route Section S1 is the western alternative in the South Routing Area that begins at the North Appleton Substation in the town of Freedom, Outagamie County, Wisconsin. It is comprised of five structure configurations and is approximately 5.5 miles in length. It extends due north out of the substation and ends in the town of Osborn, still in Outagamie County. It requires a total of 36.8 acres of new ROW, 71 percent of which would be shared with existing ROW. Nearly all of the existing corridors shared by this route are transmission line corridors. A small portion is existing public road ROW.

The route extending north out of the North Appleton Substation runs west of and parallel to French Road, cross-country through private lands comprised largely of agricultural fields and private residences. Continuing north, the route crosses Schroeder Road, CTH S, Center Valley Road, Krueger Road, Whitetail Drive, Sievert Road, and CTH EE, west of and parallel to French Road and ends north of CTH EE.

7.1.1.2. Structures and rights-of-way

ATC has identified five subsections that make up the western portion of the South Routing Area, S1-1 through S1-5. The subsections begin with S1-1 as the proposed project leaves the North Appleton Substation and heads north.

The S1-1 Route Subsection is approximately 1,294 feet in length. It requires no new ROW as it is located on the northern border of the North Appleton Substation property. It is also located in the road ROW of Rock Road.

The S1-2 Route Subsection is approximately 1,597 feet in length and continues north out of the substation property. There currently are two 138 kV transmission lines in this location. The two new lines that are proposed would be placed east of the existing lines: an additional 138 kV line adjacent to the existing138 kV line and a new 345 kV line east of that. Approximately 167.5 new feet of ROW width would be needed in this portion of the corridor, equivalent to 5.4 acres of new land impact.

The S1-3 Route Subsection is approximately 1,256 feet in length and begins where the configuration described in the above paragraph transitions to a new arrangement. There is currently only one existing 138 kV line in this location, and it would be relocated to the west. The two new lines are proposed to be

placed east of the relocated structures. The new 138 kV line would be placed east of the relocated 138 kV and the new 345 kV line would be placed along the eastern edge of the new ROW. The overall existing ROW width in this portion of the corridor would be increased by 40 feet to 220 feet resulting in a total of 3.9 acres of new impact.

The S1-4 Route Subsection is approximately 23,386 feet in length. The entire length of this subsection is of the same configuration described in the preceding paragraph for Route Subsection S1-3. The only difference is that the new ROW in this subsection is an incremental 40 feet wide for the entire length. This would result in 21.5 acres of new impact.

The S1-5 Route Subsection is approximately 1,660 feet long. The configuration of the structures in this subsection transitions from the S1-4 design layout to a one where no existing structures would need to be relocated. The resulting configuration would be a 345 kV line east of two 138 kV lines, but with one remaining in its current location. New ROW width requirements vary between an additional 40 feet to an additional 125 feet, resulting in approximately 3.6 acres of new impact.

7.1.1.3. Topography, geology, and soils

Route Section S1 is located entirely within the Central Lake Michigan Coastal Landscape as described by DNR in planning documents and publications. See Figure Vol. 2-8. This overall landscape comprises approximately 2,742 square miles of Wisconsin, representing 4.9 percent of the land area of the state.

The landforms in this region were created mostly by glaciers. The area is dominated by till plains and moraines that have resulted in relatively flat topography in the region. The favorable climate of the region, plus its level topography and fertile soils are the primary reason for the predominance of agriculture in the area. When encountered, the topographic features are distinct but generally not very high in elevation. Bedrock layers left by the glaciers have been carved by streams and weathered into a plain with mixed uplands and wetlands. The unconsolidated surficial deposits are underlain by sedimentary bedrock of the Cambrian and Ordovician periods. Depth to bedrock is a minimum of 50 feet. See Figure Vol. 2-9. One geological feature of interest in this region of the state is the occurrence of the St Peter Sandstone bedrock layer, running in a north-south orientation, particularly in areas of Winnebago, Outagamie, and Brown Counties.

The topography in the project area is dominated by cuestas. A cuesta is a ridge that has a steep escarpment on one side and a long gentle slope on the other. The westernmost ridge of the region is a rather low, narrow cuesta formed by the resistant Lower Magnesian limestone and is known as the Magnesian cuesta. The Magnesian cuesta ranges between 50 and 300 feet high and between two and 20 miles wide over its 175-mile length. However, in parts of Shawano and Outagamie Counties, the Magnesian cuesta tends to be lower and narrower than in the southern portion of the state. The eastern upland of the region consists of the taller and broader cuesta of Niagara limestone known as the Niagara cuesta. The intermediate Green Bay-Lake Winnebago-Rock River Lowland lies upon a belt of Black River and Galena limestone, with the gentle back slope of the Magnesian cuesta for one wall and the steep escarpment of the Niagara cuesta for the other.

Most upland soils of the Central Lake Michigan Coastal Landscape are reddish-brown calcareous loamy till or lacustrine deposits on moraines, till plains, and lake plains. The dominant soil is loamy or clayey with a silt loam surface, with moderately slow permeability, and high available water capacity. Most soils in Outagamie County were derived from either material deposited by the glaciers or material deposited as lacustrine sediment. Soil erodability is low.

7.1.1.4. Existing land uses

Approximately 77 percent of the proposed ROW within the S1 Route Section is in agricultural land use, with row crops comprising the majority of this area. The majority of the crops are corn and soybeans, but alfalfa and hay fields are also present. Pastures and old fields comprise the remainder of the agricultural areas. Agricultural land in Route Section S1 is 56 percent crop land and 44 percent old field.

On privately held lands along the route, much of the remaining land cover consists of fragmented forest blocks, moderately-developed residential landscapes, and pockets of concentrated residential developments. Generally, as a whole, this project does not cross or directly impact urban centers.

7.1.1.5. Off-ROW access

The majority of route sections intersect public roads. Wherever possible, the applicant's direct access to the ROW would be from public roads. Staying within the project ROW would be the preferred method of access, unless the contractor was able to arrange for alternative access that would minimize environmental and/or landowner impacts.

Access from outside the project ROW might be needed where physical limitations exist within the project ROW or where other constraints prevent direct access from public roads. The need for potential off-ROW access paths has been identified by the applicant based on a preliminary review of the route sections. If a specific route is approved by the Commission, the preliminary access plan may be amended based on further review of the chosen route, negotiations with local landowners, and/or contractor requirements.

There is one small off-ROW access point required along Route Section S1. There is a water feature that spans the entire ROW in Section S1-4, south of Krueger Road in the town of Freedom. The off-ROW access is currently planned to work around the western edge of the ROW and water feature in this location.

7.1.1.6. Staging and laydown areas

Temporary staging areas would be utilized to store vehicles and trailers, construction material and equipment, transmission line structures, conductors, cables and equipment, and other related material either within the ROW or at laydown yards outside of the project ROW. Additionally, wire-stringing setup areas would be necessary for construction of the project.

Laydown yards would be required throughout construction for the set-up of job trailers and storage of construction equipment and materials. The applicant has identified potential laydown yards based on the construction requirements of the project, proximity to work areas, and environmental and landowner impacts. Two are near the South Routing Area, one along CTH C just north of CTH J about 1.0 mile east of the North Appleton Substation and Route Section S2 (see Figure 7.1-1) and the other on Black Creek Limestone Company land, just over a mile to the east of where Route Section S2 crosses CTH J (see Figure 7.1-2).

Figure 7.1-1 Proposed staging and laydown area Site 1

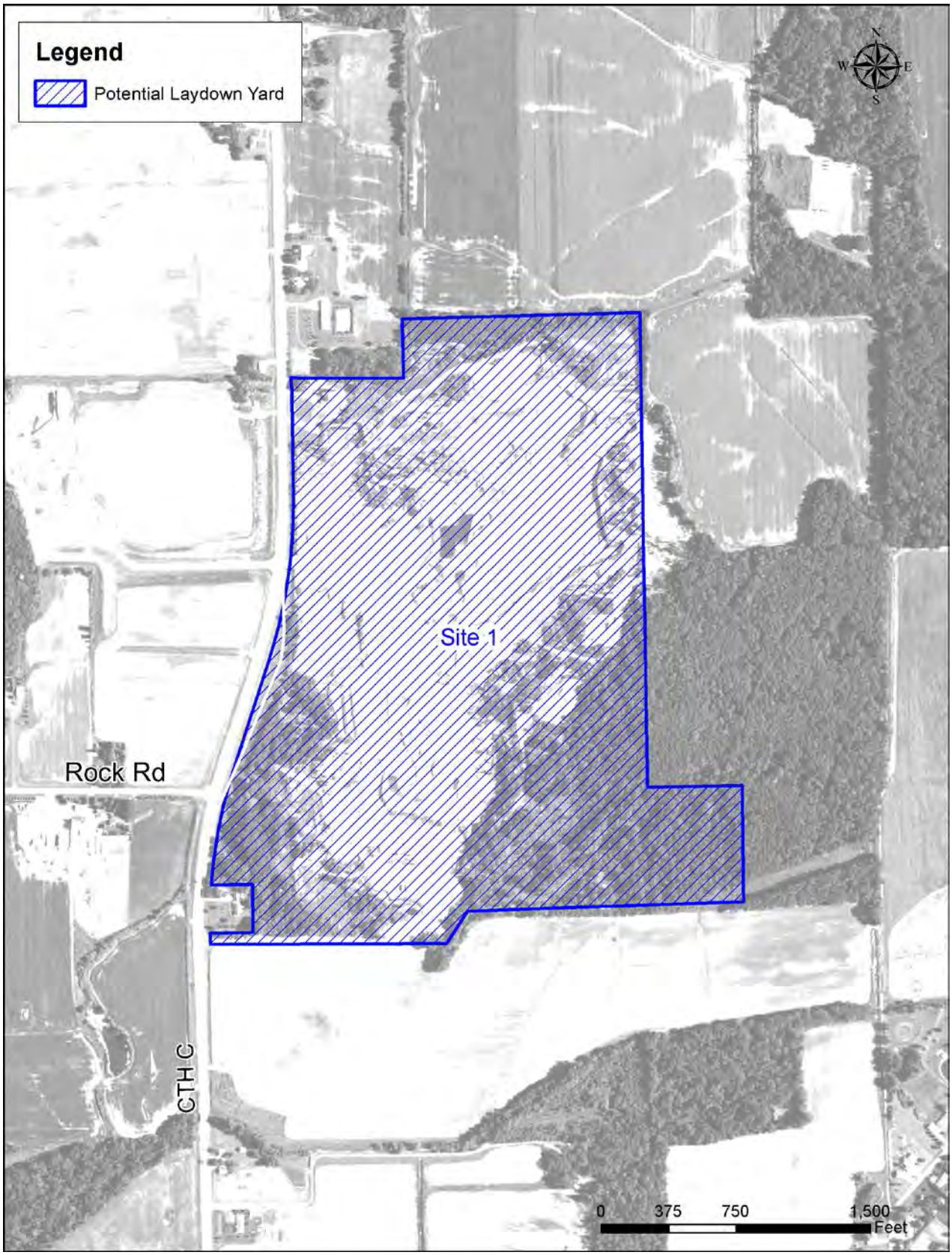


Figure 7.1-2 Proposed staging and laydown area Site 2

ATC states that, when identifying potential laydown yards, it made attempts to minimize the amount of disturbance and preparation required to provide suitable surfaces for temporary storage of construction equipment and materials. The amount of grading and clearing at these sites would be expected to be kept to a minimum because the sites were chosen with these considerations in mind. For example, sites like parking lots, old gravel pits, or fields that have already been paved or that have been previously graded and cleared of vegetation would be ideal locations for laydown yards.

There are currently no planned laydown yards adjacent to or in the area of Route Section S1.

7.1.2. Route Section S2

7.1.2.1. Detailed route section description

Route Section S2 is the eastern alternative in the South Routing Area that begins at the North Appleton Substation in the town of Freedom, Outagamie County, Wisconsin. See Figure Vol. 2-1.10. It is comprised of seven structure configurations and is approximately 5.9 miles in length. The lines would run northeast out of the substation and end in the town of Osborne. They would require a total of 102.4 acres of new ROW. Of the total136 acres of ROW needed for S2, 22 percent would be shared with existing corridors. The majority of the existing corridors to be shared are transmission line corridors. A small portion is existing gas pipeline ROW.

The route extends northeast out of the North Appleton Substation through agricultural fields north of Rock Road. It runs cross-country through private lands comprised largely of agricultural fields and private residences. East of the intersection of CTH C and Garvey Road, this route section crosses Duck Creek and an associated wetland complex. To the northeast and just south of Center Valley Road, the route angles to a direct northern path. It continues northward for several thousand feet, crossing CTH J, a long private drive, and Sievert Road. North of the crossing of Sievert Road, the route angles back to a west/northwesterly direction, where it crosses CTH C. West of CTH C and south of CTH EE, the route angles again back to the northeast where it runs adjacent to the western edge of the Oneida Indian Reservation. See Figure Vol. 2-1.08.

7.1.2.2. Structures and rights-of-way

Seven subsections make up the eastern option in the South Routing Area, identified as S2-1 through S2-7. The subsections begin with S2-1 as the proposed project leaves the North Appleton Substation and heads northeast.

The S2-1 Route Subsection is approximately 515 feet in length and is located entirely on property owned by ATC. It requires no new ROW as it is located on the northern border of the North Appleton Substation property.

The S2-2 Route Subsection is approximately 7,422 feet in length and continues northeast out of the substation. There is currently one 345 kV transmission line in this location. Two new lines are proposed to be placed west of the existing line; one additional 345 kV line west of the existing 345 kV line and a new 138 kV line west of that. Approximately 155 new feet of ROW width would be added to this portion of the corridor to accommodate the new transmission lines, equivalent to 26.7 acres of impact. See Appendix A Figure 10.

The S2-3 Route Subsection is a relatively short (627 feet) transition between the configurations of Route Subsections S2-2 and S2-4. The existing 345 kV line would be rebuilt slightly further to the east than its current position. However, the resulting configuration would be the same as that for S2-2 described

above, where there are two 345 kV lines in the eastern portion of the ROW with a new 138 kV line along the western edge of the ROW. The new ROW width required in this subsection varies from an additional 60 feet to an additional 130 feet resulting in 1.4 acres of impact.

The S2-4 Route Subsection is approximately 3,875 feet in length and begins just west of CTH C. It includes a combination of two slightly different configurations. There is currently one existing 345 kV line in this location that would be relocated to the east. Two new lines are proposed to be placed west of the relocated structures. A new 138 kV line would be built along the western edge of the ROW. A new 345 kV line would be built toward the center of the ROW, with the rebuilt 345 kV line farthest east in the ROW. The difference between the existing and proposed configurations is mainly the proximity of the rebuilt 345 kV line to its existing location. The overall ROW width in this portion of the corridor would be increased 60 feet for a total of 5.3 acres of new impact. See Appendix A Figure 11.

The S2-5 Route Subsection is another relatively short (795 feet) transition between the configurations of Route Subsections S2-4 and S2-6. The existing 345 kV line would be rebuilt slightly farther east than its current position, and the rebuild distance would continuously decrease to the point where, in Route Subsection S2-6, no rebuild would be necessary. The resulting configuration would be the same as that for S2-2 described above, where there would be two 345 kV lines in the eastern portion of the ROW with a new 138 kV line along the western edge of the ROW. The transition would result in an increase of 60 feet in ROW, adding 2.0 acres of land impact.

The S2-6 Route Subsection is 11,396 feet in length and begins just south of the ROW crossing of Center Valley Road. The configuration in this subsection is identical to that of Route Subsection S2-2, and 40.1 acres of new land would be impacted by its construction.

North of Sievert Road the route angles and begins to run in a west/northwest direction. This is the beginning of the S2-7 Route Subsection. At this location, the existing 345 kV line would continue north and no longer be within the project ROW. Also at this location, the new ROW for this project would intersect and join existing ROW of an underground Guardian natural gas pipeline. Route Subsection S2-7 is 6,602 feet long. It crosses CTH C and approaches the border of the Oneida Indian Reservation. One new 138 kV line and one new 345 kV line are proposed to be constructed in the ROW with the pipeline. The 138 kV line would be located west of the 345 kV line in the ROW. One configuration of Route Subsection S2-7 has the existing gas pipeline east of the new transmission lines while in another, the pipeline occupies the western edge of the ROW. This subsection requires a new ROW width of 170 feet and would impact 25.8 acres of land. See Appendix A Figures 16 and 17.

7.1.2.3. Topography, geology, and soils

Route Section S2 is located entirely within the Central Lake Michigan Coastal Landscape as described by DNR in planning documents and publications. This overall landscape comprises approximately 2,742 square miles of Wisconsin, representing 4.9 percent of the land area of the state. See Figure Vol. 2-8.

The landforms in this region were created mostly by glaciers. The area is dominated by till plains and moraines resulting in relatively flat topography in the region. The favorable climate of the region plus its level topography and fertile soils are the primary reasons for the predominance of agriculture in the area. When encountered, the topographic features are distinct but generally not very high in elevation. Bedrock layers left by the glaciers have been carved by streams and weathered into a plain with mixed uplands and wetlands. The unconsolidated surficial deposits are underlain by sedimentary bedrock of the Cambrian and Ordovician periods. Depth to bedrock is a minimum of 50 feet. See Figure Vol. 2-9. One geological

feature of interest in this region of the state is the occurrence of the St Peter Sandstone bedrock layer, running in a north-south orientation, particularly in areas of Winnebago, Outagamie, and Brown Counties.

The topography in the project area is dominated by cuestas. A cuesta is a ridge that has a steep escarpment on one side and a long gentle slope on the other. The westernmost ridge of the region is a rather low, narrow cuesta formed by the resistant Lower Magnesian limestone and is known as the Magnesian cuesta. The Magnesian cuesta ranges between 50 and 300 feet high and between two and 20 miles wide over its 175-mile length. However, in parts of Shawano and Outagamie Counties, the Magnesian cuesta tends to be lower and narrower than in the southern portion of the state. The eastern upland of the region consists of the taller and broader cuesta of Niagara limestone, known as the Niagara cuesta. The intermediate Green Bay-Lake Winnebago-Rock River Lowland lies upon a belt of Black River and Galena limestone, with the gentle back slope of the Magnesian cuesta for one wall and the steep escarpment of the Niagara cuesta for the other.

Most upland soils of the Central Lake Michigan Coastal Landscape are reddish-brown calcareous loamy till or lacustrine deposits on moraines, till plains, and lake plains. The dominant soil is loamy or clayey with a silt loam surface, with moderately slow permeability, and high available water capacity. Most soils in Outagamie County were derived from either material deposited by the glaciers or material deposited as lacustrine sediment. Soil erodabilitiy is low.

7.1.2.4. Existing land uses

Approximately 85 percent of the proposed ROW within the S2 routing area is in agricultural land use, with row crops comprising the majority of this area. The majority of the crops are corn and soybeans, but alfalfa and hay fields are also present. Pastures and old fields comprise the remainder of the agricultural areas. Agricultural land in Route Section S2 is approximately 82 percent crop land, 10 percent pasture, and 9.0 percent old field.

On privately held lands along the route, much of the remaining land cover consists of fragmented forest blocks, moderately-developed residential landscapes, and pockets of concentrated residential developments. Generally, as a whole, this project does not cross or directly impact urban centers.

7.1.2.5. Off-ROW access

The majority of route sections intersect public roads. Wherever possible, the applicant's direct access to the project ROW would be from the public roads. Staying within the project ROW would be the preferred method of access, unless the contractor was able to arrange for alternative access that would minimize environmental and/or landowner impacts.

Access from outside the project ROW might be needed where physical limitations exist within the project ROW or where other constraints prevent direct access from public roads. The need for potential off-ROW access paths has been identified by the applicant based on a preliminary review of the route sections. If a specific route is approved by the Commission, the preliminary access plan may be amended based on further review of the chosen route, negotiations with local landowners, and/or contractor requirements.

There are no currently planned off ROW access areas along Route Section S2.

7.1.2.6. Staging and laydown areas

Temporary staging areas would be utilized to store vehicles and trailers, construction material and equipment, transmission line structures, conductors, cables and equipment, and other related materials

either within the ROW or at laydown yards outside of the project ROW. Additionally, wire-stringing setup areas would be necessary for construction of the project.

Laydown yards would be required throughout construction for the set-up of job trailers and storage of construction equipment and materials. The applicant has identified potential laydown yards based on the construction requirements of the project, proximity to work areas, and environmental and landowner impacts. ATC states that, when identifying potential laydown yards, it made attempts to minimize the amount of disturbance and preparation required to provide suitable surfaces for temporary storage of construction equipment and materials. The amount of grading and clearing at these sites would be kept to a minimum because the sites were chosen with these considerations in mind. For example, sites like parking lots, old gravel pits, or fields that have already been paved or that have been previously graded and cleared of vegetation would be ideal locations for laydown yards.

There are two currently-planned lay down yards east, and outside of, the ROW for Route Section S2. Both sites are in the town of Freedom.

Site 1 is approximately 60 acres in size and is an active limestone mining operation located adjacent to CTH C to the east. As the site is an active mine, most of the land has been previously disturbed for the operation.

Site 2 is approximately 10 acres in size and is also an active limestone mining operation. It is located west of STH 55 and is bordered by a concrete operation to the east, agricultural fields to the north, west and south, and a subdivision to the southeast. As the site is an active mine, most of the land has been previously disturbed for the operation.

7.1.3. Route Section S3

7.1.3.1. Detailed route section description

Route Section S3 is a connecting subsection that would link the eastern S2 route to the western C3 route of the project, or link the western S1 route to the eastern C4 route heading north. Section S3 would not be utilized as part of the North Appleton to Morgan project at all if an entirely eastern path (S2 combined with C4) were ordered or an entirely western path (S1 combined with C3) were ordered. As such, there are no "alternatives" to Route Section S3. See Figure Vol. 2-1.08.

Even though there are not alternatives to Section S3, there are different impacts associated with it, depending on if it were utilized to connect S2 C3 or connect S1 to (C4).

The eastbound version (connecting S1 to C4) begins just north of CTH EE, across the highway from the Osborn Town Hall. It runs east and parallels the highway for approximately 3,690 feet, where it ends and Section C4 begins. The route section would be located entirely within agricultural fields and across French Road. It would require a total of 15.3 acres of ROW, 25 percent of which would be shared with the ROW of CTH EE.

The westbound version (connecting S2 to C3) begins in an agricultural field just south of CTH EE and travels northwest across CTH EE, heads due west on the north side of CTH EE and parallel to the highway. It crosses French Road, and angles due north directly across from Osborn Town Hall. The route section ends approximately 1,700 feet north of the building. It is located almost entirely within agricultural fields. It would require a total of 21.7 acres of ROW, 19 percent of which would be shared with the existing ROW of CTH EE.

7.1.3.2. Structures and rights-of-way

Only one structure ROW configuration would be utilized in the eastbound version of this section. A new 138 kV monopole structure configuration would be the northern of two new structure types in this stretch. The southern type would be a new 345 kV monopole. There are no existing transmission lines in Section S3. In general, the 345 kV structure would be located beginning 10 feet outside of the road ROW. Approximately 130 feet of new ROW width would be needed, in addition to that which is shared with the CTH EE ROW.

Two structure ROW configurations would be utilized in the westbound version of S3. A new 138 kV monopole structure configuration would be the western structure when the lines would run north/south and would be the southern structure when the line would run east/west. The eastern and northern line in this section would be a new 345 kV monopole. There is one existing, north-south, 138 kV transmission line in a portion of Route Section S3 westbound, located west of French Road, and it would meet up with the newly created ROW where Section S3 turns due north just north of CTH EE. In general, the 138 kV structure would be located beginning 10 feet outside of the road ROW. Approximately 145 feet of new ROW width would be needed in the portion of the route section along CTH EE, and approximately 125 feet of additional ROW would be needed in the area of overlap with the existing 138 kV transmission line. See Appendix A Figures 13a and 13b.

7.1.3.3. Topography, geology, and soils

Route Section S3, like the other two sections of the South Routing Area, is located entirely within the Central Lake Michigan Coastal Landscape. See Figure Vol. 2-8.

As discussed in similar sections above, the landforms of this region are relatively flat morainal lands created mostly by glacial action. Bedrock layers left by the glaciers have been carved by streams and weathered into a plain with mixed uplands and wetlands. The unconsolidated surficial deposits are underlain by sedimentary bedrock of the Cambrian and Ordovician periods. Depth to bedrock is a minimum of 50 feet. See Figure Vol. 2-9. One geological feature of interest in this region of the state is the occurrence of the St Peter Sandstone bedrock layer, running in a north-south orientation, particularly in areas of Winnebago, Outagamie, and Brown Counties. The topography in the project area is controlled by cuestas. Along CTH EE, slopes are gentle to non-existent.

Most upland soils of the Central Lake Michigan Coastal Landscape are reddish-brown calcareous loamy till or lacustrine deposits on moraines, till plains, and lake plains. The dominant soil is loamy or clayey with a silt loam surface, with moderately slow permeability, and high available water capacity. Most soils in Outagamie County were derived from either material deposited by the glaciers or material deposited as lacustrine sediment. Soil erodability is low.

7.1.3.4. Existing land uses

Almost 100 percent of the proposed ROW within Section S3 is in agricultural land use, with row crops comprising the majority of this area. The majority of the crops are corn and soybeans. Agricultural land in the eastbound Section S3 is comprised of approximately 76 percent crop land and 24 percent old field, while approximately 88 percent of the westbound subsection is crop land and 12 percent is old field.

7.1.3.5. Off-ROW access

Wherever possible, direct access to the project ROW would be from public roads. Staying within the project ROW would be the preferred method of access, unless the contractor would be able to arrange for alternative access that would minimize environmental and/or landowner impacts.

Access from outside the project ROW may be required where physical limitations exist within the project ROW or where other constraints prevent direct access from public roads. There are no currently planned off-ROW access areas along Route Section S3, with either the eastbound or westbound configuration.

7.1.3.6. Staging and laydown areas

Temporary staging areas would be utilized to store vehicles and trailers, construction material and equipment, transmission line structures, conductors, cables and equipment, and other related material within the ROW and at laydown yards outside of the project ROW. Additionally, wire-stringing setup areas would be necessary for construction of the project.

Laydown yards would be required throughout construction for set up of job trailers and storage of construction equipment and materials. Potential laydown yards have been identified based on the construction requirements of the project, proximity to work areas, and environmental and landowner impacts. Sites that are paved or have been previously graded and cleared of vegetation, such as parking lots, old gravel pits, and fields, are ideal locations for laydown yards. There are no lay down yards that are currently planned in either configuration of Section S3.

7.2. NATURAL RESOURCES AND POTENTIAL IMPACTS

7.2.1. Natural resource properties (local, county, state, federal lands)

There is one publicly-owned parcel of land in the South Routing Area. It is owned by the town of Osborn where the existing town hall is located. There is an existing 138 kV transmission line along the western portion of the property. The current proposed configuration in this location is to relocate the existing 138 kV line to the west and construct a new 138 kV line east of the relocated line, along with an additional 345 kV line east of that.

The existing easement on the town's parcel is 392 feet long, 100 feet wide, and comprises 0.86 acres of land. If the project were built in this location, no new ROW would be required on the town's property.

7.2.2. Forested lands

For the purposes of this project, forested lands are defined as areas where mature trees are present, forming mostly closed stands (greater than 20 percent canopy cover and trees with diameter at breast height (dbh) of 6.0 inches or more). Narrow tree lines (*e.g.*, wooded fence rows) and windbreaks are not included as forested cover.

The following tree size classification system was used:

- "Saplings" refer to live trees from 1.0 to 5.0 inches dbh
- "Structure timber" ranges from 5.0 to 9.0 inches dbh for softwoods and from 5 to 11 inches dbh for hardwoods.
- "Saw timber" is greater than 9.0 inches dbh for softwoods, and greater than 11 inches dbh for hardwoods.

The project area is located in the Green Bay Till and Lacustrine Plain ecoregion. This region is characterized by a mixture of wetlands, outwash plains, lake plains, and ground moraines. The potential natural vegetation of this ecoregion consists of a transition from northern hardwoods and conifer swamps

in the north to maple, oak, and basswood forests to the south. Current vegetation of this region is comprised of agricultural fields with interspersed hardwood woodlots and forested wetlands in the lower elevations. Generally, forested areas are dominated by structure timber and saw timber.

Table 7.2-1 shows relative amounts of upland, wetland, and total acreages of forest land in the South Routing Area. Ownership of forested lands within the project area is primarily private. Land use of the forested lands is primarily recreational, and many woodlots are used as a private source for firewood.

Table 7.2-1 Upland vs. wetland forested areas in the South Routing Area

Section	Total Acres of Forested Area	Percent Upland Forest	Percent Wetland Forest
S1	6.0	72	28
S2	4.80	52	48
S3	0	0	0

Current forested areas in Route Section S1 are comprised of small (up to 40 acres in size), scattered woodlots. Upland forests are primarily southern dry and southern dry-mesic forest dominated by red oak (*Quercus rubra*), white oak (*Q. alba*), sugar maple (*Acer saccharum*), and basswood (*Tilia americana*). Forested wetlands occur along waterways and are typically southern hardwood swamp dominated by red maple (*A. rubrum*), box elder (*A. negundo*), and green ash (*Fraxinus pennsylvanica*).

Current forested areas in Route Section S2 are comprised of small (up to 40 acres in size), scattered woodlots as well. Upland forests are primarily southern dry-mesic and southern mesic forest dominated by red oak, white oak, sugar maple, and basswood. Forested wetlands occur along waterways and are typically southern hardwood swamp dominated by red maple, box elder, and green ash.

There are no forested areas in Route Section S3.

7.2.3. Wetlands

7.2.3.1. Duck-Pensaukee Watershed Approach Report

In 2012, collaborators, including The Nature Conservancy, DNR, and the University of Wisconsin-Milwaukee, completed a study to locate and prioritize wetland restoration areas in the Duck-Pensaukee watershed. The study corresponds with revisions to the Clean Water Act Section 404 wetland compensatory mitigation rules. The Duck-Pensaukee watershed is located in Brown, Outagamie, Oconto, and Shawano Counties, and contains almost the entire North Appleton-Morgan project area. The study used a watershed approach to identify and prioritize existing wetlands for preservation and other areas with high potential for wetland restoration. Both the existing wetlands and restoration areas were ranked based on criteria such as water quality protection, flood abatement, and wildlife habitat. In the context of this project, DNR is using this study to help evaluate the potential impacts to wetlands from the proposed project.[100]

7.2.3.2. Route Section S1

Route Section S1 crosses 22 wetland totaling 2,220 feet, for a total of 10.17 acres of potential wetland impact. Wetland types crossed by this section include wet meadow, sedge meadow, emergent marsh, shrub carr, and hardwood forest wetlands. The landscape in the South Routing Area is generally rural;

[100] Miller, N., T. Bernthal, J. Wagner, M. Grimm, G. Casper, and J. Kline. 2012. The Duck-Pensaukee Watershed Approach: Mapping Wetland Services, Meeting Watershed Needs. The Nature Conservancy and Environmental Law Institute. Madison, Wisconsin.

row-crop agriculture, pasture, and woodlots are present, with small residential areas scattered throughout. This landscape, combined with the existing transmission line corridor, limits the size and diversity of wetlands present. At least parts of all of the wetlands in this section have previously been disturbed by construction of the existing transmission lines as well as agricultural development. Many of the herbaceous wetlands are dominated by invasive species while the forested wetlands have been previously cut and often contain weedy tree species. Fourteen new structures are proposed to be constructed in wetlands along Section S1.

A relatively large and diverse wetland complex is located north of Whitetail Drive in Outagamie County. The wetland crossing is 776 feet in length and affects both emergent herbaceous wetland and forested wetland. Three structures are proposed to be constructed in this complex. These structures should be located outside of the wetland to reduce impacts. Whenever structures are constructed within a wetland, impacts increase as heavy equipment must cross the wetland. Even if wetland matting is used, soil compaction can still occur. Compaction can change the hydrology of the wetland and make revegetation more difficult, possibly resulting in less diverse vegetation and more open water.

7.2.3.3. Route Section S2

Route Section S2 also follows an existing transmission line and gas pipeline ROW. This section crosses wet meadow, sedge meadow, shrub carr, hardwood forest, and floodplain forest wetlands. Similar to Section S1, the agricultural and residential landscape limits the size and diversity of wetlands present. Nine structures would be constructed in wetlands along Section S2. Further, nine wetlands are crossed by this section, totaling 1,932 feet and resulting in a total of 8.76 acres of potential wetland impact. One wetland complex of note is located east of the intersection of Garvey Road and County Highway C. It is located on both sides of Duck Creek and is composed of shrub carr and riparian forested wetland. Riparian wetlands, also known as floodplain wetlands are those located next to streams and rivers. They help buffer the waterways by filtering sediment and nutrients, making the wetlands ecologically-significant. This wetland crossing is 461 feet long and two structures are proposed to be located at the edge of the wetland. These structures should be moved outside of the wetland to reduce impacts caused by equipment travel and structure construction. Another complex, a wet meadow, is 835 feet long and located north of County Highway J. Four structures are proposed to be constructed within this wetland, although two are located at the edge of the complex and, if possible, should be sited outside of the wetland to reduce impacts.

7.2.3.4. Route Section S3

Route Section S3 contains two route options, "S3 Eastbound" and "S3 Westbound". Neither option impacts any wetlands.

7.2.3.5. Summary of wetland impacts of Route Sections S1, S2, and S3

Section S1 crosses 2,220 feet of wetlands, Section 2 crosses 1,932 feet of wetlands, and Segment S3 crosses no wetlands. As can be seen in Table 7.2-2, Section S1 would result in both more forested wetland impact, and more non-forested wetland impact. Section S1 also crosses more wetland complexes and contains more Significant/High-Quality wetlands, a measure of quality determined by the applicant. The types of wetlands impacted by both route sections are similar. Most of the wetlands have been previously disturbed by other transmission line or pipeline construction. Both route sections would impact a variety of wetland types including herbaceous, shrub carr, and forested wetlands.

Table 7.2-2 Summary of wetland impacts for route sections in the South Routing Area

	Forested Wetland				Non-Forested Wetland					
Segment	Existing Shared ROW Area Not Cleared (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Non-forested Wetland Impact (acres)	Total Wetland Impact (acres)	Wetlands Crossed	Significant/High-quality Wetlands
S1	.57	.57	1.98	2.32	6.85	1.67	8.52	10.17	22	2
S2	.34	.34	1.00	1.34	2.11	4.33	6.44	8.76	9	0
S3	0	0	0	0	0	0	0	0	0	0

7.2.4. Waterways

7.2.4.1. Route Section S1

Route Section S1 intersects 11 waterways. See Figure Vol. 2-10. Again, partially due to the agricultural nature of the South Routing Area, most of these waterways are small, low-order streams or agricultural ditches. To avoid driving on the beds of the waterways, the applicant has proposed that seven of the 11 waterways be crossed by a TCSB. See Chapter 5, Section 5.5.16.3. The remaining four waterways would not need to be crossed by construction equipment to access structure locations. The largest and highest-quality waterway that would be crossed by a TCSB is Duck Creek. It is located north of County Highway S. Duck Creek is designated as an ASNRI waterway because of the presence of state-listed species. Even though no impacts below the Ordinary High Water Mark (OHWM) of Duck Creek are proposed, TCSBs still affect stream health because they shade the waterway and create bank disturbance. Implementing proper erosion control and following DNR's TCSB standards can minimize the impacts of TCSBs. To completely avoid impacts by TCSBs access routes should avoid crossing waterways all together, if possible.

7.2.4.2. Route Section S2

Section S2 intersects 16 waterways, 11 of which are proposed to be crossed by a TCSB. As with Section S1, these waterways have been previously disturbed in some way. Most are relatively small and many have been ditched as they are adjacent to farm fields or pasture. Again, one quality waterway is Duck Creek. It is an ASNRI waterway, as state-listed species are present within it. It is proposed to be crossed with a TCSB. No other special-designated waterways are crossed by Section S2.

7.2.4.3. Route Section S3

Section S3 contains two route options, "S3 Eastbound" and "S3 Westbound". Both would cross one waterway, an unnamed tributary to Duck Creek. This crossing would be via TCSB.

7.2.4.4. Summary of waterway impacts of Sections S1, S2, and S3

Overall, Route Section S1 crosses 11 waterways, seven of which would require a TCSB. Section S2 crosses 16 waterways; all of which would require a TCSB. Section S3 crosses one waterway by TCSB, an unnamed tributary to Duck Creek. Sections S1 and S2 both cross Duck Creek, which is an ASNRI due to the presence of state-listed species. No other waterways in the South Routing Area are special-designation waterways. Also, no waterways require other activities regulated by Wis. Stat. ch. 3, such as grading on the bank or structures below the OHWM.

Table 7.2-3 Summary of impacts to waterways in the South Routing Area

Section	# of Waterways Crossings	# of Special Designated Waterways	# of TCSBs Required	# of TCSBs Over Special Designated Waterways	# of Misc. Structures Below OHWM
S1	11	1	7	1	0
S2	16	1	11	1	0
S3	1	0	1	0	0

7.2.5. Endangered resources

This section discusses the potential impacts to endangered resources that might be affected by construction or operation of the proposed project along Segments S1 and S2. Endangered resources, as discussed in Chapter 5, Section 5.5.7, are tracked using the state's NHI database, which is maintained by the DNR Bureau of Natural Heritage Conservation. The project area evaluation consists of both the specific route and a buffer of one mile for terrestrial and wetland species and a 2.0-mile buffer for aquatic species.

The combined presence of natural habitat and man-made disturbances must be taken into consideration to evaluate whether there is a likelihood that rare species are present and the potential for negative impacts to those species. While the existing sources of information are important for estimating impacts to rare species, they are incomplete. Additional rare species beyond those identified may actually be present in potentially impacted areas.

Within the vicinity of Route Section S1, the NHI database indicates a Migratory Bird Concentration Site. Migratory bird concentration sites are important resting and feeding areas for birds as they fly between their breeding and wintering grounds. These areas also can be locations where large numbers of migrating birds often become concentrated because of prevailing winds and/or water barriers. The areas are used by many different species, both rare and non-rare. During seasonal or diurnal migrations, birds can collide with transmission lines, and lines can present barriers to their use of stopover habitat. The risk to birds increases when:

- The lines are vertically arrayed.
- The lines or structures reach above other visible barriers such as tree lines or buildings.
- The lines are placed in areas of abundant bird use like migration corridors, colonial nesting areas, or stopover habitat.

If the lines are constructed on transmission structures with a reduced height, there is often a tradeoff requiring a wider ROW width and/or shorter span lengths. DNR recommendations to minimize impacts to birds in areas of known high bird traffic include reducting transmission structure heights. Ideally structure heights of less than 105 feet would help mitigate impacts to the bird species. Also, bird diverters are an important tool in preventing bird collisions with transmission conductors.

If the Commission approves this project, the DNR, in consultation with the USFWS and the applicant should determine: 1) the appropriate type of bird diverters; 2) the locations where bird diverters should be installed; and 3) the areas where lower transmission structures could minimize impacts.

The NHI database indicates an occurrence of a Migratory Bird Concentration Site within the vicinity of Route Section S2 and S3. The concentration site is farther away from these route sections than from Route Section S1 but, if this route section is approved, USFWS and DNR should be consulted to determine where bird diverters would be necessary to help birds recognize and avoid the lines.

The northern long-eared bat is currently proposed for federal listing and is expected to be listed as either endangered or threatened by the time this project is proposed to begin. During the summer, northern long-eared bats typically roost singly or in colonies in a wide variety of forested habitat, in cavities or crevices, or underneath loose bark of both live trees and snags greater than three inches diameter at breast height (dbh). They forage for insects in upland and lowland woodlots and tree lined corridors. During the winter, northern long-eared bats predominately hibernate in caves and abandoned mine portals. Suitable habitat for the northern long-eared bat is likely present within the proposed project areas, and this species may be impacted. Therefore, at this time, it is recommended that the applicant, in coordination with USFWS and DNR, determine species presence or if impacts can be avoided or minimized by use of conservation measures. Where suitable habitat occurs, avoidance measures for this species may include presence/absence surveys and/or no tree clearing during the species' active period from April 1 to September 30.

7.2.6. Invasive species

ATC's assessment of invasive species has been done on a project-wide scale. Because invasive species are identified in order to avoid their spread throughout the project area, it is less important to know precisely where they are located at this time. It is important to know what has been observed in the project area so that measures can be identified to eliminate or reduce their populations and avoid their spread.

ATC says in its application that it evaluated the ROW for invasive plant species during field surveys along existing corridors during the growing seasons of 2012 and 2013. The general locations and composition of dominant invasive species present within the ROW were identified and mapped with GPS instruments during wetland delineations and natural habitat evaluations. However, targeted surveys to identify and map all invasive species were not completed as part this assessment.

Invasive plant species were commonly observed along the route sections evaluated by the applicant in the field. Overall, 16 invasive plant species were identified along the route sections, all falling into the "Restricted" category of Wis. Admin. Code ch. NR 40 as of May 2013. There were no "Prohibited" species found.

The observed species included:

- Garlic mustard (*Alliaria petiolata*)
- Creeping bellflower (*Campanula rapunculoides*)
- Spotted knapweed (*Centaurea biebersteinii*)
- Canada thistle (*Cirsium arvense*)
- Common teasel (*Dipsacus fullonum*)
- Autumn olive (*Elaeagnus umbellata*)
- Honeysuckle species (*Lonicera spp.*)
- Purple loosestrife (*Lythrum salicaria*)
- Wild parsnip (*Pastinaca sativa*)
- Common reed (*Phragmites australis*)
- Common buckthorn (*Rhamnus cathartica*)
- Glossy buckthorn

The most commonly observed "Restricted" plant species along the route sections included narrowleaf cattail (*T. angustifolia*), Canada thistle, multiflora rose, common reed, and honeysuckles.

ATC states that it would comply with Wis. Admin. Code ch. NR 40 by implementing BMPs when encountering species listed as "Restricted" or "Prohibited." This is appropriate because standard BMPs have been developed by DNR and interested stakeholders to avoid and minimize the spread of listed species. The BMPs would vary throughout the ROW based on the degree of invasiveness, severity of the current infestation, and susceptibility of non-infested areas to invasion.

BMPs would include:

- Avoidance through construction timing and alternate access.
- Proper management of construction vehicles and materials (*i.e.*, storage, cleaning).
- Minimization of ground disturbance.
- Placement of a barrier between construction vehicles and plants (*i.e.*, construction matting or geotextile fabric).
- Proper storage and disposal of plant materials.
- Promotion of native regeneration using short-term stabilization measures.
- Leaving cut vegetation on-site where it is cut (*i.e.*, mowing shrubs).

Additional evaluation would be conducted to further identify where site specific

BMPs are appropriate if a particular route is chosen. ATC states that those BMPs would be incorporated into environmental access plans implemented during construction.

The rusty crayfish (*Orconectes rusticus*) is an invasive crayfish species whose populations began to increase swiftly in Wisconsin around 1960. It was likely introduced by fishermen who used it as live bait. It eats native aquatic plants and fish eggs in lakes and streams, which would severely damage native aquatic ecosystems by destroying habitat, limiting the reproduction of native fish species and wildlife, and negatively affecting the health of the waters they inhabit.

Construction of a transmission line could have the potential to allow further spread of the rusty crayfish if work were to occur in streams or lakes below the OHWM. If any equipment, boats, or tools that would be used for the project contained rusty crayfish or its eggs, the species could be spread into a waterbody that is currently free from the pest.

Several medium-sized rivers are crossed by South Routing Area route sections (*e.g.*, Pensaukee River, North Branch of the Pensaukee River, and the Little Suamico River), along with numerous other smaller waterways. Work below the OHWM of waterways is not anticipated at any locations along the route sections, although some waterways may need to be waded or crossed with boats during wire stringing operations if a TCSB is not built to cross the waterway. Rusty crayfish is present in Duck Creek, the North and West Branches of the Suamico River, and the Pensaukee River. If equipment would be placed below the OHWM of one of these waterways prior to moving equipment between waterway construction locations, ATC states in its application that standard inspection and disinfection procedures would be incorporated into construction methods as applicable. These would be appropriate measures to control the crayfish.

7.2.7. Archaeological and historic resources

Pursuant to Wis. Stat. § 44.40, a review of the reconnaissance of the project area was conducted to determine the potential presence of archaeological and historic sites. ATC contracted Commonwealth

Cultural Resources Group, Inc. (CCRG) to conduct an archival and literature review of cultural resources, architectural/historic resources, and previously-recorded archaeological and burial sites along the route sections and substation sites of the project. To assess the potential effects of the project on archaeological and cemetery/burial sites and architectural/historic resources, the Archaeological Site Inventory, the Architecture and History Inventory and associated site files, and the national and state registers of historic places were reviewed.

No above-ground NRHP eligible or listed architectural/historic resources were identified in the South Routing Area. No cemetery or burial sites were identified in the South Routing Area. No NRHP-listed or NRHP-eligible archaeological sites were identified in the South Routing Area.

7.3. COMMUNITY RESOURCES AND POTENTIAL IMPACTS

7.3.1. Agriculture

Approximately 82 percent of the proposed ROW within the South Routing Area is in agricultural land use, with row crops comprising the majority of this area. The majority of the crops are corn and soybeans, but alfalfa and hay fields are also present. Pasture and old fields comprise the remainder of the agricultural land. In terms of route sections, 85 percent of the total ROW area of Route Section S2 would cross agricultural land, while 77 percent of Route Section S1 would cross agricultural land. The total ROW impact of both Route Section S3 Eastbound and S3 Westbound would be more than 90 percent agricultural land. The majority of agricultural land that the route sections would cross is crop land. Agricultural land in Route Section S2 is comprised of 82 percent crop land, 10 percent pasture, and 9 percent old field. Agricultural land in Route Section S1 is comprised of 56 percent crop land and 44 percent old field. Route Section S3 Eastbound and S3 Westbound are comprised of primarily crop land (76 percent and 88 percent, respectively), with the remainder being old field. Agricultural land use in the South Routing Area is summarized in Table 7.3-1.

Table 7.3-1 Agricultural land use along route sections in the South Routing Area

Route Section	Agricultural Land Use											
	Crops			Pasture			Old Field			Specialty		
	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)	Length (feet)	Existing ROW (acres)	New ROW (acres)	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)
S1	16,088.0	36.3	19.4	0.0	0.0	0.0	8,534.0	32.7	10.1	0.0	0.0	0.0
S2	21,666.0	14.5	74.9	2,562.0	3.2	7.5	2,235.0	2.8	6.1	0.0	0.0	0.0
S3 Eastbound	6,424.0	0.1	10.5	0.0	0.0	0.0	233.0	2.7	0.6	0.0	0.0	0.0
S3 Westbound	9,053.0	2.1	16.6	0.0	0.0	0.0	203.0	2.1	0.5	0.0	0.0	0.0

In addition to the agricultural practices and land uses listed above, other agricultural practices that may be affected by this project include windbreaks, organic farms, drainage tiles, and automated tractor use. Initial research into locations of organic farms along the project routes does not indicate the presence of any such farms in the South Routing Area (S1, S2, or S3).

Land enrolled in the Farmland Preservation Program (FPP) is an indicator of farmland quality and value. Although electric transmission lines are permitted on lands enrolled in the FPP and are considered to be compatible with agricultural use, the number and size of parcels enrolled in the FPP along each route have been identified from a database obtained from DATCP. The database lists landowners who have

voluntarily filed a FPP agreement with DATCP. One landowner has been identified in Route Section S2 as having FPP property. All FPP parcels impacted by the project would be identified during the easement acquisition process along the route selected by the Commission if the project was approved.

Potential construction-related impacts on agriculture would generally be short-term in nature, and could consist of crop losses, soil mixing, and/or soil compaction along equipment access routes and around structure installation sites. ATC would likely mitigate these short-term impacts by providing compensation to the property owner or person leasing the land for farming and/or by restoring agricultural lands to the extent practicable. Where appropriate, mitigation techniques such as deep tilling could be utilized. Wisconsin Stat. § 182.017(7)(c) through (h) is a list of landowner rights, many of which address issues important to farm fields, and these rights include required construction impact mitigation measures such as proper segregation of topsoils, post-construction restoration of the field, repair of damaged fences or drainage tile, payment for crop damage and others. A detailed discussion of landowners' statutory rights is included in Section 4.3 in Chapter 4 of the EIS.

In general, in advance of any construction for the project, ATC would and should coordinate with each agricultural landowner regarding their farm operation including field facilities like drainage tiles, locations of farm animals and crops, current farm biological security practices, landowner concerns, and use of access routes. Potential impacts to each farm property along a given ordered route would need to be identified and, where practicable, construction impact minimization measures would need to be agreed upon and implemented. Site-specific practices would need to vary according to the activities of the landowner/farm operator, the type of agricultural operation, the susceptibility of site-specific soils to compaction, the degree of construction occurring on the parcel, and the ability to avoid areas of potential concern. ATC has stated in its CPCN application that it would have this work done.

There are no confined animal dairy operations within 300 feet of the outermost centerline of the proposed structures in the South Routing Area.

NRCS easement Geographic Information Systems (GIS) data show that there are no properties in the South Routing Area subject to NRCS easements such as the wetland reserve program or grassland reserve program.

Nearly all of the land that is actively being farmed in the proposed ROW of the project is comprised of NRCS-classified prime farmland. PSC staff reviewed GIS information to analyze and confirm the locations of prime farmland along the project routes.

Prime farmland is land that contains soils with certain characteristics that allow for high yields of a variety of commonly grown agricultural crops. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding. Prime farmland, as described here, is a categorization based on environmental factors. It is not a program, certification, or an easement category. The geologic history of the area played a large role in the formation of these farmlands.

Wisconsin's forest tax laws encourage sustainable forest management on private lands by providing a property tax incentive to landowners. Two forest tax law programs, both administered by DNR, currently exist: the MFL and the FCL. No properties along the project are shown to be currently enrolled in the FCL program.

DNR records show that there are nine individual land parcels along Route Section S1 that are currently enrolled in the MFL program. The full extent to which MFL program participation may be affected by a possible chosen route is unknown at this time. During the easement negotiation process, conflicts between the terms and conditions of the MFL program agreement and ATC's proposed easement, if any, would need to be addressed. If any landowner would be unable to continue participation in the program, or if the level of participation was impacted, ATC would and should compensate the landowner as appropriate. If there were conflicts between a transmission line easement and the obligations of a landowner under the terms of the program, land in the easement area would possibly have to be removed from the program.

7.3.2. Land use plans

Figure 7.3-1 shows the municipalities potentially affected by the project in the South Routing Area.

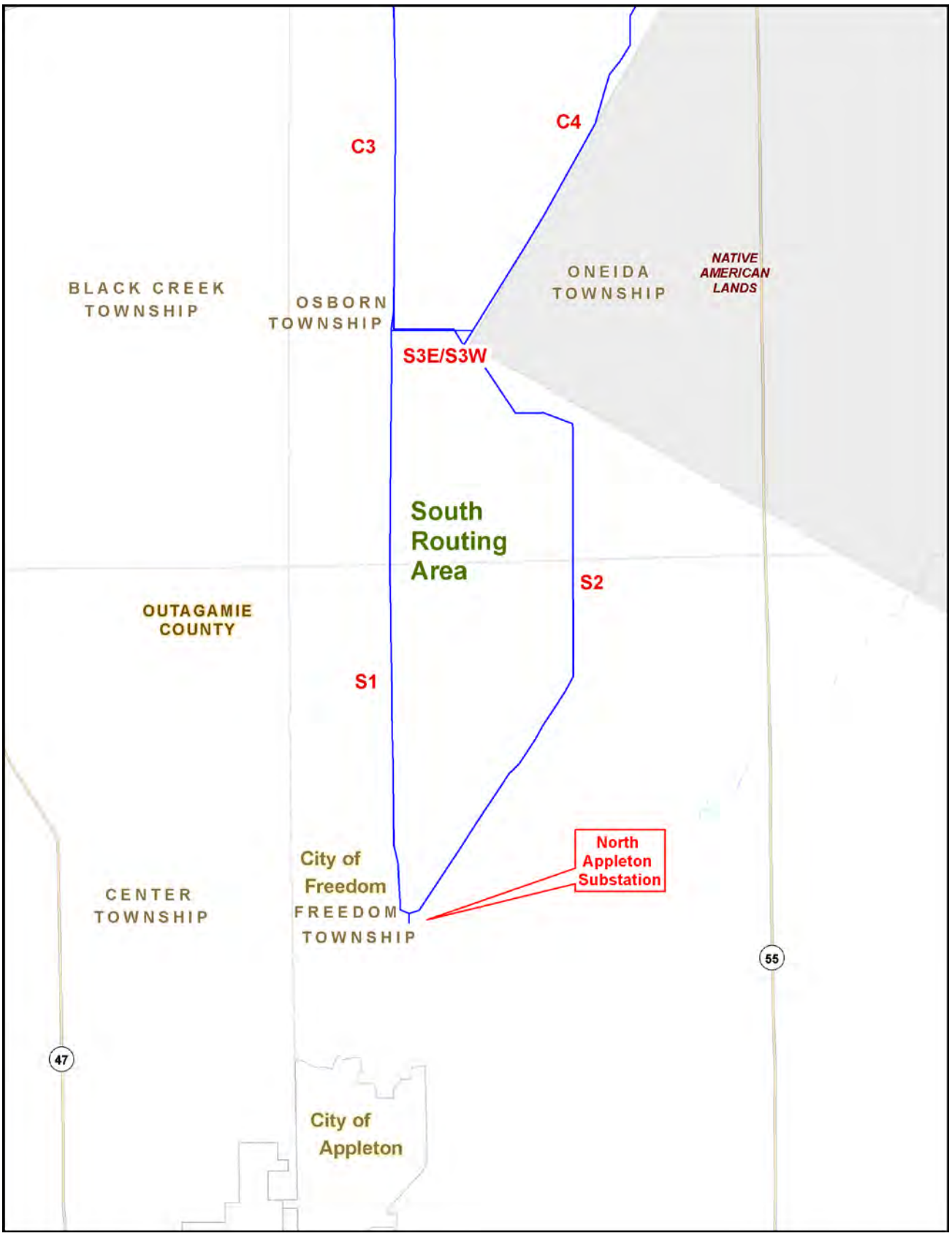
The Southern Route Sections S1 and S2 are located in the towns of Freedom and Osborn, in Outagamie County, with potential connector Route Section S3 located in the town of Osborn. See Figure 7.3.-1. Land use along all of these route sections is mixed. The majority of land use is rural in nature and primarily made up of agricultural lands, including row crops such as corn or soybeans, old fields, and pastures. This agricultural land use is expected to continue into the future, and both towns' municipal land use plans designate the majority of lands in the areas of the southern route options as "Agriculture" or "Rural Character"—which is primarily used to encourage agriculture. An electric transmission line is generally compatible with agricultural land use such as row crops.

Other rural land use designations such as "Open Lands" with a specification of either wetlands or woodlands are common across both routes. None of the routes pass directly through an urban center or dense residential development, but moderate residential development and other scattered farmsteads or residences would likely be impacted by any of the proposed route sections. More information on these impacts can be found in Section 7.3.3.

In general, residential land use is considered to be more sensitive to impacts from electric transmission lines than commercial or industrial land uses, primarily due to potential adverse aesthetic effects, such as visual impacts or noise. Urban areas or areas where land use planning indicates future urban or high density residential developments have the potential for more conflict with regards to the compatibility between transmission lines and land use plans. Other land uses that are less compatible with transmission lines are parks or recreational lands, where aesthetic effects such as visual impacts or noise and the creation of ROW corridors that can fragment habitats and introduce invasive species may impact the ability of an area to remain a high quality park or recreational area.

Corridor-sharing with other types of infrastructure such as existing transmission lines and multi-lane highways can mitigate new transmission line impacts by causing incremental impacts instead of the entirely new impacts associated with a new ROW corridor. Narrow roads, distribution lines, and gas pipelines typically have smaller and less disturbed ROWs than transmission lines and highways, however, and may not be as suitable at reducing impacts from new transmission lines.

Figure 7.3-1 Municipalities potentially affected by the project in the South Routing Area



7.3.2.1. Route Section S1

Route Section S1 follows an existing transmission line corridor for the entirety of its length. It begins at the existing North Appleton Substation in the town of Freedom and proceeds north from the substation through a range of land uses and ends at the intersection with Route Section C3 from the Central Route, north of CTH EE. Along the length of Section S1, approximately 71 percent of the ROW required for the two new transmission lines is shared with the existing 138 kV line utility corridor, requiring an additional 36.7 acres of new ROW. The most common land use in the proposed project area is agriculture at 77 percent, with row crops the most common type of agriculture use. Both of the town land use plans as well as the land use plan for Outagamie County indicate that maintaining rural and agricultural land use is an important part of their future land use.

Although much of the existing use is agriculture, a large portion of land crossed by Route Section S1 is shown on the town of Freedom's land use map as Rural Transition, which is defined in their Comprehensive Plan as "areas that are projected to transition from primarily agricultural use to more intensive uses, such as platted residential subdivisions, commercial developments, and/or industrial developments…"[101] This part of the route would have the two new transmission lines adjacent to an existing 138 kV line. It is likely that the three parallel transmission lines would discourage some residential development near the utility corridor. The proposed lines would also cross an area that has been proposed as a trail connecting one of these new residential areas to other local roads. The town of Osborn also has an area along Whitetail Drive and French Road that is indicated as "Residential" on its Land Use Plan. Existing houses in this area tend to be spaced farther apart with substantial vegetation to provide screening from other residences and the existing 138 kV line.

Route Section S1 also crosses several streams where the surrounding area has been classified as "Environmental Corridors" by the town of Freedom in its Comprehensive Plan. The plan suggests a buffer around the streams to protect habitat and water quality, as well as retaining woodland in these areas.[102] In each area where the proposed S1 Route Section crosses one of these features, the expansion of the ROW needed to accommodate the two new transmission lines would require the removal of some riparian woodland habitat. Within the town of Osborn, the proposed Route Section S1 crosses through an area indicated as open land consisting of both wetlands and woodlands, in part sharing the existing 138 kV line ROW, but requiring some clearing of woodland to expand the ROW 40 feet in width. Further discussion on forested land impacts can be found in Section 7.2.2.

7.3.2.2. Route Section S2

Route Section S2 also starts at the North Appleton Substation in the town of Freedom, and runs northeast and then north into the town of Osborn, terminating near the boundary with the town of Oneida. It shares ROW with an existing 345 kV transmission line in some areas, shares ROW with an existing Guardian natural gas pipeline in others, and runs through areas where there are no existing utility corridors, resulting in variable amounts of new ROW width required throughout the length of the route section. In total, 102.4 acres of new ROW would be required if Route Section S2 was selected. Much of the existing land use is agricultural; approximately 85 percent overall. There are some moderately-developed residential areas as well as existing forests, wetlands, and a golf course along this proposed route.

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[101] Town of Freedom Comprehensive Plan, Chapter 10, Town of Freedom Planning Commission, Adoption Date: June 2003, Amended: August 2009.
[102] Town of Freedom Comprehensive Plan.

Both of the town land use plans as well as the land use plan for Outagamie County indicate that maintaining rural and agricultural land use is an important part of the future land use. Much of the area that is currently categorized as agriculture is listed as "Rural Character" land use under the town of Freedom Comprehensive Plan, which allows for existing agriculture and livestock intensive agriculture.[103] Fewer areas along the eastern Route Section S2, compared to S1, are indicated as areas of Rural Transition by the town of Freedom. In some of these Rural Transition areas, particularly south of Garvey Road, east of CTH C, the proposed areas for Rural Transition would be much less suited to residential development or commercial development if the two new transmission lines join the existing 345 kV line currently crossing through that area. Where there are existing residential areas in both towns, the proximity of the new lines to residences and farmsteads is likely to create some impacts, which is discussed further in Section 7.3.3.

Route Subsection S2-2 crosses an area that is indicated on the town of Freedom's Comprehensive Plan as suitable for mining or quarry use. There are existing non-metallic mining operations in the nearby area. The presence of transmission lines would be unlikely to constitute a significant barrier to this type of land use, although operations would need to take into account the limitations of working near the conductors and structures.

Route Subsection S2-4 crosses an area designated by the town of Freedom as Parks and Recreation land, which is currently made up of the Irish Waters Golf Course. If this route is selected, the proposed transmission lines would share the existing 345 kV corridor, which would reduce the amount of new ROW needed, although it would require some expansion of the total area of existing and proposed ROW on the golf course totaling 6.32 acres. There would be visual impacts as a result of having three transmission lines each on its own set of structures crossing the golf course less than 600 feet from the central parking area and clubhouse.

7.3.2.3. Route Section S3

Route Section S3 is a potential connection section that links the eastern S2 route to the western C3 route or links the western S1 route to the eastern C4 route heading north. It would not be utilized as part of this project if an entirely eastern (S2 to C4) or western (S1 to C3) route was approved. Either way, it is entirely within existing road ROW or agricultural lands that are on the land use plan for the town of Osborn as remaining in agricultural use.

7.3.3. Proximity to residences and potentially sensitive populations

This section discusses the proposed project's proximity to residences and farmsteads along the South Route Sections S1, S2, and S3. See Figures Vol. 2-1.08, 2-1.10, and 2-4 to locate the South Routing Area. Along all proposed routes in the South Routing Area, the lines would not come within 300 feet of a school, daycare, or hospital. Information for this section came from the tables submitted in the project application that categorize the number of residences within specified distances of the proposed centerline of the transmission lines and the estimated magnetic fields associated with the different proposed transmission line configurations. Additionally, Commission staff reviewed comments submitted by the public, reviewed aerial imagery, and conducted site visits along the routes. A table summarizing the number of residences within 300 feet of either one of the proposed centerlines on all southern route sections is found below in Table 7.3-2.

[103] Town of Freedom Comprehensive Plan.

Table 7.3-2 Number of residential structures within 300 feet of the proposed centerline on Route Sections S1, S2, and S3 in the South Routing Area

Route Section	Distance to Proposed Centerline				Total
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	
S1		3	10	17	30
S2	2	3		7	12
S3 (Eastbound and westbound)				3	3

The proximity of properties to high-voltage transmission lines is important because of real and perceived concerns about local aesthetics, changes to valued viewsheds, personal enjoyment and use of one's property, potential impacts to property values, magnetic fields and other electrical phenomenon, and personal and public safety. A generalized discussion of some of these issues is contained in Chapter 5 of this EIS.

Concerns about the construction phase of the proposed project may also be related to the potential impacts to residences. In particular, the southern route options are in a region that has been classified as an arsenic advisory area by DNR, and there is some concern that construction activities such as drilling or blasting to install structures might fracture rock and create a risk of arsenic being released into groundwater/nearby wells.[104] For these advisory areas, a guidance document relating to drilling activities (directed at wells) has been produced by DNR that may have applicable techniques to decrease any risk of releasing arsenic into groundwater supplies, such as no air rotary drilling.[105]

Commission staff recognizes that individuals and families have substantial financial, physical, and emotional investments in their homes and properties, and that the discussions in this document will most likely not adequately address all the issues felt by many individuals owning property along the proposed routes. This section is not addressing impacts that are restricted to agriculture (see Section 7.3.1) or other open land types such as woodlands or wetlands (see Sections 7.2.2 and 7.2.3). Refer to the appropriate sections of this EIS for more detailed description of impacts to those property types. The following sections of the EIS discuss some special concerns raised with regards to the proximity to residences or sensitive populations for each proposed Route Section.

7.3.3.1. Route Section S1

Route Section S1 would follow an existing transmission line corridor for the entirety of its length. It would begin at the North Appleton Substation, where the proposed 138 kV line would run along the eastern side parallel to French Road, and the proposed 345 kV line would begin on the northern side of the substation along Rock Road. See Figure Vol. 2-1.10. French Road and Rock Road residents around the substation would have these new transmission lines closer to but still on the opposite side of the road from their houses for Subsection S1-1. Leaving the North Appleton Substation, Subsection S1-2 would co-locate with two existing 138 kV transmission lines and travel north. The two existing 138 kV lines would remain in their existing location and the two new lines would be built to the east, with the 345 kV line built on the eastern edge. On the north side of Rock Road, the new lines would come within 110 feet of a residence. Noise and visual impacts could increase. There is a small row of trees on the edge of this

[104] DNR website on arsenic in groundwater, including DNR Map of Arsenic Advisory Area: http://dnr.wi.gov/topic/Groundwater/images/arsenic/AAA.jpg
[105] DNR website on well construction methods that eliminate the introduction of oxidants in the aquifer systems http://dnr.wi.gov/topic/Groundwater/documents/arsenic/sp_cs_areas/Specs.pdf

property that might provide some partial screening, and would not be removed due to the expansion of the ROW.

The end of Subsection S1-2 and all of S1-3 would be located at the back of properties on French Road, and although the ROW would expand in this area and require the removal or trees on each property, there would be some screening vegetation left for residents. Here one of the 138 kV lines leaves the corridor and travels northeast, while the other existing 138 kV line would be rebuilt to the west of its existing centerline.

Subsection S1-4 would begin on the north side of Schroeder Road, with all three lines sharing a 190-foot wide ROW, of which 40 feet would be a new addition to the ROW width. The existing 138 kV line would be rebuilt to the west of its existing centerline throughout, with the new 138 kV line in the center and the new 345 kV line on the eastern edge of the configuration. On the north side of Schroeder Road, the 345 kV centerline would be approximately 150 feet from a residence, and this landowner would lose some established landscaping trees along the length of the property due to the expansion of the ROW. The centerline would pass over the mound system and a small outbuilding on this property.

As the lines cross CTH S, the rebuilt 138 kV line would come within 215 feet of a farmstead on the south side of the road, and less than 40 feet from the farm outbuildings and barn complex as the ROW would extend into the farmyard. On the north side of CTH S, the 345 kV line would be approximately 115 feet from a residence, and the expansion of the ROW would require removal of several mature trees near the house as well as other young trees further back on the property, decreasing the screening of the lines. This area is the start of a subdivision that extends north through Geenen Lane, Panoramic Avenue, and Outlook Drive up to Center Valley Road. There are a number of undeveloped parcels in this area that could be less likely to be developed with the addition of two more transmission lines crossing the area.

A residence on the southwest side of Ed's Lane would lose approximately 475 feet of a formally landscaped row of trees planted to screen the property, as a result of the expansion of the ROW. The 345 kV centerline would be approximately 260 feet from the residence and 100 feet from a garage. Further north, a group of residences on the western end of Geenen Lane would be impacted by the expansion of ROW and proximity of the 345 kV line, which would require the removal of some landscaping and natural woodland vegetation. The 345 kV centerline would be 110 feet west of one residence and 80 feet west of another in this area.

North of the crossing of Duck Creek, the relocated 138 kV line would be approximately 160 feet east of one residence on Panoramic Avenue and 200 feet east of a second residence and several undeveloped plots. No existing tall vegetation exists to screen these properties from the existing and proposed lines, although new tree plantings or landscaping in the area not yet established could be adapted to the ROW expansion. As the lines would approach Outlook Drive, the 345 kV centerline would be just under 300 feet from a residence to the east, with no screening vegetation in the area.

Where the proposed lines crossed Center Valley Road, they would come within a very close proximity to two houses on the north side of the road, passing between them. The house on the west of the proposed lines would be approximately 95 feet from the relocated 138 kV centerline, with its associated storage barn/garage only five feet from the centerline. The house on the east side of the lines would be approximately 190 feet from the 345 kV centerline, with its associated workshop/garage only 45 feet from the centerline. Both properties would lose some mature trees to the ROW expansion at the roadside, the residence on the east side of the proposed lines would have a 345 kV line crossing an area of formal

landscaping, their mound system and a vegetable garden. The house on the west would have the 138 kV line running directly over their driveway.

Further north, the proposed S1-4 subsection would pass to the east of a large property with formal gardens. The expansion of the ROW west into this area would require the removal of some of this formal landscaping and scattered mature trees. The residences on this property would be over 300 feet from the proposed western centerline. Further north, a residence on the west side of French Road would be approximately 250 feet from the proposed 345 kV centerline, with no screening vegetation in the area. As the proposed lines crossed Krueger Road, there would be a residence on the western side of the proposed route that has a pond on their property that all three lines would cross.

As Subsection S1-4 continued north, it would come into another subdivision area associated with Whitetail Road and Sievert Road. Many of these lots are already developed with houses located on large lots with significant screening vegetation consisting of mature trees on most of the properties. There are some houses that do not have this screening vegetation, including one on the western side of the proposed route on Whitetail Road. Here the relocated 138 kV line could cross the front yard of the house and driveway with only 90 feet between the residence and the centerline. A residence on the eastern side of the lines, and south of Whitetail Road would be just under 190 feet from the proposed 345 kV centerline, but retain a row of trees that would provide some screening from the lines.

Two residences between Whitetail and Sievert Roads are located in more wooded settings, and although both would lose some mature trees to the ROW expansion, both would retain some screening vegetation. As the proposed lines crossed Sievert Road, they would pass closely between houses on both north and south sides of the road. To the south, the relocated 138 kV line would be approximately 105 feet from a residence that would lose almost all of its screening vegetation to ROW expansion. To the east of the proposed route, the 345 kV line would be 215 feet from a residence, 55 feet from the associated garage/storage building, and would run along the length of the driveway to this residence. On the north side of Sievert Road, the 345 kV line would be 140 feet from a residence on the eastern side, and the ROW expansion could result in the removal of many mature trees that form a partial screen to the proposed line route. On the western side of the proposed lines, the 138 kV line would be 110 feet from a residence with no screening vegetation, and just north of that residence, sharing a driveway, another house would be approximately 150 feet from the 138 kV line, with no screening vegetation and a garage approximately 30 feet from the line.

7.3.3.2. Route Section S2

Route Section S2 would share two different utility corridors and the new impacts that would occur to expand the ROW to accommodate the two new lines would be different depending on what type of corridor it shared. As the proposed route left the North Appleton Substation, it would run alongside an existing 345 kV line and require between 60 and 155 feet of new ROW. This difference depends on where the route would rebuild the existing 345 kV line on vertical monopoles, or where the new lines would simply run adjacent to the existing 345 kV lines on existing H-frame structures. Further north, the proposed route would leave the existing 345 kV line and join the Guardian natural gas pipeline, where it would require approximately 170 feet in new ROW width along subsection S2-7; slightly variable based on any angles in pipe alignment.

Similar to S1, Route Section S2 would begin at the North Appleton Substation, where the 138 kV line would run along the eastern side parallel to French Road, and the 345 kV line would begin on the northern side of the substation along Rock Road. See Figure Vol. 2-1.10. French Road and Rock Road residents around the substation would have these new transmission lines closer to but still on the opposite side of

the road from their houses for Subsection S2-1. Leaving the North Appleton Substation area, Subsection S2-2 would be co-located with an existing 345 kV transmission line and travel northeast. The configuration of the lines in this area would have the new 138 kV line furthest west, the new 345 kV line in the center, with the existing 345 kV line on the east side of the transmission lines.

The beginning of Subsection S2-2 would cross French and Rock Roads, and here the two new transmission lines would cut diagonally across a residential property on the northwest corner of the intersection. The centerline to the proposed 138 kV line would be less than 100 feet from the house, and the expansion of ROW would require the removal of several mature trees in the front of the property. Noise and visual impacts from this configuration and proximity would be more noticeable to residents as the existing 345 kV line does not currently cross their property.

Northeast of this area, the lines would eventually come to cross CTH C. Prior to crossing, Subsection S2-3 would begin a new configuration of the lines, with the existing 345 kV line (currently built on H-frames) rebuilt on vertical monopoles, which require less ROW width. The existing 345 kV line would be shifted east, with the new 345 kV line in the center and new 138 kV line on the west side of the configuration. The ROW width in Subsection S2-4 would therefore be 210 feet with new ROW width of 60 feet being added along this subsection and S2-5. A residence on the western side of CTH C would be less than 100 feet from the new 138 kV centerline, which equates to the same distance the residence is to the existing 345 kV line. No significant changes to the property would occur as a result of any ROW expansion.

As the transmission lines proceeded northeast, they would cross Garvey Road. Here the addition of two new lines each on their own structures is likely to cause new impacts to local residents. On the south side of Garvey Road, the 138 kV centerline would be approximately 40 feet from a residence to the west. The ROW would extend to the corner of this residence, and would impact some established trees and landscaping.

North of Garvey Road, the three lines would pass closely between two residences. The residence on the west side of the lines would be approximately 20 feet from the new 138 kV centerline. A small pond in the back yard would have the 138 kV line cross the eastern side of the pond, and a vegetable garden would be between the 138 and the 345 kV lines. Due to the slight change in angle from the existing line to the new configuration, additional trees on the property, particularly at the back of the property, would be impacted. The residence located east of the proposed lines would be approximately 80 feet from the relocated and rebuilt 345 kV centerline. The ROW would extend further onto this property, requiring the removal of some mature trees in the front of the property as well as a strip of mature riparian woodland at the back of the property adjacent to Duck Creek. Neither property would have screening vegetation that could lessen the noise or visual impacts of these additional lines. Additional houses on either side are within 300 feet of the new lines, but have some mature trees that could provide partial screening from these impacts.

South of Center Valley Road, subsection S2-5 would be approximately 275 feet from a residence as it would cross through agricultural fields and shift back to the original configuration with existing 345 kV line on H-frames and the two new lines on delta monopoles. The ROW would not extend onto the residential property or impact any structures or vegetation. North of Krueger Road, Subsection S2-6 would be less than 300 feet from a residence on the east side of the proposed route. With the existing 345 kV line remaining in place closest to the residence, there would be no expansion of ROW or significant impact to this property.

Subsection S2-7 would have the proposed new transmission lines leave the existing 345 kV line corridor and join the Guardian pipeline corridor. Total ROW width for this subsection would be 180 feet. There would be one residence within 300 feet of the proposed 138 kV centerline. However, it is located in a wooded setting and has many mature trees that would not be lost to ROW expansion that would provide some screening vegetation and lessen the visual or noise impacts of the proposed lines.

One residential property on the western side of CTH C, located north of the proposed route (over 300 feet) has a wind turbine located south of the residence, 125 feet north of the proposed 345 kV centerline. ATC states that the proposed route at this location was placed north of and parallel to the Guardian pipeline ROW along the southern portion of the property to avoid a forested wetland and associated waterway south of the property line. However, placement of the transmission lines as described would put the turbine in a situation not considered suitable based on criteria set forth in the Wind Siting Criteria in Wis. Admin. Code ch. PSC 128. The applicant states that PSC 128 does not apply to it, but to a wind farm developer looking to site turbines. The applicant acknowledges that it is taking on the risk in siting the transmission line closer to the wind turbine than the setback prescribed in PSC 128 for placing turbines near a transmission line. The applicant provided information on the anticipated activities and costs associated with relocating the turbine approximately 150 feet from its existing location on the same property that creates a setback in compliance with PSC 128.[106] ATC estimates a total cost of approximately $200,000 to $250,000 to move the turbine, exclusive of real estate and legal costs to acquire the necessary land rights associated with relocating the turbine.

7.3.3.3. Route Section S3 (eastbound and westbound)

If either S3 route is ordered, whether eastbound or westbound, the same three residences would fall within 300 feet of the proposed transmission lines. See Figure Vol. 2-1.08. All three residences are found on the south side of CTH EE, on the east and west sides of French Road. The main difference to the residential impacts is whether the 345 kV or 138 kV line would be closer to the road. The S3-eastbound orientation would have the 345 kV transmission line immediately north of CTH EE, with the 138 kV line located further north within the agricultural field. The S3-westbound route would have this situation reversed, with the 138 kV line along the road, and 345 kV line further back in the field.

In all three cases, the expansion of ROW needed for the proposed transmission lines would not extend to the southern side of CTH EE; therefore none of the residences would lose any screening vegetation to ROW expansion. Noise or visual impacts would be similar for all three residences, with some slight variation depending on whether there were any mature trees between the house and the lines, or the distance of the residence from the road and proposed lines. The residence on the east side of French Road would be approximately 170 feet south of the proposed lines. There are several mature trees on the north side of the house that may provide some partial screening of the transmission lines. The house immediately west of French Road is approximately 180 feet from the proposed southern centerline, with only a few landscaping trees or shrubs dotted across the yard. The residence further west would be approximately 210 feet from the southern centerline and has no real screening vegetation in place.

7.3.3.4. Electric and magnetic fields

The following section on EMF is provided to give readers an idea of the expected magnitude of the magnetic fields that could be produced by the proposed transmission lines under expected normal load and peak load conditions. More background information and a general discussion of EMF is found in

[106] The original data request response from ATC can be found in PSC REF#: 214881. A supplemental response to the Commission's data request that includes estimated works and costs of moving the turbine can be found in PSC REF#221006.

Section 5.5.6 of Chapter 5 and Appendix B of this EIS. Because of questions and concerns from the public, the Commission requires applicants for transmission line projects to provide magnetic field data for locations where there are existing transmission lines along the project routes and the estimated magnetic fields at varying distances from the centerline of the proposed project, for both normal load and peak load conditions, at one and ten years after the new line is placed in operation.[107] Magnetic fields are proportional to the current flowing on a line at any given time. Staff has verified that the magnetic field estimates provided by the utility are reasonable estimates based on the modeling tools available.

Because current flow is highly variable, only an estimate of the magnetic fields can be provided. If route S1 were ordered, the route would have no residences within 50 feet of any centerline. If route S2 were ordered, there would be two residences within 50 feet of proposed centerlines. See Figures Vol. 2-1.10 and 2-1.08.

Route Section S1

The southernmost section of S1 would share the corridor of two existing 138 kV lines, which are each on their own H-frame structures. The two proposed lines would each be on their own delta configured monopole structures adjacent to the existing lines. The existing magnetic fields of the western 138 kV line (6851) range from 89 to 99 mG under normal and peak load conditions at the centerline, while the second existing 138 kV line (K-37) fields range from 109 to 108 mG under normal and peak load conditions at the centerline respectively.

Estimated magnetic field levels for 2020 for the area with this configuration are 56 to 63 mG (average and peak loads respectively) for the western, 138 kV, centerline and 63 to 72 mG for the eastern, 345 kV, centerline (average and peak loads respectively). Ranges of EMF found between the two outside centerlines (under all four lines) would range from 32 mG to 91 mG. At 50 feet from each respective centerline, the estimated magnetic field levels for 2020 would be 9.8 to 11 mG for the 138 kV line and 28 to 33 mG for the 345 kV line. At 200 feet from each centerline the levels would decrease to 0.22 to 0.33 mG for the 138 kV line and 2.5 to 3.0 mG for the 345 kV line.

North of the point where one of the existing 138 kV lines leaves the proposed corridor and moves northeast, the line configuration for most of the rest of Route Section S1 would have one existing 138 kV line (6851) relocated and rebuilt on vertical configured monopoles on the western side, the proposed 138 kV line installed on vertical configured monopoles in the center, and the proposed 345 kV line installed on vertical configured monopoles on the eastern side. Existing values for the current 138 kV line range from 14 to 17 mG under normal and peak load conditions at the centerline respectively. There would be no houses within 50 feet of proposed centerlines for this area of Section S1.

Estimated magnetic field levels for 2020 for the area with this configuration are 20 to 23 mG at the 138 kV centerline and 65 to 75 mG at the 345 kV centerline (average and peak loads respectively). At 50 feet beyond the 138 kV centerline, the estimated magnetic field levels for 2020 would be 6.6 to 7.9 mG for the majority of the 138 kV line (a small section towards the northern third of the route would drop to 3.9 to 47 mG) at average and peak loads. At 50 feet beyond the 345 kV centerline in the other direction, estimated levels would be 24 to 28 mG at average and peak loads respectively. At 200 feet the levels would drop to 1.0 to 1.3 mG for the 138 kV line (with a variation as described above of 0.97 to 1.2 mG)

[107] Peak load is defined as 100 percent of estimated peak, system normal configuration and normal load is defined as 80 percent of peak load. Values provided are for 2020, the anticipated initial year of operation.

and 2.4 to 2.9 mG for the 345 kV line (slight variation in the north as described above of 2.5 to 2.9 mG) at average and peak loads respectively.

One small area of Route Section S1 would have a change in the configuration of the transmission lines from delta monopoles to vertical monopoles where the lines would pass closely between residences near Whitetail and Sievert Roads. In this area, EMF values for the existing 138 kV line are 15 to 17 mG at normal and peak loads respectively, dropping to 3.1 to 35 mG at 50 feet from the centerline, and 0.59 to 0.63 at 200 feet from the centerline. Estimated EMF values for 2020 in this area are 20 to 23 mG at the western 138 kV centerline and 65 to 75 mG at the eastern 345 kV centerline. Estimated values underneath all three lines would fall into a similar range. At 50 feet beyond each centerline, values would fall to 3.9 to 4.7 mG for the 138 kV line and 24 to 28 mG for the 345 kV line. At 200 feet from each centerline, there would be a further decrease to 0.97 to 1.2 mG for the 138 kV line and 2.5 to 2.9 mG for the 345 kV line.

Route Section S2

Route Section S2 would have three types of line configuration, most of which would have the two new lines on delta configured monopoles built west of the existing 345 kV line (ATC's R-304 line) which is on H-frame structures. Subsections S2-2 and S2-6 fall into this configuration, and in these areas, no residences would be within 50 feet of any centerlines. Existing magnetic fields of the 345 kV line range from 186 to 217 mG under normal and peak load conditions at the centerline, respectively.

Estimated magnetic field levels for 2020 in these areas are 38 mG at both normal and peak loads for the western, 138 kV, centerline and 185 to 217 mG at normal and peak loads for the eastern, existing 345 kV, centerline. Levels between the three lines would range from 27 to 217 mG. At 50 feet from the outside centerlines, levels would drop to 7.6 to 8.1 mG for the western 138 kV line, and 87 to 102 mG for the eastern 345 kV line. At 200 feet, levels would decrease to 2.5 to 3.0 mG for the 138 kV line, and 5.4 to 6.3 mG for the 345 kV line.

Subsections S2-3, S2-4, and S2-5 make up an area where the proposed route would pass closely through a residential area and cross Duck Creek. The existing 345 kV line would be relocated and rebuilt on vertical monopoles, and the two proposed lines would also be built on vertical monopoles to decrease the amount of ROW needed. Even with this effort, Subsection S2-4 would have two houses within 50 feet of the proposed western 138 kV centerline, north and south of Garvey Road. Current EMF levels for the existing 345 kV line are 99 to 116 mG at normal and peak loads respectively. Estimated magnetic fields for 2020 for these subsections are 40 to 42 mG (average and peak loads respectively) for the proposed, 138 kV, centerline, and 115 to 135 mG for the eastern, 345 kV, centerline. EMF levels between the three lines are not estimated to go over or under these values. At 50 feet beyond each outside centerline, EMF levels are estimated at 6.8 to 8.8 mG for the 138 kV line and 45 to 53 mG for the 345 kV line. At 200 feet from the centerlines, estimated values decrease to 2.5 to 3.0 mG for the 138 kV line and 5.4 to 6.3 mG for the 345 kV line.

Subsections S2-7 would have a different configuration of the proposed lines and leave an existing transmission line corridor to follow an existing natural gas pipeline corridor. The 138 kV line would be built on the west, and the 345 kV line built on the east, with the pipeline crossing from west side to east side approximately halfway down the subsection. No residences would be located within 50 feet of either centerline on this subsection. Estimated magnetic field levels for 2020 would be 35 mG for the 138 kV centerline (at both normal and peak loads) and 62 to 71 mG for the 345 kV centerline at normal and peak loads respectively. At 50 feet from each centerline, estimated levels decrease to 5.3 mG for the 138 kV line and 29 to 34 mG for the 345 kV line. Estimated levels further decrease at 200 feet from each

centerline, with estimated levels of 0.49 to 0.60 mG given for the 138 kV line and 2.7 to 3.2 mG given for the 345 kV line.

Route Section S3 is a potential connection that could be selected if a certain combination of South and Central Routes are ordered. It has a westbound and eastbound line configuration, with some minor variations based on the possible route selected. See Section 7.1.3.1 in this chapter for a detailed route description. For either option, there would be one 138 kV line and one 345 kV line running parallel to Rock Road. Whether eastbound or westbound is selected, each line has a few very minor variations within the estimated EMF levels (±0.01 mG) across the length of the route section and compared between east or westbound. One range of values is therefore given to describe the estimated magnetic fields for both options. There are no residences within 50 feet of any centerline along Route Section S3, eastbound or westbound.

Estimated magnetic fields for 2020 at each centerline are 35 mG for the 138 kV line and 61 to 71 mG for the 345 kV line at normal and peak loads respectively. The estimated values at the midpoint between the two lines are 31 to 35 mG. At 50 feet from each centerline, values for the 138 kV line are 5.3 to 5.2 mG (normal and peak loads, respectively) and 29 to 34 mG for the 345 kV line. The estimated values decrease further at 200 feet from each centerline, to 0.49 to 0.61 at 200 feet from the 138 kV line and 2.7 to 3.2 mG at200 feet from the 345 kV line.

7.3.4. Aesthetics and visual impacts

Aesthetics and visual impacts are closely related and often used interchangeably. Aesthetics tends to encompass whole sensory experiences including sights, smells or sounds from the surrounding environment while visual impact is more directly related to the observer's views, sightlines and viewsheds. More background discussion on the types and perception of aesthetic impacts can be found in Section 5.5.1. The following discussion of aesthetics is based on the following assumptions:

- Different viewers may have different levels of visual sensitivity.
- The surrounding physical setting can influence the degree of visual impact.
- The viewing conditions can influence the degree of visual impact.

In general, aesthetic and visual impacts are difficult to measure and tend to be perceived as greater in more natural or scenic settings. However, homeowners in partially developed residential settings can also experience significant aesthetic and visual impacts related to transmission lines, especially if no other aboveground utility infrastructure is present in the area.

The Southern Route Sections would cross areas where agriculture is the dominant landscape feature, interspersed with moderately dense residential developments, woodlands, and wetland areas. Overall, the topography is generally flat or gently rolling hills. The proposed configuration of having the two new transmission lines each on their own structures, one at either 120 or 135 feet tall and the other at 85 to 90 feet tall, rather than double-circuiting the lines, is likely to result in higher visual impacts across the South Routing Area. The impact of the heights of the new facilities would likely be only partially mitigated by the proposed oxidized coating on the structures, meant to blend in better with the northern woodlands.

Section S1

Route Section S1 begins at the North Appleton Substation and crosses Rock Road to join an existing transmission line corridor and proceed north. The existing transmission lines in this area are two 138 kV lines, both on H-frame structures. The existing ROW is 150 feet in width, and this would increase by an additional 168 feet to a total ROW width of 318 feet to accommodate all four lines. Residences on Rock

and French Roads would have more transmission lines closer to their residences, in addition to the existing lines and the substation. Although the visual impacts of electric facilities would not be new to the area, there would be an increase in the number of lines and the visual congestion.

Prior to crossing Schroeder Road, one of the existing 138 kV lines would turn northeast and leave the proposed corridor for this project. One 138 kV line would remain and be rebuilt on vertically configured monopoles, as would the two new proposed lines. Less new ROW would be needed by rebuilding the existing line and new lines onto the vertical poles than just adding the new lines and their associated structures to the east. Visual impacts would be mitigated somewhat by ensuring the two 138 kV lines are on similarly sized structures. However, a corridor with three structures and lines is still likely to create visual impacts, particularly where they would cross a road, pass through a woodland area, or approach or pass through a residential area.

Two residential developments would be likely to experience increased visual impacts from the proposed new lines. One is between CTH S and Center Valley Road and the other is near Sievert and Whitetail Roads. The additional lines and ROW expansion would pass close to several residences in these areas, remove screening vegetation on some properties, and cross areas that are planned for future residential development. More specific residential impacts are described in Section 7.3.3 above. The increased number of lines and associated ROWs crossing the residential roads in these areas would be likely to increase visual impacts to local residents and commuters.

Visitors to the Osborn Town Hall would likely notice the addition of multiple lines and structures in close proximity to the Town Hall Building, as the 345 kV line would pass only 50 feet to the west of the building over the parking area. If one of the S3 routes was chosen in addition to the S1 route, this visual impact would increase as the Town Hall would have transmission lines on both the west side of the building and to the north across CTH EE.

Section S2

Route Section S2 begins at the North Appleton Substation, and the visual impacts of the two new lines to nearby residents of Rock and French Roads would initially be similar as described for S1 above. However, Route Section S2 would join an existing 345 kV line that proceeds northeast from the substation through agricultural fields. Subsections S2-2 and S2-6 would have the existing 345 kV line remain on its H-frames on the eastern side of the configuration with proposed new 345 kV line built on delta monopoles in the center of the configuration, and the proposed new 138 kV line built on the western side, also on delta monopoles. All three structures would be at different heights and the ROW would be expanded from the existing 150 feet in width to 305 feet in width. The proposed route in this configuration would typically cross through agricultural fields, and primarily create an aesthetic impact at those locations where it would cross a road, particularly where there may be houses, such as at CTH S, CTH J or Sievert Road. The heights of the structures would make them visible across the farm fields.

Subsections S2-3, S2-4, and S2-5 have a different configuration from that described above, although the two new lines would continue to follow the corridor of the existing 345 kV line. For these subsections, all lines would be built on vertical monopoles, which would allow the ROW to decrease to 210 feet in width. These subsections cross CTH C and Garvey Road, where there is residential housing in close proximity to the proposed route. The lines would then cross Irish Waters Golf Course before changing to the above mentioned configuration in Subsection S2-6. Although the introduction of the two new lines to the existing corridor would not be as significant as adding the three lines all at once, the increase in the number of structures, lines, and the wider ROW width, particularly in this area where homes are near the

ROW will increase the visual impact for residents. Visitors to the golf course are likely to experience increased visual impacts as the three lines would run directly across several greens and fairways.

Further north, Route Section S2 leaves the existing transmission line corridor and joins the Guardian pipeline corridor, proceeding northwest, predominantly through agricultural fields and thus visible for some distance. The two new transmission lines would be built on delta monopoles, and their presence would be a new element on the landscape in addition to an increase in ROW width of approximately 170 feet. The associated visual impacts of the proposed transmission lines would probably be less in these areas due to the lack of houses or many road crossings, compared to other areas along the route.

Section S3
Route Section S3 is an optional connection route should certain southern and central routes be ordered. It has a westbound or eastbound configuration; however, should either S3 be ordered, the aesthetic and visual impacts would be very similar. Both route options have the two new transmission lines run along the north side of CTH EE. The two new lines and associated structures, one 120 feet tall and the other 85 feet tall, would create a new visual impact in this area, which currently consists of agricultural fields to the north and residential housing to the south of the road. Residents along CTH EE would notice the new structures as they look north from their residences and properties, and those driving along the road would notice the new lines and their connecting sections to the north and south.

7.3.5. Public lands and recreation

Apart from ROWs associated with state, county, and local roads, the only publicly-owned lands along this section are those associated with the Osborn Town Hall, discussed above in Section 7.2.1.

One privately-owned recreational area along Route Section S2 is Irish Waters Golf Course Club, which is a 144 acre golf course located in the town of Freedom, WI. The existing North Appleton to Kewaunee 345 kV line already crosses the golf course on an existing ROW. If this route is ordered there would be two additional lines crossing the golf course, each on its own structures. All of the lines would cross several greens and fairways from southwest to northeast. Several mature trees would need to be removed in the golf course area, as well as a small area of woodland on the southwest corner near where the lines cross Duck Creek. The total area of existing and proposed ROW on the golf course property would be approximately 6.32 acres.

Based on 2013-2014 maps of Outagamie County, both Route Section S1 and S2 would cross local and statewide snowmobile trails. It does not appear that potential route connector S3 would cross any snowmobile or recreational trails. Communicating with trail managers prior to construction and adequate signage during construction, if needed, would minimize the potential for any accidents.

7.3.6. Airports and airstrips

There are no public or privately-owned airports or airstrips on the southern route sections.

7.3.7. Communication towers

An initial assessment of the potential impact to communication facilities was conducted to determine whether a viable risk to communication operations is present. See Section 5.5.12 in Chapter 5.

Along all potential southern route options, there were no AM or TV broadcast facilities within 10 km (6.2 miles) of the proposed routes. There is one FM broadcast facility located within 10 km of Route

Section S3, located on the north side of the city of Seymour (WKZG - 104.3 megahertz (MHz), FM station), and its closest potential route section would be C3 in the proposed central route area.[108]

ATC provided a list of FCC licensed structures found within 10 km of both of the proposed southern routes. Along Route Section S1, there are two shared cell/microwave towers. The project consultant has recommended that one have additional analysis done to determine the potential impacts. Route Section S2 has one cell tower within 10 km, but it has not been identified as needing additional analysis to determine impacts.

7.3.8. Electric distribution lines

Along Route Section S2, there are three places where distribution lines owned by WEPCO would require relocation if the proposed project was approved along this route. There appear to be no distribution lines identified that would need to be relocated along either S1 or S3 if either of those routes were ordered. Existing distribution lines that are proposed for relocation may be located in areas that would pose physical conflicts with the proposed route or where their proximity to one of the transmission lines might result in stray voltage concerns through NEV. No distribution lines are proposed to be underbuilt on either of the proposed new structures along any route.

Due to concern over the impacts associated with stray voltage and its potential effect on confined animals (such as dairy cows), all routes were analyzed for areas where distribution lines might be located too close to the proposed transmission lines. There is a general consensus that distribution lines located less than 150 feet from a transmission line and running parallel to a transmission line for a continuous distance greater than 1,000 feet can cause impacts to farms with confined animals. Further information on the cause, impact, and mitigation options of stray voltage or NEV is provided in Section 5.5.15.

All distribution modifications required as a result of the ordering of this project would be made by the distribution owners, including distribution line design, relocation, burial, and any associated permitting.

All of the distribution lines that are proposed to be relocated if Route Section S2 is selected are short lengths where the proposed transmission lines would cross or run adjacent to existing distribution lines. See Table 7.3-3. Where there would be conflict between the height of the existing distribution lines and the clearance needed by the proposed new transmission lines, the distribution lines would need to be relocated, or more likely, buried.

Table 7.3-3 Distribution lines that would be relocated at transmission line crossings for Route Section S2

Subsection	Location	Length (feet)
S2-4	Along the west side of CTH C	275
S2-6	Along the north side of CTH J	490
S2-7	Along the east side of CTH C	490

There is an overhead distribution line running along the north side of Rock Road that runs parallel less than 80 feet away from the proposed 138 kV transmission line for a length of 857 feet, and then just adjacent to more proposed transmission lines in subsection S2-2 for another 256 feet. A CAFO is located less than 0.5 miles west of this area.

[108] Data provided to ATC by Power Engineers, Communication Facility Impact Study, Phase 1, January 31, 2014.

CHAPTER

8

8. Environmental Analysis: Central Routing Area

8.1. ROUTE SECTION COMPARISONS

8.1.1. Route Section C3

8.1.1.1. Detailed route section description

Route Section C3 is the western portion of the Central Routing Area that would begin in the town of Osborn, in Outagamie County and proceed north into Shawano County and then east to the town of Pittsfield in Brown County. See Figures Vol. 2-1.08, 1.07, and 1.04. The total distance for this route is 18.5 miles, and the land use is predominantly agriculture with some scattered wetlands and woodlands that are fragmented across the landscape. This route shares some ROW with an existing 138 kV line and would require 3,314 acres of new ROW, most of which would be located in agricultural lands.

Section C3 begins at the endpoint of Route Sections S1 or S3 Westbound on the northwest corner of the town of Osborn and proceeds north along the existing North Appleton-White Clay 138 kV line. It crosses Mielke, Kropp, and Culbertson Roads in Outagamie County, all of which have some residences within 150 feet of the proposed route. Southwest of the city of Seymour, the route crosses STH 54 and passes through an active limestone quarry to avoid the city, still along the existing 138 kV line. West of Seymour it crosses the Newton Blackmour State Trail, Black Creek and CTH G, passing east of the Lawn Road Substation.

From the vicinity of the Lawn Road Substation, C3 continues north, through agricultural fields, crossing Jeske Road, CTH VV, and Cicero Road before passing into Shawano County at Shady Road. Continuing north through more agricultural land, the route turns east shortly after crossing STH 156. Here the route leaves the existing 138 kV line and continues east through private agricultural lands where entirely new ROW would be needed, parallel to and north of STH 156, crossing CTH F, Fir Road, STH 55, Laney Road, and STH 29. From STH 29, it runs north, adjacent to South St. Augustine Road, sharing some ROW for 0.7 miles, after which it turns east and ends at the intersection with Route Section N17.

8.1.1.2. Structures and rights-of-way

Route Section C3 has 14 subsections identified by ATC as C3-1 through C3-14. The subsections begin with C3-1 at the beginning of the C3 route near the intersection with S1 or S3 Westbound and follow the route north and east, with subsections varying in length from each other. For part of this route section, the existing North Appleton-White Clay 138 kV line would need to be relocated and rebuilt. Where relocation occurred or where new structures were being built along an existing line, attempts would be

made to locate the new structures next to each other and next to the existing structures to minimize impacts. See Appendix A Figure 4-6.

Route Subsection C3-1 is approximately 13,393 feet in length from the beginning of the C3 route to just south of Culbertson Road. An existing 138 kV transmission line parallels the entire subsection allowing for sharing 55 feet of ROW. The two new lines are proposed to be placed east of the existing structures, with the new 138 kV line just east of the existing 138 kV line, and the 345 kV line on the eastern edge of the ROW. See Appendix A Figure 3. There would be a resulting 125 feet in width of new ROW required, totaling 39.3 acres of new land impacted across this subsection.

Route Subsection C3-2 is 901 feet in length and crosses Culbertson Road with the centerline diverging from the existing transmission line to avoid a residence. The configuration of the structures would be the same as those in the previously described subsection apart from the shift in direction. The existing 138 kV line would be shifted west, and the new 138 kV and 345 kV lines would follow this shift west, sharing 150 feet in width of ROW. See Appendix A Figure 4. The ROW would need to be an expanded by 125 feet in width, along both the east and west sides of the existing transmission corridor, resulting in 2.6 acres of new land impacts. Although the shift in direction would prevent the proposed transmission line from passing directly over a residence, the shift would bring the existing 138 kV line closer to residences on the western side.

Route Subsection C3-3 is 911 feet in length and remains shifted west from the original configuration of the existing 138 kV line with the same structure configuration as that described for the previous subsections. It would share 150 feet of existing ROW for its entire length, and require 125 feet of new ROW, totaling 2.6 acres of new land impacts.

Route Subsection C3-4 is 908 feet in length and shifts back east to allow the diverted lines to rejoin the existing 138 kV centerline and head north following that existing ROW corridor. See Appendix A Figure 3. The new structure configuration would remain the same as the previously described subsections with the relocated existing 138 kV line farthest west, the new 138 kV line in the middle, and the new 345 kV line on the eastern side. As described in the previous two subsections, this route subsection would share 150 feet of existing ROW width and require 125 feet of new ROW, totaling 2.6 acres of new land impacts.

Route Subsection C3-5 resumes following the existing 138 kV line configuration north and northwest to the Lawn Road Substation. No structures would need to be relocated. This subsection is 13,433 feet in length and shares 55 feet of the existing transmission line ROW. To build the new 138 kV and new 345 kV lines, there would need to be an additional 125 feet width of ROW added over the length of this subsection, for a total of 39.5 acres of new land impact. The structure configuration would be the same as described for the previous subsections. If approved and permitted, this route would have six new structures potentially built in or within 50 feet of a wetland.

Route Subsection C3-6 leaves the existing 138 kV transmission line ROW just south of the Lawn Road Substation to avoid crossing directly over the substation. Instead, the new ROW of this subsection angles north and then northwest to remain outside of the substation fence. The length of Subsection C3-6 is 1,486 feet and it would require 180 feet of new ROW for this length, totaling 6.2 acres of new land impacts. The existing 138 kV line would not be altered. See Appendix A Figure 3.

Route Subsection C3-7 is 19,798 feet in length and rejoins the existing 138 kV line heading north from the Lawn Road Substation. The layout of the three transmission lines would be similar to that in C3-1, with

55 feet of ROW shared and 125 feet of new ROW width required. The total area of new land impacted by this ROW expansion would be 57.9 acres. Four structures could be built in or within 50 feet of a wetland.

Route Subsections C3-8, C3-9, and C3-10 follow a route change similar to that described in Route Subsections C3-2, C3-3, and C3-4 in order to avoid passing directly over a residence on Shady Road in Shawano County. The three subsections are similar in length (886, 823, and 877 feet, respectively). They also share a similar width of existing ROW (150 feet), and each subsection requires 125 feet of additional new ROW width. The total areas of new land impacted by each subsection are 2.5 acres for C3-8 and C3-10 and 2.4 acres for C3-9. For each of these three subsections, the existing 138 kV line would be rebuilt, with the new 138 kV line built east of this relocation, and the 345 kV line on the eastern side of the configuration.

Route Subsection C3-11 is the last portion of this route section that follows the existing 138 kV transmission line corridor. It is 4,963 feet in length and shares 55 feet of ROW with the existing line, requiring an increase of 125 feet of ROW width for the length of the subsection, totaling 14.5 acres of new land impact. The configuration of the structures would be the same as for Route Subsection C3-1.

At the intersection of C3-11 and C3-12, the proposed lines make a 90° turn to proceed east on Route Subsection C3-12, leaving the existing 138 kV line. Subsection C3-12 does not share any ROW with existing infrastructure. See Appendix A Figure 1. It proceeds east across privately owned land for 32,780 feet (6.21 miles) with new ROW required throughout. ROW width is planned to be 180 feet in width for the length of the subsection, resulting in new land impacts to 135.4 acres. The 138 kV line would be on the northern side of the project corridor, with the 345 kV line on the southern side as the lines run parallel to and north of STH 156. There are potentially six structures that would be built in or within 50 feet of a wetland, based on the preliminary route given. The final part of this subsection crosses into Brown County.

Route Subsection C3-13 turns north in Brown County and runs along the eastern side of St. Augustine Road for 3,958 feet, sharing approximately 35 feet of ROW with the road, although the road ROW width varies along the length of the subsection. Approximately 145 feet in new ROW width is required for this subsection, totaling 13.3 acres of new land impacts. An electric distribution line is located on the opposite side of the road from the proposed lines. The proposed configuration for the new lines has the 138 kV line running closer to the road, with the 345 kV line east of the 138 kV line. See Appendix A Figure 23. Where this route intersects with the final subsection, C3-14, the lines would turn 90° and run east to finish at the intersection with N17-1. Subsection C3-14 is 2,434 feet in length and does not share ROW with any existing infrastructure, similar to C3-12. It would require new 180-foot ROW, with a total of 10.1 acres of new land impacts. The structure configuration would be the same as that described in C3-12.

8.1.1.3. Topography, geology, and soils

Route Section C3 is primarily within the Northern Lake Michigan Coastal Landscape (see Figure Vol. 2-8)as described by DNR in planning documents and publications. This overall ecological landscape comprises 2,004 square miles, representing 3.6 percent of the land area of the state.

This landscape was influenced greatly by the glaciers that shaped both the topography and soils of this region and by Lake Michigan and Green Bay and their surrounding landforms. Along the Lake Michigan shore there are many landforms typical of Great Lakes Coastal geography such as ridge-and-swales, dunes, beaches and freshwater estuaries. Away from the shoreline, this ecological landscape has ground moraines left by the retreating glaciers as a dominant landform. The Niagara Escarpment is a cuesta—a ridge that has a steep escarpment on one side and a long gentle slope on the other. This affects the landscape as a

prominent ridge of dolomite that appears as cliffs and ledges along the western edge of the Door Peninsula. The western part of the ecological landscape has more level topography, including a broad lacustrine plain along much of the west shore of Green Bay. One geological feature of interest in this region of the state is the occurrence of the St. Peter Sandstone bedrock layer, running in a north-south orientation, particularly in areas of Winnebago, Outagamie and Brown Counties.

Across this landscape, soils are very diverse, from the thin soils over bedrock common on the Door Peninsula, to the well-drained rocky and sandy loams found west of Green Bay. Typically this route section is found in an area that has a range of soil depths, from 5.0 to 100+ feet. Soils in the C3 Route Section area are typically moderately well-drained, red, sandy and loamy soils over dolomite, or clayey with a silt loam surface, as well as some significant areas of wetland soils such as peats and mucks. The landscape has fewer lakes than other regions of Wisconsin, but there are many streams and rivers that drain the western portion of this ecological landscape.

8.1.1.4. Existing land uses

The combination of the soil types, the level topography of the area and the relatively mild climate due to the proximity to Lake Michigan are all beneficial to agricultural development, which is observed as the most common land-use of the area, with over half the overall area converted from forest to agricultural use. Overall, land cover is a mosaic of farm fields with some areas of woodlots and wetlands, surrounding areas of development, primarily residential housing.

In the Central Routing Area, approximately 91 percent of the proposed ROW is in agricultural land use, the majority of which are corn and soybeans, but with alfalfa and hay crops also present. Specialty crops (tree nurseries), old fields, and pastures make up the rest of the agricultural land uses. Percentages of agricultural uses for Route Section C3 are 94 percent crop land, 5 percent old field, and 1 percent pasture.

Other land uses in this route section consist of residential areas outside of urban centers, a sand/gravel mining area that may be used as a laydown area, a State Recreational Trail and an existing electrical substation.

8.1.1.5. Off-ROW access

The majority of the proposed project's route sections intersect public roads. Wherever possible, the applicant's direct access to the project ROW would be from the public roads. Staying within the project ROW would be the preferred method of access, unless the contractor was able to arrange for alternative access that would minimize environmental and/or landowner impacts.

Access from outside the project ROW might be needed where physical limitations exist within the project ROW or where other constraints prevent direct access from public roads. The need for potential off-ROW access paths has been identified by the applicant based on a preliminary review of the route sections. If a specific route is approved by the Commission, the preliminary access plan may be amended based on further review of the chosen route, negotiations with local landowners, and/or contractor requirements. In this situation the PSC and DNR would need to be notified of any access route changes, the route would be evaluated for potential impacts, and any activities within wetlands or waterways would be subject to DNR permitting review and approval. Once construction was completed, off-ROW access roads could be restored to pre-construction conditions or left in place, based on negotiations with the property owner.

There would be one off-ROW access road along Route Subsection C3-5 at an active quarry north of STH 54 in Outagamie County. Gradients in some areas along the ROW are too steep to allow for safe material

and equipment access without extensive grading. The off-ROW access road is planned to be 3,711 feet in length though the quarry area to allow work to be done in the proposed ROW without requiring extensive grading in the active quarry site. No access through wetlands is anticipated.

8.1.1.6. Staging and laydown areas

Construction staging areas (laydown yards) would be required during the entire construction period for the storage of construction materials, transmission line poles, cables, equipment, vehicles, job trailers, and related materials. The ATC identified potential staging areas on the basis of their locations, access, security, and suitability for the efficient and safe warehousing of supplies. Environmental and landowner impacts were also considered by the company, and identified sites were evaluated for potential impacts to wetlands, streams, natural features, threatened and endangered resources, and cultural or archaeological resources. Sites were also evaluated as to vegetation clearance, excavation, and grading requirements. Sites that need minimal site preparation were preferred. Sites that are paved or have been previously graded and cleared of vegetation (parking lots, old gravel pits, and farm fields) are considered ideal locations for laydown yards/staging areas.

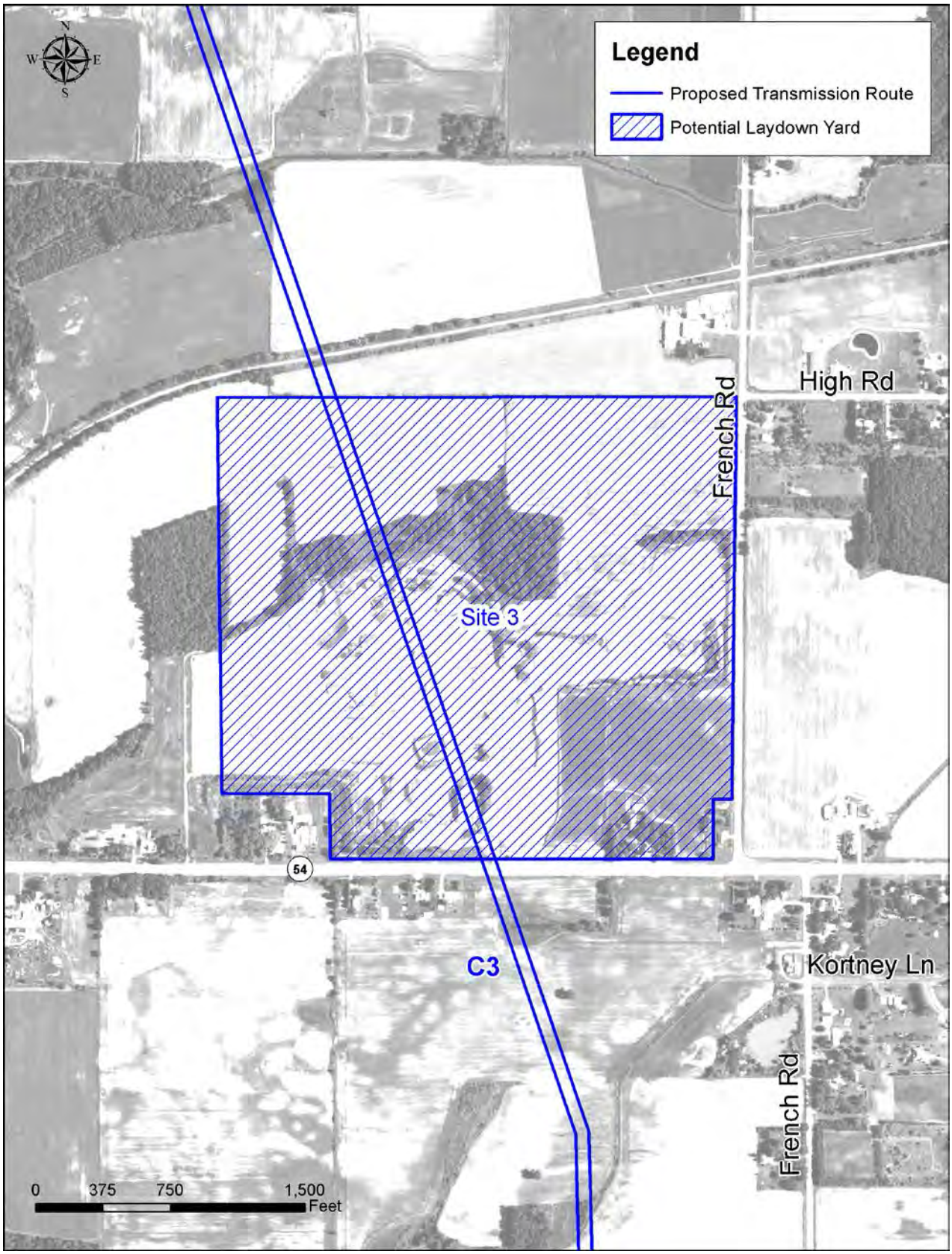
Laydown yards/staging areas outside the transmission line ROW would be obtained from private landowners through leases that would last until the end of construction.

Route Section C3 has one planned laydown yard (ATC's Site 3) located along the ROW in Route Subsection C3-5 at the same active limestone quarry in the town of Seymour just off STH 54 where there is planned off-ROW access as described above. The laydown site size is planned to be 50 acres and would take up a flat area of the quarry north of STH 54. There are areas of existing woodland and grassland on the larger site and the laydown area should be planned for an existing disturbed area where the more natural habitat would not be impacted. The surrounding area along STH 54 has a large number of small residential houses that might be impacted by increased traffic, noise, and dust from operational vehicles. Details of the site are shown in Figure 8.1-1.

If it became necessary to secure additional staging areas (not listed above) near the route to temporarily store transmission line construction materials, ATC has indicated that it would follow a similar selection process as that used for the original site selection, including an environmental review.

During construction, temporary wire pulling/handling areas would be required approximately every 10,000 feet along the route. The staging areas for this process would be approximately 40 feet by 300 feet. These areas have not yet been identified, but would be identified after the final route selection. Areas outside of wetlands would be preferred, but the applicant has indicated that, with the typical distance between areas, it might be necessary to locate some of these areas within wetlands. In those cases, DNR permits for applying temporary fill in wetlands would be needed.

Figure 8.1-1 Proposed staging and laydown area Site 3



8.1.2. Route Section C4

8.1.2.1. Detailed route section description

Route Section C4 is the eastern option in the Central Routing Area that begins at the north end of Route Section S2 or the eastern end of S3 Eastbound in the South Routing Area in Outagamie County, near the southwest corner of the Oneida Reservation. See Figures Vol. 2-1.08, 1.09, and 1.04. C4 is approximately 15.4 miles long and crosses through areas of shared corridors with existing gas pipelines as well as areas where there is no existing shared infrastructure. Fewer acres of shared ROW are available on this section than on others in this project. Land use is predominately agriculture, with some woodlands and wetlands that are already fragmented across the landscape.

The section would begin either south of CTH EE or just north of it, at the corner of the Oneida Reservation. It would proceed northeast along the boundary of the reservation, following the Guardian pipeline northeast, crossing CTH C, Culbertson Road, Ranch Road, STH 54, the Newton Blackmour State Trail, Pearl Street, Isaar Road, and CTH G. It stays east of the city of Seymour and leaves the Guardian pipeline corridor, crossing private lands before joining the ANR pipeline in the town of Pittsfield. Outside of the gas pipeline corridors, C4 crosses Linsmeyer Road, Plainview Road, CTH VV, and Shady Road, as well as the West Branch of the Suamico River, before turning east and crossing the West Branch of the Suamico River again, Old Wisconsin 29, STH 29, and Cottonwood Drive before ending at the intersection with Section N17-1 of the North Routing Area in Brown County.

8.1.2.2. Structures and rights-of-way

Depending on the southern route used, there are either nine or ten subsections that make up the eastern part of the Central Routing Area, identified by ATC as C4-1 through C4-10. The variable in the subsection makeup is whether Route Subsection C4-1 is included or not. Selection of Section S2 would result in the inclusion of C4-1, whereas the selection of S1 with S3 Eastbound would exclude Route Subsection C4-1.

The new transmission lines would generally be built with the same span lengths so that each pair of structures was sited near each other, in order to minimize impacts.

The C4-1 Route Subsection is 838 feet in length and is adjacent to the Guardian pipeline, sharing approximately 10 feet of ROW. An additional 170 feet of ROW width are needed, resulting in a new land impact to 3.2 acres. The 345 kV line would be on the eastern side of the ROW adjacent to the Guardian pipeline, and the 138 kV line on the western side. This configuration remains consistent throughout much of Section C4. See Appendix A Figure 16.

Route Subsection C4-2 is approximately 10,881 feet in length and proceeds northeast adjacent to the Guardian pipeline and the boundary with the Oneida Reservation. The structure configuration would be the same as that described above. It would share approximately 10 feet of ROW width with the pipeline, and it would require the addition of 170 feet of new ROW. Six structures would potentially be located in or within 50 feet of a wetland depending on final engineering requirements and the route ordered. In total, the area of new ROW required for this subsection would total 42.8 acres, including 7.76 acres of forested wetlands.

The C4-3 Route Subsection is 3,069 feet in length. It diverts slightly away from the Guardian pipeline ROW at the beginning of the subsection, and crosses directly over the pipeline at the end of the subsection. Across the subsection the amount of ROW shared varies from 0 to 50 feet due to the configuration of the pipeline and the proposed route. Transmission structures would follow the same

configuration as described above in C4-1, but change in relation to the pipeline as described above. Across the subsection, there would be between 130 and 180 feet of new ROW width needed, equivalent to 11.3 acres of new land impact.

Route Subsections C4-4 and C4-5 are both (relatively) short in length at 586 feet and 570 feet, respectively. Both subsections are near the Guardian pipeline, with C4-5 diverting slightly to the northeast before turning north to rejoin the pipeline corridor. As a result, the amount of shared ROW might vary depending on the areas where the pipeline has angles in alignment that do not match the proposed transmission lines. The amount of shared ROW is not likely to be more than 10 feet anywhere along this route, requiring between 170 and 180 feet of new ROW over the length of each subsection. This would equate to 2.4 acres of new land impacts for C4-4 and 2.3 acres of new land impacts for C4-5.

The C4-6 Route Subsection is 2,527 feet in length and, similar to some of the previous subsections, varies in how closely it follows the Guardian pipeline ROW. Approximately halfway down the length of this subsection, the proposed transmission line would cross the pipeline, and continue along the western side of the pipeline. Thus, the amount of shared ROW would vary from between 0 to 50 feet in width across the length of the subsection. This results in variable amounts of new ROW width required, from 130 to 180 feet, and would cause approximately 10.1 acres of new land impacts. The subsection ends just north of an intersection between the Guardian pipeline and an ANR pipeline.

The C4-7 Route Subsection begins just north of the intersection of the Guardian and ANR pipelines, south of Culbertson Road, and diverts from the Guardian pipeline route in order to avoid residences near the intersection of Culbertson and Ranch Roads. The subsection is 1,528 feet in length and due to the diversion away from the pipeline, it does not share any ROW and would require the creation of a full 180 feet of ROW over its entire length, totaling 6.3 acres of new land impacts. See Appendix A Figure 1.

The C4-8 Route Subsection is 19,781 feet in length and rejoins the Guardian pipeline corridor east of the city of Seymour to proceed north and east. The configuration of the pipeline and structures would be the same as C4-1. The transmission lines would share approximately 10 feet of pipeline ROW, requiring the addition of another 170 feet of ROW width for the length of the subsection. This would result in a total of 78.2 acres of new land impact.

The C4-9 Route Subsection is the longest of this section at 32,170 feet or 6.09 miles. This subsection leaves the Guardian pipeline corridor and proceeds north through Outagamie County into Shawano County where it makes a 90° right turn, and then east into Brown County in the town of Pittsfield. The 345 kV line would be on the east side of the ROW and the 138 kV line on the west side, the same as on previously described subsections. New ROW 180 feet in width would be required throughout, resulting in 132.9 acres of new land impact.

The northernmost subsection in this route is C4-10, which is 9,246 feet in length and joins the ANR pipeline near the town of Pittsfield. This subsection proceeds north to its terminus at the N17-1 Route Subsection in the North Routing Area. In this subsection, the pipeline would be on the western side of the ROW corridor, with the new 138 kV line adjacent on the east and the 345 kV line farther east on the eastern side of the ROW corridor. The transmission lines would be share approximately 10 feet of pipeline ROW, and would require an additional 170 feet of ROW width for the length of the subsection, resulting in 36.3 acres of new land impact.

8.1.2.3. Topography, geology and soils

Route Section C4 is primarily within the Northern Lake Michigan Coastal Landscape (see Figure Vol. 2-8)as described by DNR in planning documents and publications. This overall ecological landscape comprises 2,004 square miles, representing 3.6 percent of the land area of the state. This landscape was influenced greatly by the glaciers that shaped both the topography and soils of this region, and by Lake Michigan and Green Bay and their surrounding landforms. Along the Lake Michigan shore there are many landforms typical of Great Lakes Coastal geography such as ridge-and-swales, dunes, beaches and freshwater estuaries. Away from the shoreline, this ecological landscape has ground moraines left by the retreating glaciers as a dominant landform. The Niagara Escarpment is a cuesta—a ridge that has a steep escarpment on one side and a long gentle slope on the other. This affects the landscape as a prominent ridge of dolomite that appears as cliffs and ledges along the western edge of the Door Peninsula. The western part of the ecological landscape has more level topography, including a broad lacustrine plain along much of the west shore of Green Bay. One geological feature of interest in this region of the state is the occurrence of the St. Peter Sandstone bedrock layer, running in a north-south orientation, particularly in areas of Winnebago, Outagamie and Brown Counties.

Across this landscape, soils are very diverse, from the thin soils over bedrock common on the Door Peninsula, to the well-drained rocky and sandy loams found west of Green Bay. Typically this route section is found in an area that has a range of soil depths from 5 to 100+ feet. Soils in the Central Routing Area are typically moderately well-drained, red, sandy and loamy soils over dolomite, or clayey with a silt loam surface as well as some significant areas of wetland soils such as peats and mucks. The landscape has fewer lakes than other regions of Wisconsin, but there are many streams and rivers that drain the western portion of this ecological landscape.

8.1.2.4. Existing land uses

The combination of the soil types, the level topography of the area and the relatively mild climate due to the proximity to Lake Michigan are all beneficial to agricultural development, which is observed as the most common land-use of the area, with over half the overall area converted from forest to agricultural use. Overall, land cover is a mosaic of farm fields with some areas of woodlots and wetlands surrounding areas of development, predominantly residential housing.

In the Central Routing Area, approximately 91 percent of the proposed ROW is in agricultural land use, the majority of which are corn and soybeans, but with alfalfa and hay crops also present. Specialty crops (tree nurseries), old fields, and pastures make up the rest of the agricultural land uses. Percentages of agricultural uses for the area around Route Section C4 are 96 percent crop land, 3 percent old field, and 1 percent pasture. Approximately 0.38 acre of a tree nursery would be impacted by this route section, on Route Subsection C4-9.

Other land uses in this route section consist of exurban residential areas and a State Recreational Trail.

8.1.2.5. Off-ROW access

There are currently no planned off-ROW access routes proposed by the applicant for Route Section C4.

8.1.2.6. Staging and laydown areas

Construction staging areas (laydown yards) would be required during the entire construction period for the storage of construction materials, transmission line poles, cables, equipment, vehicles, job trailers, and related materials. The applicant identified potential staging areas on the basis of their location, access, security, suitability for the efficient and safe warehousing of supplies, potential environmental impact, and

potential effects on local landowners. Identified sites were evaluated by the company for potential impacts to wetlands, streams, natural features, threatened and endangered resources, and cultural or archaeological resources. Sites were also evaluated as to vegetation clearance, excavation, and grading requirements. Sites that needed minimal site preparation were preferred. Laydown yards or staging areas outside the transmission line ROW would be obtained from private landowners through leases that would last until the end of construction.

Route Section C4 has two planned laydown yards located east of Route Subsection C4-10.

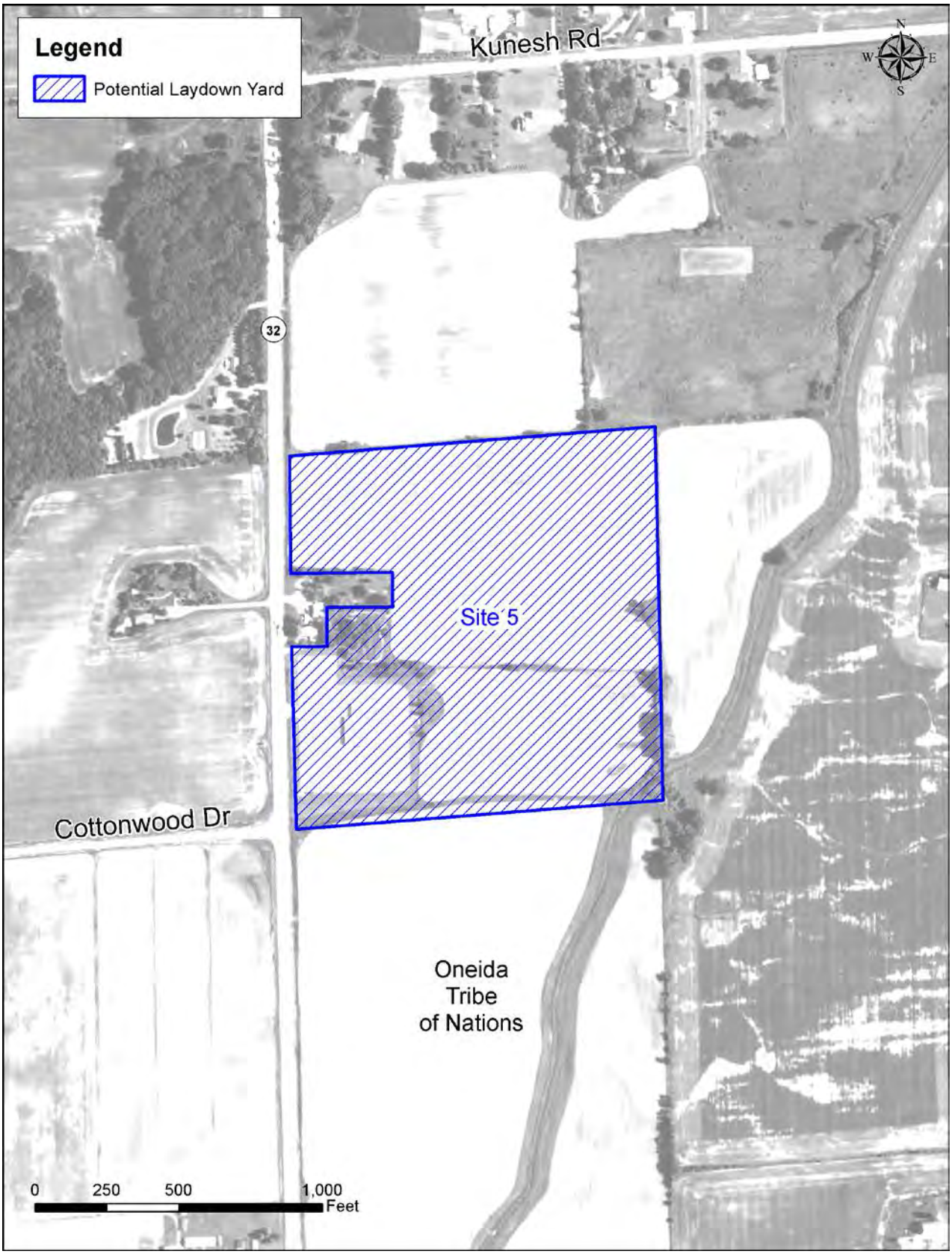
One laydown yard site (ATC's Site 4) is located on the northwest corner of the intersection with STH 29 and STH 32. See Figure 8.1-2. This is an area of grassland with a vehicle track proceeding west through the site and a roadside shop advertising fireworks. The proposed laydown yard at this location would be 10 acres. The DNR Surface Water Data Viewer shows an unnamed stream crossing from the northeast to southwest corner of the site, with a manmade pond west of the site. Erosion and storm water management practices would need to be implemented to prevent impact to these resources.

The other laydown yard (ATC's Site 5) on Route Subsection C4-10 is located northeast of Site 4 on the east side of STH 32 at an abandoned car dealership in an area of hard surfaced parking lots, surrounded by agricultural fields and a private residence just north of the parking lot. See Figure 8.1-3. This laydown yard would be approximately 50 acres in size. The same unnamed stream that passes through Site 4 cuts through the southeast corner of Site 5 and if use of this area is extended into the agricultural fields around this stream, erosion and storm water measures would need to be implemented. If equipment storage or the laydown yards extended into the agricultural fields, soil compaction would be likely and would need to be addressed by restoring soil condition to a pre-construction condition. Equipment or vehicle noise and increased traffic could impact the nearby houses.

If it became necessary to secure additional staging areas near the route to temporarily store transmission line construction materials, ATC says that it would follow a selection process similar to that used for the original site, including an environmental review. During construction, temporary wire pulling/handling areas would be required approximately every 10,000 feet along the route. The staging areas for this process would be approximately 40 feet by 300 feet. These areas have not yet been identified, but would be after the final route selection if the project was approved. Areas outside of wetlands would be preferred by the company, but the typical distance between areas might make it necessary for it to locate some of these areas within wetlands. In these cases, DNR permits for applying temporary fill in wetlands would be needed.

Figure 8.1-2 Proposed staging and laydown area Site 4

Figure 8.1-3 Proposed staging and laydown area Site 5



8.2. NATURAL RESOURCES AND POTENTIAL IMPACTS

8.2.1. Natural resource properties (local, county, state, federal lands)

One recreational trail is located within the Central Routing Area. It is the Newton Blackmour State Trail, and it is located along portions of both Route Sections C3 and C4. It is a DNR state trail and a former railroad corridor. Nine miles of the proposed 28 miles have been completed. The trail is currently open from the east side of the city of Seymour to the village of Black Creek. Permitted recreational uses along the trail include biking, hiking, horseback riding, and snowmobiling in the winter. The trail is maintained by the Outagamie County Parks Department.

Route Sections C3 and C4 both cross the trail. The existing North Appleton-White Clay 138 kV transmission line currently crosses the trail at the crossing proposed for Route Section C3, and the Guardian pipeline crosses the trail adjacent to Route Section C4. There currently is no existing transmission line at the proposed C4 crossing, so the visual impact at this location would likely be greater than at the C3 crossing. The area of the trail within the ROW is approximately 0.06 acres at the proposed Route Section C3 crossing and approximately 0.08 acres at the proposed Route Section C4 crossing. The two new transmission lines would be constructed east of the existing 138 kV line at the proposed C3 crossing while the two new lines would be constructed west of the existing Guardian pipeline at the proposed C4 crossing. No structures would be placed on the trail itself at either of the crossing locations. Impacts to the trail, other than the new visual impact, would occur only during construction. There would be no impacts to the use of the trail following construction.

8.2.2. Forested lands

For the purposes of this project, forested lands are defined as areas where mature trees are present, forming mostly closed stands (greater than 20 percent canopy cover and trees with dbh of 6.0 inches or more). Narrow tree lines (*e.g.*, wooded fence rows) and windbreaks are not included as forested cover and would be considered under the subject of agriculture. Nearly all of the forested land impacts of the project occur within new ROW because the existing ROWs for electric transmission lines or natural gas pipelines have generally been kept clear of trees.

The following tree size classification system is being used:

- "Saplings" refers to live trees from 1.0 to 5.0 inches dbh.
- "Structure timber" ranges from 5.0 to 9.0 inches dbh for softwoods and from 5 to 11 inches dbh for hardwoods.
- "Saw timber" is greater than 9.0 inches dbh for softwoods, and greater than 11 inches dbh for hardwoods.

The North Appleton-Morgan project area is located in the Green Bay Till and Lacustrine Plain ecoregion. This region is characterized by a mixture of wetlands, outwash plains, lake plains, and ground moraines. The potential natural vegetation of this ecoregion would consist of a transition from maple, oak, and basswood forests in the south to northern hardwoods and conifer swamps in the north. Current vegetation of this region is comprised of agricultural fields with interspersed hardwood forest tracts in uplands and forested wetlands in the lower elevations. Generally, forested areas are dominated by structure timber and saw timber.

Table 8.2-1 shows relative amounts of upland, wetland, and total acreages of forest land in the Central Routing Area. Ownership of forested lands within the project area is primarily private. Land use on forested lands is primarily recreational, and many woodlots are used as a private source for firewood.

Table 8.2-1 Upland vs. wetland forested areas in the Central Routing Area

Section	Total Acres of Forested Area	Percent Upland Forest	Percent Wetland Forest
C3	19.56	33	67
C4	18.85	50	50

Table 8.2-1 shows that the potential ROW of Route Section C3 would impact about 0.7 acres more forest than Route Section C4, and that a greater percentage of that impacted forest would be wooded wetland. Potential wooded wetland impacts are discussed in the next section of this chapter.

Current forested areas on Route Section C3 are comprised of small (up to 40 acres in size), scattered woodlots. Upland forests are primarily northern dry and southern dry-mesic forest dominated by red pine (*Pinus resinosa*), white pine (*Pinus strobus*), red oak (*Quercus rubra*), and white oak (*Q. alba*). Forested wetlands generally occur along waterways and are typically southern hardwood swamp dominated by red maple (*A. rubrum*), box elder (*A. negundo*), and green ash (*Fraxinus pennsylvanica*).

Current forested areas on Route Section C4 are comprised of small (up to 40 acres in size), scattered woodlots as well. Upland forests are primarily northern dry, southern dry-mesic, and southern mesic forest dominated by red pine, white pine, red oak, white oak, sugar maple, and basswood. Forested wetlands generally occur along waterways and are comprised of southern hardwood swamp and wet-mesic forest dominated by red maple, box elder, green ash, and white cedar (*Thuja occidentalis*).

8.2.3. Wetlands

8.2.3.1. Route Section C3

Section C3 crosses 26 wetlands covering 4,835 feet, for a total of 17.21 acres of potential wetland impact. Fourteen structures are proposed to be constructed in wetlands along Section C3. Wetland types crossed by this section include wet meadow, shrub carr, hardwood forest, and floodplain forest wetland. One of the largest wetland complexes along C3 is 1,381 feet long. It is located north and east of CTH G in Outagamie County. It is a forested wetland containing a mix of hardwood tree species. Four structures are proposed to be placed in this complex. Another large forested wetland is 989 feet long. It is located north of Cicero Road near the Outagamie and Shawano County line. This is a high-quality forested wetland dominated by native species. Two structures are proposed to be installed here. This wetland is an example of several forested wetlands that would be "clipped" by Section C3 where one edge of the forested wetland would be cleared to accommodate the new ROW.

Clearing of forested wetland in a transmission line ROW, including the edges of forested wetlands, causes a permanent conversion to shrub carr or herbaceous wetlands. All of the previous ecological functions that forested wetlands provide, such as wildlife habitat and trapping of runoff, are permanently changed. Forested wetland conversion can result in the introduction of non-native herbaceous wetland species like reed canary grass.

In southern Shawano County, Section C3 turns east and runs cross country parallel to STH 156. Transmission corridors running cross country can cause increased impacts by fragmenting previously intact, contiguous wetlands. But in this case, very few wetlands are impacted by this cross country portion

of Section C3. As in the South Routing Area, this is mostly due to the dominance of agriculture in this part of the project.

Until C3 turns east, all of the wetlands on Section C3 were delineated by ground surveys. Because this east/west portion of C3 does not follow an existing transmission line, the wetland boundaries have only been approximated using aerial photos and desktop resources, such as state wetland inventory data. If this route section is part of an approved route, the applicant will be required to complete an on-the-ground wetland delineation to verify the wetlands present.

For Section C3, the new ROW width cleared would be 125 feet. Where Section C3 follows an existing transmission line, this 125 feet would not be divided on each side of the existing ROW but rather only on one side. Instead of clearing more along each edge of the existing ROW where more degraded wetlands are likely present, the applicant proposes to clear the entire 125-foot width on one side, which could result in impacting more "core" wetlands. These core wetlands, located farther from the wetland edge, can contain more intact ecological systems with more diverse vegetation than more disturbed edge wetlands. This clearing strategy could result in increased impacts to higher quality wetlands.

8.2.3.2. Route Section C4

Route Section C4 crosses ten wetland complexes, totaling 2,762 feet in length. Impacts to these wetlands would total 11.58 acres. It is important to note that most of the wetlands on Section C4 were approximated, as field access to conduct ground surveys was not obtained. The size, type, and quality of each of these wetlands would be verified via an actual delineation if this section is part of an approved route. Wetland types crossed by this section include wet meadow, shrub carr, hardwood forest, and emergent marsh. This section follows an existing pipeline ROW for the southern half of the route and then goes cross country to the north. In total, six structures would be constructed in wetlands along Section C4. The largest wetland complex along C4 is 2,260 feet long, located north of CTH EE and west of CTH C. It is composed of both forested wetland and wet meadow. Impacts should be minimized in this wetland as it is dominated by native species, containing a diverse mix of herbaceous and tree species. Six structures are proposed to be installed in this wetland. Two unnamed tributaries to Duck Creek are located at both the northern and southern edges of this wetland complex. Structures should be located out of the wetland to minimize impacts to this wetland and the two waterways. One additional important wetland is a riparian wet meadow and forested wetland located on both sides of the West Branch of the Suamico River at the north end of Section C4. Impacts should be minimized to protect both the wetland and the waterway.

As in Section C3, wetland impacts are less for the cross-country portion of C4 even though it does not run next to an adjacent corridor. This is again due to the prominence of agriculture in this part of the project. As mentioned above, part of Section C4 follows an existing gas pipeline. Because the proposed transmission lines must be located adjacent to and not over the pipeline, additional wooded wetland would be cleared. As also mentioned for Section C3, clearing only on one side of existing corridors requires additional core wetland to be cleared, which could disturb high quality wetland habitat. Wetland disturbance resulting from clearing or construction activities can result in invasion by exotic species and loss of wetland functions.

8.2.3.3. Summary of wetland impacts of Route Sections C3 and C4

As shown in Table 8.2-2, Section C3 results in more permanent and temporary wetland impacts and more forested wetland clearing than Section C4. The relatively large sum of forested wetland clearing on Route Section C4 compared to the other potential wetland impacts on this subsection is a result of potential impacts to the large forested/wet meadow wetland described above, which would include clearing of

7.76 acres of forested wetland. On Route Section C3, the summed wetland impacts result from impacts to many smaller wetlands that, when combined, result in a larger impacted acreage. Fourteen structures are proposed to be placed in wetlands on Section C3, while six are proposed on Section C4.

Table 8.2-2 Summary of wetland impact in the Central Routing Area

	Forested Wetland				Non-Forested Wetland					
Segment	Existing Shared ROW Area Not Cleared (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Non-forested Wetland Impact (acres)	Total Wetland Impact (acres)	Wetlands Crossed	Significant/High-quality Wetlands
C3	1.71	1.71	11.3	13.01	1.12	3.08	4.2	17.21	26	3
C4	0.12	0.12	9.39	9.51	0.5	1.57	2.07	11.58	10	1

8.2.4. Waterways

8.2.4.1. Route Section C3

Route Section C3 intersects 28 waterways. See Figure Vol. 2-10. Of those 28, the applicant is proposing to cross 22 of them using TCSBs. The remaining six waterways do not need to be crossed for construction activities. Even though the crossed waterways would be bridged, access routes should be planned to minimize the number of waterways crossed because bridging waterways can still adversely impact waterways by shading or disturbing the bank. No special-designated waterways intersect Section C3, and no other activities that would occur near waterways, such as grading on the bank or installing miscellaneous structures below the OHWM, would be required.

8.2.4.2. Route Section C4

Route Section C4 intersects 26 waterways, 25 of which would be crossed by a TCSB. As with Section C3, no special-designated waterways intersect Section C4 and no other Chapter 30-regulated activities are proposed in this section. Again, it must be noted that, though there are no special-designated waterways, it is important to minimize impacts to waterways by minimizing the number of TCSBs placed. If possible, alternative access routes that avoid waterways should be used, even if the waterways would otherwise be crossed by a TCSB.

8.2.4.3. Summary of waterway impacts of Route Sections C3 and C4

Overall, Section C3 crosses 28 waterways, 22 of which would require being crossed by a TCSB. Section C4 crosses 26 waterways, all of which would be crossed by a TCSB. See Table 8.2-3. No special-designated waterways intersect either C3 or C4, and no other Chapter 30-regulated activities (grading on the bank or miscellaneous structures below the OHWM) are proposed.

Table 8.2-3 Summary of impacts to waterways in the Central Routing Area

Segment	# of Waterways Crossings	# of Special-Designated Waterways	# of TCSBs Required	# of TCSBs Over Special Designated Waterways	# of Misc. Structures Below OHWM
C3	28	0	22	0	0
C4	26	0	25	0	0

8.2.5. Endangered resources

This section discusses the potential impacts to endangered resources that might be affected by construction or operation of the proposed project along Segments C3 and C4. Endangered resources, as discussed in Chapter 5, Section 5.5.7, are tracked via the state's NHI database, which is maintained by the DNR Bureau of Natural Heritage Conservation. The project area evaluation consists of both the specific route and a buffer of one mile for terrestrial and wetland species and a two-mile buffer for aquatic species.

The combined presence of natural habitat and man-made disturbances must be taken into consideration to evaluate whether there is a likelihood that rare species are present and the potential for negative impacts to those species. While the existing sources of information are important for estimating impacts to rare species, they are incomplete. Additional rare species beyond those identified may actually be present in potentially impacted areas.

Within the vicinity of Route Sections C3 and C4, the NHI database indicates an occurrence of a Migratory Bird Concentration Site. Migratory bird concentration sites are important resting and feeding areas for birds as they fly between their breeding and wintering grounds. These areas also can be locations where large numbers of migrating birds often become concentrated because of prevailing winds and/or water barriers. Sites are used by many different species, both rare and non-rare. During seasonal or diurnal migrations, birds can collide with transmission lines and lines can present barriers to their use of stopover habitat. The risk to birds increases when:

- The lines are vertically arrayed.
- The lines or their structures reach above other visible barriers such as tree lines or buildings.
- The lines are placed in areas of abundant bird use like migration corridors, colonial nesting areas, or stopover habitat.

If the lines are constructed on transmission structures with a reduced height, there is often a tradeoff requiring a wider ROW width and/or shorter span lengths. DNR recommendations to minimize impacts to birds in areas of known high bird traffic, include reducting transmission structure heights. Ideally, structure heights of less than 105 feet would help mitigate impacts to the bird species. Also, bird diverters are an important tool in preventing bird collisions with transmission conductors. If the Commission approves this project, the DNR, in consultation with the USFWS and the applicant should determine: 1) the appropriate type of bird diverters; 2) the locations where bird diverters should be installed; and 3) the areas where lower transmission structures could minimize impacts.

The northern long-eared bat is currently proposed for federal listing and is expected to be listed as either endangered or threatened at the time this project is proposed to begin. During the summer, northern long-eared bats typically roost singly or in colonies in a wide variety of forested habitat, in cavities or crevices, or underneath loose bark of both live trees and snags greater than three inches dbh. They forage for insects in upland and lowland woodlots and tree lined corridors. During the winter, northern long-eared bats predominately hibernate in caves and abandoned mine portals. Suitable habitat for the northern long-eared bat is likely present within the proposed project areas, and this species may be impacted. Therefore, at this time, it is recommended that the applicant, in coordination with USFWS and DNR, determine species presence or if impacts can be avoided or minimized by use of conservation measures. Where suitable habitat occurs, avoidance measures for this species may include presence/absence surveys and/or no tree clearing during the species' active period from April 1 to September 30.

8.2.6. Invasive species

ATC's assessment of invasive species has been done on a project-wide scale. Because invasive species are identified in order to avoid their spread through the project area, it is less important to identify their precise locations prior to beginning construction. It is more important to know which species have been observed in the project area so that strategies or measures can be included in the construction plan to eliminate or reduce their populations and avoid their spread.

ATC states that it evaluated the ROW for invasive plant species during field surveys along existing corridors during the growing seasons of 2012 and 2013. The general locations and composition of dominant invasive species present within the ROW were identified and mapped with GPS instruments during wetland delineations and natural habitat evaluations. However, targeted surveys to identify and map all invasive species were not completed as part this assessment.

Invasive plant species were commonly observed along the route sections evaluated by the applicant in the field. Overall, 16 invasive plant species were identified along the route sections, all falling into the "Restricted" category of Wis. Admin. Code ch. NR 40 as of May 2013. There were no "Prohibited" species found.

The observed invasive species included:

- Garlic mustard (*Alliaria petiolata*)
- Creeping bellflower (*Campanula rapunculoides*)
- Spotted knapweed (*Centaurea biebersteinii*)
- Canada thistle (*Cirsium arvense*)
- Common teasel (*Dipsacus fullonum*)
- Autumn olive (*Elaeagnus umbellata*)
- Honeysuckle species (*Lonicera spp.*)
- Purple loosestrife (*Lythrum salicaria*)
- Wild parsnip (*Pastinaca sativa*)
- Common reed (*Phragmites australis*)
- Common buckthorn (*Rhamnus cathartica*)
- Glossy buckthorn (*Rhamnus frangula* or *Frangula alnus*)

The most commonly observed "Restricted" plant species along the route sections included narrowleaf cattail (*T. angustifolia*), Canada thistle, multiflora rose, common reed, and honeysuckles.

ATC states that it would comply with Wis. Admin. Code ch. NR 40 by implementing BMPs when encountering species listed as "Restricted" or "Prohibited." This is appropriate because standard BMPs have been developed by DNR and interested stakeholders to avoid and minimize the spread of listed species. The BMPs would vary throughout the ROW based on the degree of invasiveness, severity of the current infestation, and susceptibility of non-infested areas to invasion.

BMPs would include:

- Avoidance through construction timing and alternate access.
- Proper management of construction vehicles and materials (i.e., storage, cleaning).

- Minimization of ground disturbance.
- Placement of a barrier between construction vehicles and plants (i.e., construction matting or geotextile fabric).
- Proper storage and disposal of plant materials.
- Promotion of native regeneration using short-term stabilization measures.
- Retainment of cut vegetation on-site where it is cut (i.e., mowing shrubs).

Additional evaluation would be conducted if a particular route was chosen to further identify where site-specific BMPs would be appropriate. ATC states that those BMPs would be incorporated into environmental access plans implemented during construction.

Besides plant species, there are other invasive species that would bear monitoring and prevention of spread during the transmission construction.

- Portions of both Route Sections C3 and C4 are in the EAB (*Agrilus planipennis*) quarantine areas, specifically in Brown County. Practices that minimize the spread of EAB include avoiding movement of ash wood products (logs, posts, pulpwood, bark and bark products, slash and chipped wood from clearing) and hardwood firewood from EAB quarantine areas to non-quarantine areas, as per Wis. Admin. Code § ATCP 21.17. Where ash wood products cannot be left on-site, ATC states that alternate plans would be developed to meet the requirements to prevent spread of the EAB.
- The rusty crayfish (*Orconectes rusticus*) is an invasive crayfish species whose populations began to increase swiftly in Wisconsin around 1960. It was likely introduced by fishermen who used it as live bait. It eats native aquatic plants and fish eggs in lakes and streams, which would severely damage native aquatic ecosystems by destroying habitat, limiting the reproduction of native fish species and wildlife, and negatively affecting the health of the waters they inhabit.

  Construction of a transmission line could have the potential to allow further spread of the rusty crayfish if work were to occur in streams or lakes below the OHWM. If any equipment, boats, or tools that would be used for the project contained rusty crayfish or its eggs, the species could be spread into a waterbody that was currently free from the pest.

  Several medium-sized rivers are crossed by Central Routing Area route sections (*e.g.*, Pensaukee River, North Branch of the Pensaukee River, and the Little Suamico River), along with numerous other smaller waterways. Work below the OHWM of waterways is not anticipated at any locations along the route sections, although some waterways might need to be waded or crossed with boats during wire stringing operations if a TCSB is not built to cross the waterway. The rusty crayfish is present in Duck Creek, the North and West Branches of the Suamico River, and the Pensaukee River. If equipment was placed below the OHWM in one of these waterways prior to moving equipment between waterway construction locations, ATC states in its application that standard inspection and disinfection procedures would be incorporated into construction methods as applicable. These would be appropriate measures to control the crayfish.

8.2.7. Archaeological and historic resources

Pursuant to Wis. Stat. § 44.40, a reconnaissance of the project area was conducted to determine the potential presence of archaeological and historic sites in the Central Routing Area and overall project area. ATC contracted CCRG to conduct an archival and literature review of cultural resources, architectural/historic resources, and previously-recorded archaeological and burial sites along the route sections and substation sites of the project. To assess the potential effects of the project on archaeological

and cemetery/burial sites and architectural/historic resources, the Archaeological Site Inventory, the Architecture and History Inventory and associated site files, and the national and state registers of historic places were reviewed.

No above-ground NRHP eligible or listed architectural/historic resources were identified in the Central Routing Area. No cemetery or burial sites were identified in the Central Routing Area. No NRHP-listed or NRHP-eligible archaeological sites were identified in the Central Routing Area.

8.3. COMMUNITY RESOURCES AND POTENTIAL IMPACTS

8.3.1. Agriculture

Approximately 91 percent of the proposed ROW within the Central Routing Area is in agricultural land use, with row crops comprising the majority of this area. The majority of the crops are corn and soybeans, but alfalfa and hay fields are also present. Pasture, old fields, and a specialty tree nursery comprise the remainder of the agricultural land.

As a portion of total route section area, 91 percent of the total ROW area of Route Sections C3 and C4 crosses agricultural land. The majority of agricultural land that the route sections cross is cropped. Agricultural land in Route Section C4 is comprised of 96 percent crop land, 3.0 percent old field, and 1.0 percent pasture. Agricultural land in Route Section C3 is comprised of 94 percent crop land, 5.0 percent old field, and 1.0 percent pasture.

Approximately 0.38 acres of a tree nursery would be impacted by Route Section C4. In general, for transmission line projects, when trees are present in the ROW they are cleared. This may result in a loss of a portion of the existing tree farm.

Agricultural land use in the Central Routing Area is summarized in Table 8.3-1.

Table 8.3-1 Agricultural land use along route sections in the Central Routing Area

Route Section	Agricultural Land Use											
	Crops			Pasture			Old Field			Specialty		
	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)	Length (feet)	Existing ROW (acres)	New ROW (acres)	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)
C3	82,657.0	67.7	283.0	1287.0	1.3	4.0	4161.0	6.6	12.4	0.0	0.0	0.0
C4	70,334.0	8.3	282.8	1725.0	0.1	4.3	2016.0	0.3	8.5	96	0.0	0.4

Land enrolled in the FPP is an indicator of farmland quality and value. Although electric transmission lines are permitted on lands enrolled in the FPP and are considered to be compatible with agricultural use, the number and size of parcels enrolled in the FPP along each route have been identified from a database obtained from DATCP in order to locate this quality farmland. The database lists landowners who have voluntarily filed a FPP agreement with DATCP. One landowner has been identified in Route Section C3 as having a FPP property agreement. All FPP parcels impacted by the project would be identified during the easement acquisition process if the project was approved.

Potential construction-related impacts on agriculture would generally be short-term in nature, and could consist of crop losses, soil mixing, or soil compaction along equipment access routes and around structure installation sites. ATC would need to mitigate these short-term impacts by providing compensation to the property owner or person leasing the land for farming and/or by restoring agricultural lands to the extent

practicable. Where appropriate, mitigation techniques such as deep tilling could be utilized. Wisconsin Stat. § 182.017(7)(c) through (h) is a list of landowner rights, many of which address issues important to farm fields, and these rights include required construction impact mitigation measures such as proper segregation of topsoils, post-construction restoration of the field, repair of damaged fences or drainage tile, payment for crop damage and others. A detailed discussion of landowners' statutory rights is included in Section 4.3 in Chapter 5 of the EIS.

In addition to the agricultural practices and land uses listed above, other practices that may be affected by this project include windbreaks, organic farms, drainage tiles, central irrigation systems, and automated tractor use.

Initial research on locations of organic farms along the project routes does not indicate the presence of any such farms in the Central Routing Area (C3 or C4).

In general, in advance of any construction for the project, ATC would and should coordinate with each agricultural landowner regarding their farm operation including field facilities like drainage tiles, locations of farm animals and crops, current farm biological security practices, landowner concerns, and use of access routes. Potential impacts to each farm property along a given ordered route would need to be identified and, where practicable, construction impact minimization measures would need to be agreed upon and implemented. Site-specific practices would vary according to the activities of the landowner/farm operator, the type of agricultural operation, the susceptibility of the local livestock or crops to disease or the susceptibility of site-specific soils to compaction or erosion, the degree of construction occurring on the parcel, and the ability to avoid areas of potential concern. ATC has stated in its CPCN application that it would complete these activities.

There is one confined animal dairy operation within 300 feet of the outermost centerline along portions of both Route Sections C3 and C4.

NRCS easement GIS data show that there are no properties in the Central Routing Area subject to NRCS easements like the wetland reserve program or grassland reserve program. Before ATC filed its CPCN application, however, it had been made aware of two properties along Route Section C3 that may be subject to agreements under the Conservation Reserve Enhancement Program (CREP). CREP agreements are not recorded and so are not in the public record. They are private agreements between the agency and the landowner. The program is administered by the FSA. If the North Appleton-Morgan project is approved and a route is chosen, ATC indicates it will start negotiations and make an offer to purchase the CREP easement. Thus, any landowner could work with the FSA and share the information with ATC regarding the proposed easement. ATC suggests in its application that it would provide compensation to a landowner if the landowner would have to reimburse FSA because of the project.

Nearly all of the land actively farmed within the proposed ROW of the project is comprised of NRCS-classified prime farmland. PSC staff was able to review GIS information to analyze and confirm the locations of prime farmland along the project routes. Prime farmland is land that contains soils with certain characteristics that allow for high yields of a variety of commonly grown agricultural crops. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not

flood frequently during the growing season or is protected from flooding. Prime farmland, as described here, is a categorization based on environmental factors. It is not a program, certification, or an easement category. The geologic history of the area played a large role in the formation of these farmlands.

Wisconsin's forest tax laws encourage sustainable forest management on private lands by providing a property tax incentive to landowners. Two forest tax law programs, both administered by DNR, currently exist: the MFL and the FCL. No properties along the project are shown to be currently enrolled in the FCL program. DNR records show that there are six individual land parcels along Route Section C3 that are currently enrolled in the MFL program, and two along Route Section C4. The full extent to which MFL program participation may be affected by a possible route is unknown at this time. During the easement negotiation process, conflicts between the terms and conditions of the MFL program agreement and ATC's proposed easement, if any, would need to be addressed. If any landowner was unable to continue participation in the MFL program, or if the level of participation was impacted, ATC would and should compensate the landowner as appropriate. If there were conflicts between a transmission line easement and the obligations of a landowner under the terms of the program, land in the easement area would possibly have to be removed from the program.

8.3.2. Land use plans

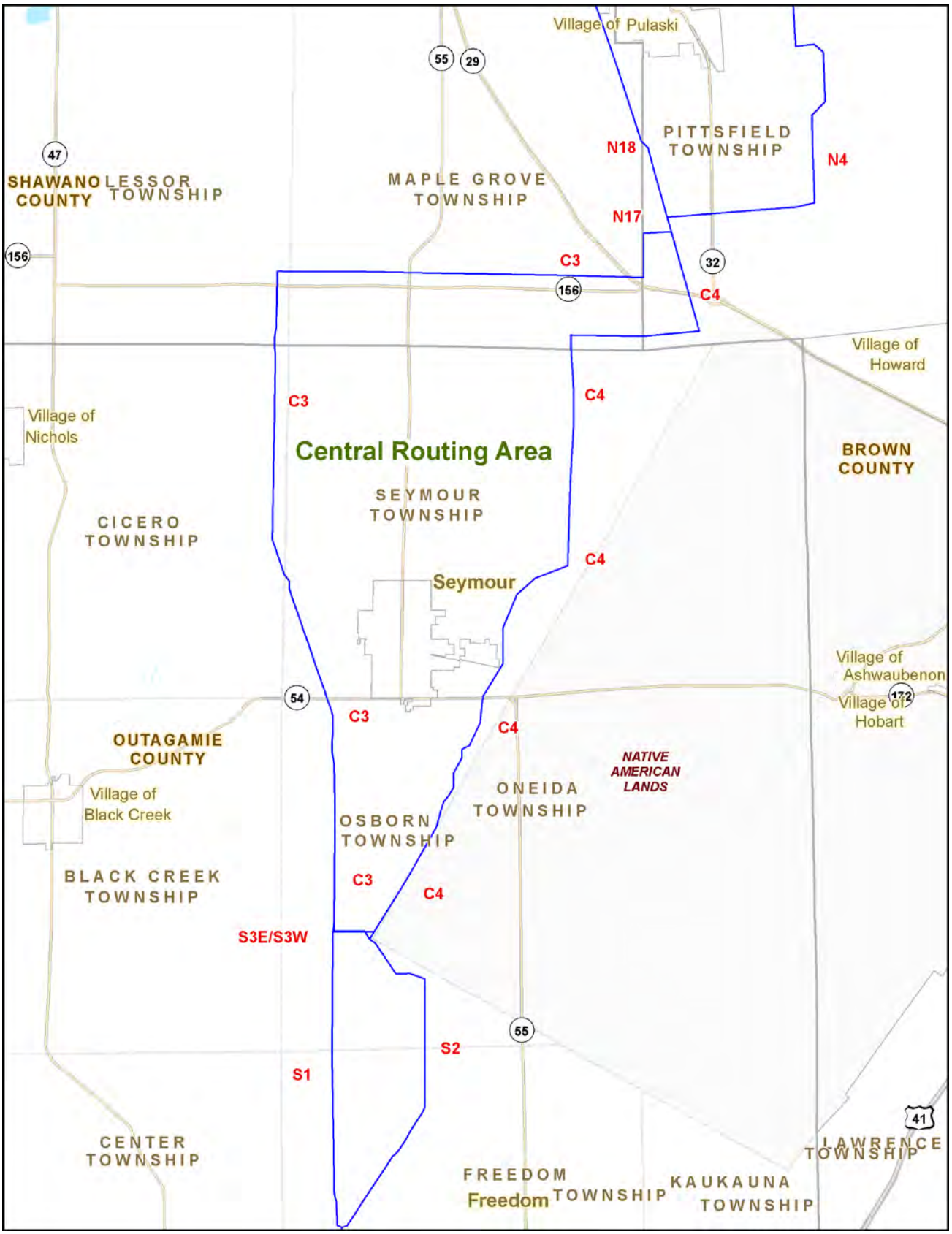
Figure 8.3-1 shows the municipalities potentially affected by the project in the Central Routing Area.

Most areas along both of the proposed Central Routing Area options are rural in nature and primarily made up of agricultural lands, including row crops such as corn or soybeans, fields, and pastures. This agricultural land use is expected to continue into the future, and most municipal land use plans designate the majority of lands in the areas of the central route options as "Agriculture" or "Agricultural encouragement". An electric transmission line is usually mostly compatible with agricultural land use such as row crops. Other rural land use designations such as "Open Lands" with a specification of either wetlands or woodlands are common across both routes. Neither route passes directly through an urban center or dense residential development, but scattered farmsteads and single-family residences are likely to be affected by the visual impacts of the proposed routes. More information on these impacts can be found in Section 8.3.3.

In general, residential land use is considered to be more sensitive to impacts from electric transmission lines than commercial or industrial land uses, primarily due to potential adverse aesthetic effects such as visual impacts or noise. Urban areas or areas where land use planning indicates future urban or high density residential developments have the potential for more conflict with regards to the suitability of transmission lines and land use plans. Other land uses that are less compatible with transmission lines are parks or recreational lands, where aesthetic effects such as visual impacts or noise and the creation of ROW corridors that can fragment habitats and introduce invasive species may impact the quality of a park or recreational area.

Corridor-sharing with other types of infrastructure such as existing transmission lines and multi-lane highways can mitigate new transmission line impacts by causing incremental impacts rather than entirely new impacts associated with a new corridor and new easements. Narrow roads, distribution lines and smaller gas pipelines typically have smaller and less disturbed ROWs than transmission lines and highways, however, and may not be as suitable for corridor sharing and reducing impacts from new transmission lines.

Figure 8.3-1 Municipalities potentially affected by the project in the Central Routing Area



8.3.2.1. Route Section C3

Route Section C3 begins in the town of Osborn in Outagamie County and proceeds north and slightly northwest, avoiding the city of Seymour, before crossing into southern Shawano County and turning east to finish in Brown County in the town of Pittsfield. Across the length of Section C3, 20 percent of the ROW area needed would be shared with an existing 138 kV transmission line, which would decrease the amount of new ROW needed by approximately 83 acres compared to a route that did not share the utility corridor. The most common land use in the proposed project area is agriculture at 94 percent, with row crops the most common type of agriculture use. All of the county, city, and town plans indicate that maintaining agricultural land use is an important part of the land use. Other common land use designations such as open land, wetlands, or woodlands are in keeping with the rural designation of the majority of Section C3's surrounding areas.

Subsection C3-5 crosses the Newton Blackmour State Trail on the western side of the city of Seymour, but does not run parallel to the trail. This area is designated as Parks and Recreation land by the town of Seymour. There is currently a 138 kV line crossing the trail at this location, and the ROW width at this intersection would be increased by 125 feet to accommodate the two new lines if this route is ordered. The area surrounding the trail in this location is agricultural, while the sides of the trail are quite open and grassy with some scattered trees. Proposed routes (C3 and C4) cross this trail in different locations, and impacts to users may be less by routing the new transmission lines on C3, as there is already an existing transmission line in the area.

This proposed C3 (Subsection C3-5) also crosses an area of land designated as Quarries/Mining in the town of Seymour, and this land is currently an active limestone quarry, north of STH 54. The existing 138 kV line that currently crosses the site has two structures within the active quarry, with quarry operations, including access roads, around them. There would be additional obstacles to the use of the quarry with the introduction of the new proposed lines, both during construction and after installation:

- Ground work would be needed to create places suitable for the new structures.
- There would be some disturbance to operations by transmission construction activities during the construction phase.
- There would be limitations to use around the new structures once they were in place.

Subsections C3-9 and C3-11 cross areas along STH 156 and Shady Road in the town of Lessor that are planned for residential development. Subsection C3-9 has been routed to avoid constructing a line directly over an existing residence.

Subsection C3-13 crosses an area of the town of Pittsfield in Brown County in areas of agricultural land and land classified as Environmentally Sensitive Areas (ESA)—which includes "wetlands from the DNR Wetlands Inventory Map, existing mapped floodplain areas, and areas 75 feet back from streams not having mapped floodplain that are protected under the Wisconsin Shoreland Management Program."[109] The plan further states that "Development and associated filling, excavation, grading, and clearing are generally prohibited within ESAs. Farming and landscaping are allowed within ESAs and certain non-intensive uses, such as public utilities and public recreation, are often allowed within these areas." Brown County states that a transmission line is considered a public utility and is exempt from ESA restrictions provided that BMPs are followed during construction and post-construction activities.[110]

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[109] Town of Pittsfield Comprehensive Plan, Chapter 7, Brown County Planning Commission, Adoption Date: August 14, 2007 (Pittsfield Plan).
[110] Letter from Brown County Planning Commission (PSC REF#: 223280, p. 6).

Issues relating to wetland and waterway impacts are further addressed in Section 5.5 in Chapter 5 of this EIS.

8.3.2.2. Route Section C4

Route Section C4 begins in the town of Osborn in Outagamie County and proceeds northeast along the Guardian pipeline route for much of its length, east of the city of Seymour and just outside the boundary with the Oneida Indian Reservation. It would proceed north into Shawano County for a brief distance, in the town of Maple Grove, before turning east and finishing in Brown County in the town of Pittsfield. The majority of land along the proposed route is designated as agricultural or open land (either wetland or woodland) and is rural in nature.

Subsection C4-8 crosses Parks and Recreation designated land consisting of the Newton Blackmour State Trail/Duck Creek Trail on the eastern side of the city of Seymour, at the very southeast corner of land that is designated for industrial use. This land is currently still open grassland, and the land on either side of the trail is agricultural with few trees lining it. This area would share ROW with the existing Guardian pipeline, but would need an additional 170 feet of ROW width created in order to accommodate both transmission lines. Both proposed central routes cross this recreational trail, but the use of Section C4 may cause more impact than C3 as the above ground utility facilities would be entirely new.

The proposed transmission lines in this area of the C4-8 Route Subsection are unlikely to cause conflict with the industrial land use designation as the lines would cross through the southeast corner of the designated industrial land and not fragment the overall site.

A small area of Subsection C4-5 would cross land designated as Quarries/Mining in the town of Osborn. This appears to be an older site no longer in active use for quarry operations. Siting the structures on land in this area would restrict the land surrounding the structures from any future quarry use, but it appears this would have little impact to the usefulness of the site. A greater land use impact in this area would be on the nearby designated residential use along the road leading to the old quarry site on Subsection C4-6. C4-7 diverts from the Guardian pipeline ROW to avoid passing directly over an existing residence, but its proximity to that and other nearby farmsteads and residences is likely to create some aesthetic impacts.

Two of the proposed Route Subsections, C4-9 and C4-10, cross through the town of Pittsfield in Brown County. Both subsections pass through agricultural land and land classified as ESAs that includes "wetlands from the DNR Wetlands Inventory Map, existing mapped floodplain areas, and areas 75 feet back from streams not having mapped floodplain which are protected under the Wisconsin Shoreland Management Program."[111] The Pittsfield plan further states that "Development and associated filling, excavation, grading, and clearing are generally prohibited within ESAs. Farming and landscaping are allowed within ESAs and certain non-intensive uses, such as public utilities and public recreation, are often allowed within these areas." Brown County further states that transmission lines are considered a public utility, exempt from ESA restrictions provided BMPs are followed during construction and post-construction.[112] As stated above, issues relating to wetland and waterway impacts are further addressed in Section 5.5.

The proposed Subsection C4-10 passes through an area between Old Wisconsin 29 and STH 29 that has been designated as having the potential for commercial use and is being promoted for new business development. The town's Comprehensive Plan states that future commercial land uses developed in this

[111] Pittsfield Plan, Chapter 7.
[112] Letter from Brown County Planning Commission (PSC REF#: 223280, p. 6).

area should be done in a fashion that does not detract from the character and attractiveness of the town, but the Plan does not have any specifications regarding utilities.[113]

8.3.3. Proximity to residences and potentially sensitive populations

This section discusses the proposed project's proximity to residences and farmsteads along the Central Route Sections, C3 and C4. Along both proposed routes in the Central Routing Area, the lines would not come within 300 feet of a school, daycare, or hospital. Information for this section came from the tables submitted in the project application that categorize the number of residences within specified distances of the proposed centerline of the transmission lines and the estimated magnetic fields associated with the different proposed transmission line configurations. Additionally, Commission staff reviewed comments submitted by the public, reviewed aerial imagery, and conducted site visits along the routes. A table summarizing the number of residences within 300 feet of either one of the proposed centerlines on both central route sections is found below in Table 8.3-2.

Table 8.3-2 Number of residential structures within 300 feet of the proposed centerline on Route Sections C3 and C4 in the Central Routing Area

Route Section	Distance to Proposed Centerline				Total
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	
C3*		2	5	4	11
C4*		1	3	15	19

* Both C3 and C4 have two additional optional route changes that would alter the number of houses within certain distances to the proposed centerline, see Tables 8.3-3 and 8.3-4 below for this information.

The proximity of properties to high-voltage transmission lines is important because of real and perceived concerns about local aesthetics, changes to valued viewsheds, personal enjoyment and use of one's property, potential impacts to property values, magnetic fields and other electrical phenomenon, and personal and public safety. A generalized discussion of some of these issues is contained in Chapter 5 of this EIS.

Concerns about the construction phase of the proposed project may also be related to the potential impacts to residences. In particular, areas of both routes are in a region that has been classified as an arsenic advisory area by DNR, and there is some concern that construction activities such as drilling or blasting to install structures might fracture rock and create a risk of arsenic being released into groundwater/nearby wells.[114] For these advisory areas, a guidance document relating to drilling activities (directed at wells) has been produced by DNR that may have applicable techniques to decrease any risk of releasing arsenic into groundwater supplies, such as no air rotary drilling.[115]

Commission staff recognizes that individuals and families have substantial financial, physical, and emotional investments in their homes and properties, and that the discussions in this document will most likely not adequately address all the issues felt by many individuals owning property along the proposed routes. This section is not addressing impacts that are restricted to agriculture (see Section 8.3.1) or other open land types such as woodlands or wetlands (see Section 8.2). Refer to the appropriate sections of this

[113] Pittsfield Plan, Chapter 2.
[114] DNR website on arsenic in groundwater, including DNR Map of Arsenic Advisory Area: http://dnr.wi.gov/topic/Groundwater/images/arsenic/AAA.jpg
[115] DNR website on well construction methods that eliminate the introduction of oxidants in the aquifer systems http://dnr.wi.gov/topic/Groundwater/documents/arsenic/sp_cs_areas/Specs.pdf

EIS for more detailed description of impacts to those property types. The following sections of the EIS discuss some special concerns raised with regards to the proximity to residences or sensitive populations for each proposed Route Section.

8.3.3.1. Route Section C3

Route Section C3 follows an existing 138 kV line for much of its proposed length and crosses through farmland north of STH 156. Where the two proposed new lines would run next to the existing line, the expansion of ROW and installation of structures would typically be to the east of the existing ROW, creating greater impact to residences on the eastern side of the existing line. There are several instances where, because existing residences present special challenges to potential routing, several spans of the existing 138 kV line would be rebuilt to the west, with the proposed new lines still built on the eastern side of this existing line. This would result in the ROW expanding to the west of the existing centerline rather than only on the east side. Locations where there is a change to the ROW adjacent to residential properties are described below.

Subsection C3-1 proceeds north and crosses several local roads with residential houses and farmsteads. This area follows the existing 138 kV line, and new ROW would typically be to the east of the existing line. Where the line would cross Kropp Road, a house is approximately 60 feet west side of the existing line and would be approximately 140 feet from the new 138 kV centerline. Although there would be no new ROW impacts to the residence or associated vegetation, the house would have three high-voltage transmission lines just east of the property instead of only one. The current resident has been identified as having a pacemaker and is concerned about increased EMF exposure due to multiple lines.[116]

Further north on Subsection C3-2, the proposed route crosses Culbertson Road and, because existing residences would be close, a shift in the orientation of the line is required, diverting to the west to avoid passing directly over a house. The existing 138 kV line and ROW would be shifted to the west, over some residential landscaping and a residential mound septic system. This would bring the western centerline to 140 feet from the residence, and there would likely be some increased visual impacts and noise from the additional lines. No large trees would be removed, but existing landscaping could be impacted by ROW vegetation requirements. The house on the eastern side of the proposed lines would be less than 100 feet from the proposed new eastern centerline and would not have any trees or vegetation to be removed, but the expanded ROW would encompass part of the existing driveway. Similar noise and visual impacts would be expected.

Route Subsection C3-7 follows the existing 138 kV line parallel to Lawn Road and, where it crosses CTH VV, a farmstead house would be located approximately 75 feet east of the new 345 kV centerline and less than 20 feet from the edge of the ROW. A row of trees provides some screening from the existing line, but the expansion of the ROW to the east towards the house to accommodate the additional lines would require the removal of some a large portion of these trees, removing the existing vegetative screening and increasing the potential noise and visual impacts on this landowner. This residence is the subject of a proposed alternative route option (C3-06.02) that would increase the distance from the proposed centerline to the house by 95 feet at additional cost to the project. See Table 8.3-3 and Figure 8.3-2 for details on this proposal. This alternative route option would bring the lines closer to a residence on the south side of CTH VV (to just over 200 feet) and would result in an additional 4.2 acres of agricultural land impacted.

[116] PSC REF#: 212713.

Figure 8.3-2 Route Section C3 and Option C3-06.02

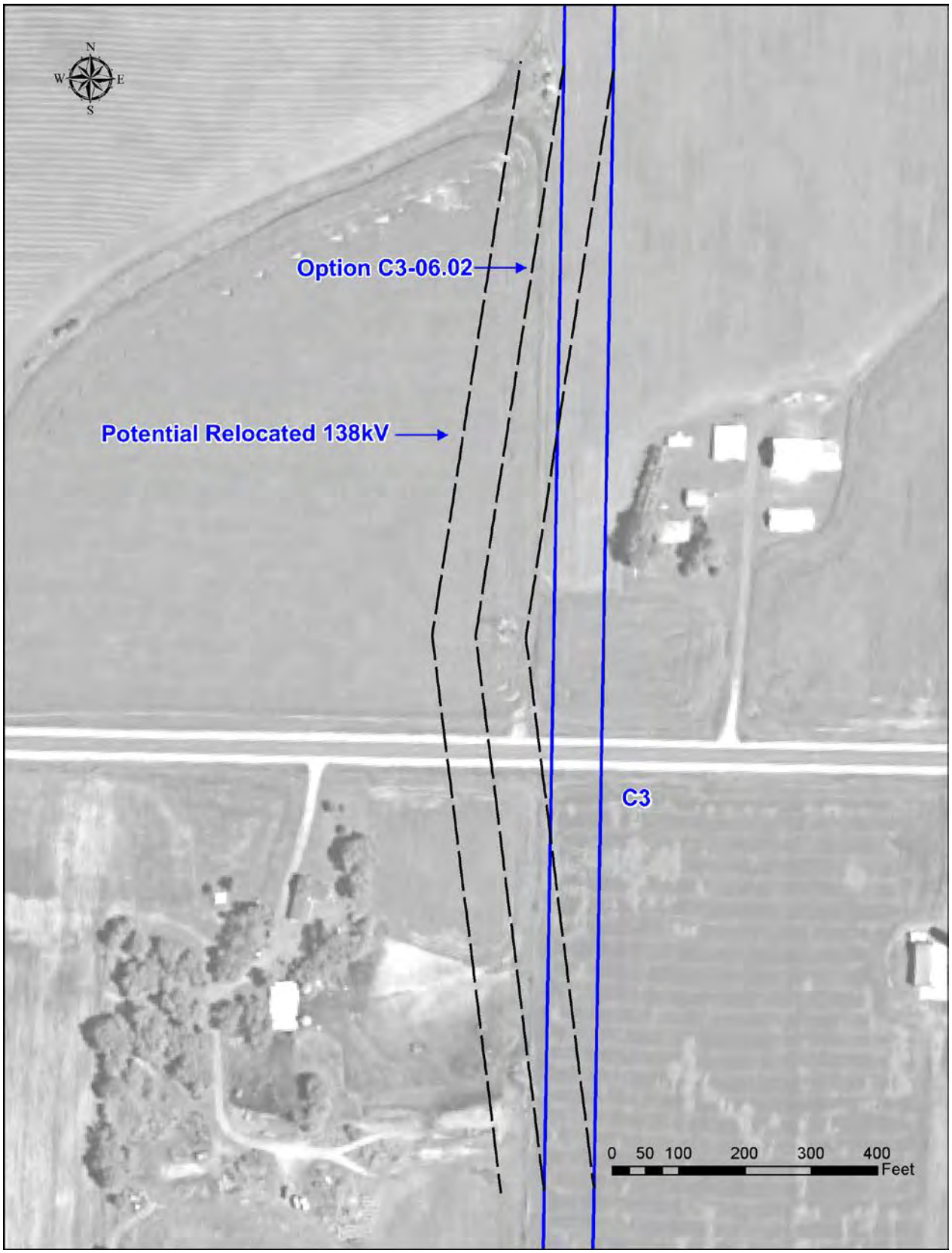
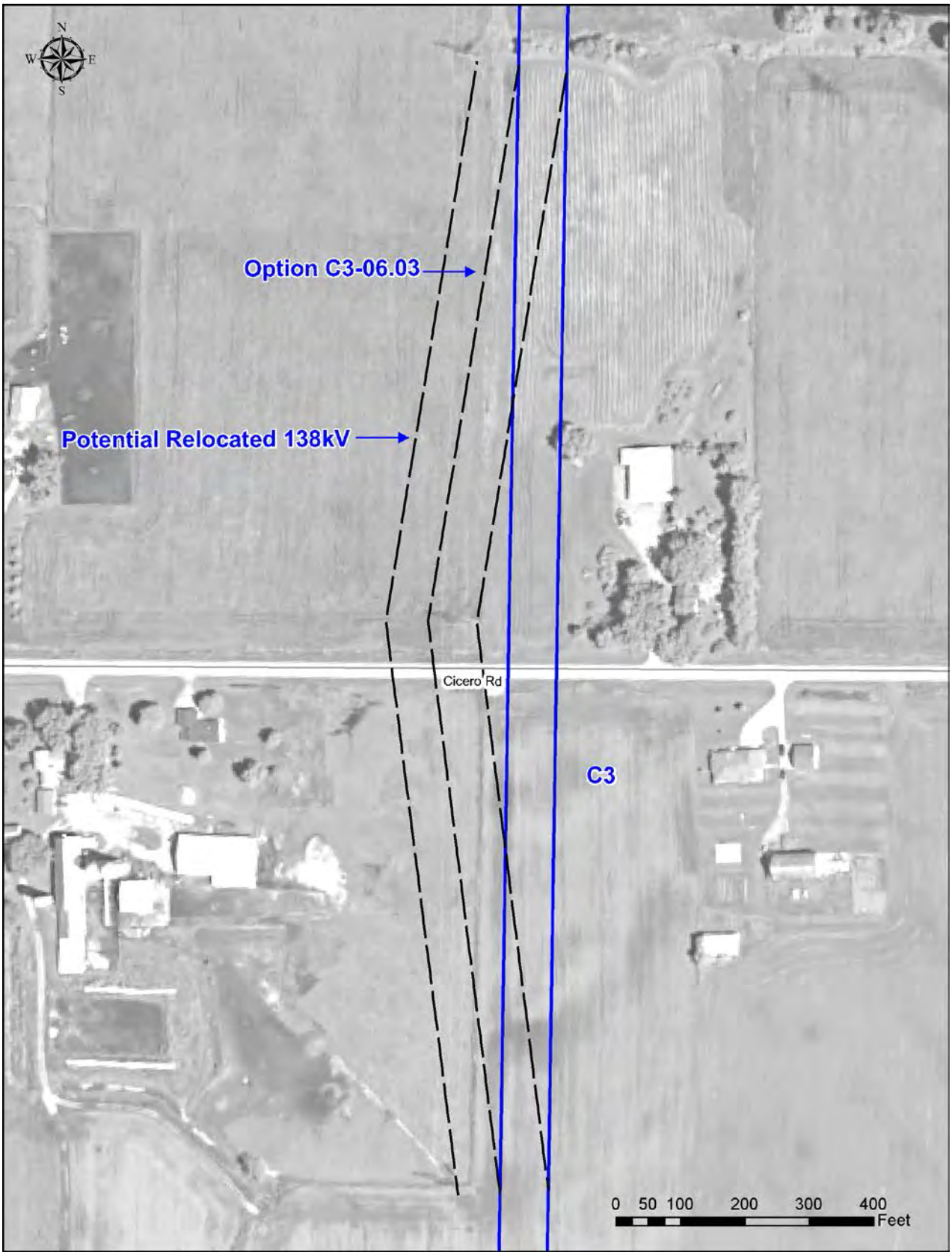


Figure 8.3-3 Route Section C3 and Option C3-06.03



Route Subsection C3-7 also crosses Cicero Road, in the town of Cicero and, at this crossing, there are two residences on the eastern side of the proposed new lines that are approximately 200 to 250 feet away from the projected 345 kV centerline. The ROW would expand to the east, and the house north of Cicero Road would lose some mature trees but retain mature trees closer to the residence that might provide some screening of the lines. This residence has some newer outbuildings that would be within the proposed ROW. The house south of Cicero Road would not lose any vegetation because the expansion would occur within an agricultural field. The applicant provided a proposed alternative route option in this area (C3-06.03 in Table 8.3-3 below) that would increase the distance between the easternmost line and the house on the northern side of Cicero Road by approximately 120 feet at an additional cost to the project. See Figure 8.3-3. This alternative route option would move the proposed lines closer to the house on the western side and increase agricultural land impacts through acreage impacted and the lines passing over stockyards.

Where C3 crosses Shady Road into Shawano County, if the new lines followed the previous layout adjacent to the 138 kV line, they would pass directly over an existing residence. A proposed reconstruction of the existing line and corresponding ROW expansion west of the existing line, with the two new lines constructed to the east, would divert the ROW enough to prevent the centerlines from passing over the residence. The 345 kV centerline would be approximately 150 feet west of the residence under the proposed route and, although the new ROW might result in some trees removed or trimmed on the eastern edge, the majority of the trees that screen the residence from the existing line would be retained.

After the proposed C3 route turns east and leaves the existing 138 kV line, it runs across agricultural fields parallel to but north of STH 156. Less than a mile from this turn, an area resident has been identified as having a pacemaker. Although his house would not be near the proposed lines, there could be an effect if he would work near or underneath the lines. As with any direct health impact, the utility would need to ascertain this possibility.

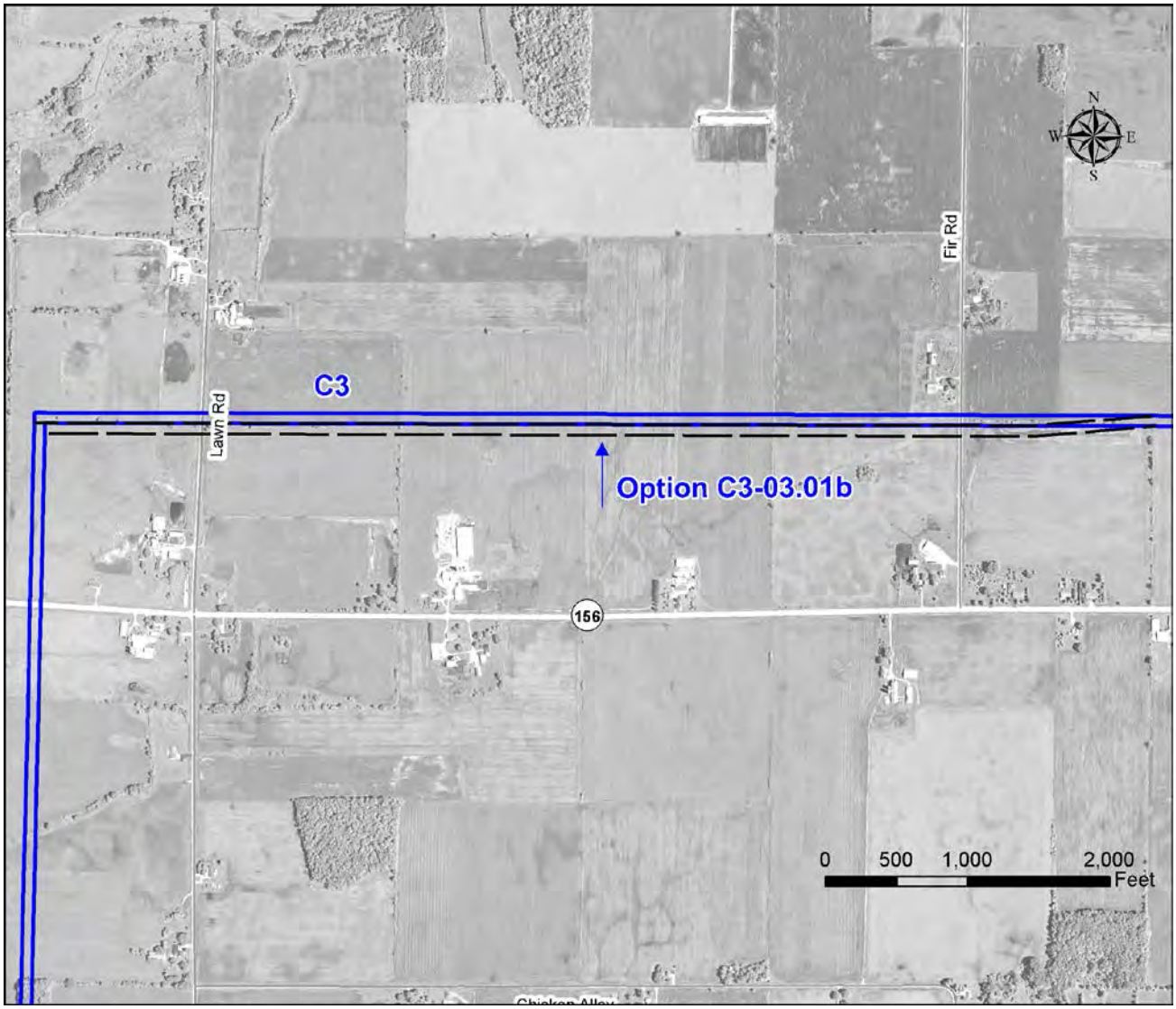
In this area, STH 156 has a large number of houses that are close to the roadway and, typically, running the proposed lines at the back of the parcel lines would avoid having any of the residences fall within 300 feet of the proposed centerlines. An exception to this is where the proposed lines cross Fir Road in Subsection C3-12, where a residence is located approximately 165 feet north of the proposed 138 kV centerline. See Figures 8.3-4 and 8.3-5. No large trees would be lost to the expanded ROW, but neither are there any that could screen the house from these new lines and their potential visual or noise impacts. This residence is the subject of two proposed alternative route options (C3-03.1a and C3-03.1b in Table 8.3-3 below) that increase the distance from the proposed centerline to the house at additional cost to the project, but also increase impact to agricultural acreage and pass closer to a stream.

Figure 8.3-4 Route Section C3 and Option C3-03.01a

Table 8.3-3 Details of additional route options in C3 to increase distances to some residences

Route Option	Added Distance to Centerline	Total Distance to Centerline from Residence	Change in Agricultural Impacts	Cost of Route Option
C3-06.02	+95 feet	170 feet	Increase of 4.20 acres impacted	$775,000
C3-06.03	+120 feet	320 feet	Increase of 2.8 acres impacted	$775,000
C3-03.1a	+ 60 feet	225 feet	Increase of 0.92 acres impacted	$375,000
C3-03.1b	+ 75 feet	240 feet	Increase of 1.45 acres impacted	$200,000
C3-02.01	+ 145 feet	265 feet	Decrease of 1.8 acres impacted	$400,000

Figure 8.3-5 Route Section C3 and Option C3-03.01b



As proposed, Route Section C3 crosses into Brown County and turns north along the east side of St. Augustine Road in Subsection C3-13. Under this configuration, the 138 kV line would be immediately east of the road, closest to it, with the 345 kV line on the eastern side of that line. The proposed route would move the centerline of the 345 kV line to less than 120 feet from a residence on the north side of Cottonwood Road. The corresponding ROW would require the clearing of some mature trees on the western side of the residence between the proposed line and the house. This area is the subject of a proposed route option (C3-02.01, in Table 8.3-3 above) to increase the distance between the house and the proposed centerline and avoid removing the trees. The option would run the transmission lines up the western side of St. Augustine Road until past the residence of concern, before crossing the road and continuing up the eastern side of the road as described in the utility's original proposal. This option is illustrated in Figure 8.3-6.

Further north on Route Subsection C3-13 along St. Augustine Road, the proposed lines would be on the eastern side of the road with the centerline approximately 200 feet away from a residence. This residence has numerous mature trees and shrubs that would not be impacted by the new ROW and would provide some screening of the new transmission lines. Route option C3-02.01 would not change any impacts to this residence.

Figure 8.3-6 Route Section C3 and Option C3-02.01

8.3.3.2. Route Section C4

Route Section C4 generally follows the Guardian natural gas pipeline along much of its route north and east to the Northern Routing Area. Along much of the route, it passes through agricultural or other open lands such as forests, but there are residences scattered throughout the area. Particularly where the proposed route crosses roads, it could be in close enough proximity to cause noise or visual impacts to residences. Locations where the creation of new ROW would impact residential vegetation are highlighted below.

Route Subsection C4-2 follows the Guardian pipeline, just outside the boundary with the Oneida Reservation. Where the proposed lines would cross CTH C, south of Blohm Road, they would be approximately 245 feet from a farmstead residence on the eastern side of CTH C that is part of the Oneida Reservation. The entirety of the ROW is located off tribal land, and no vegetation that would screen the residence from the line would be affected.

Route Subsection C4-6 diverts away from the Guardian pipeline and moves the proposed lines north towards agricultural fields. To reach this area, the proposed lines would cross Ranch Lane, a small road zoned for residential use with two existing houses in place. One of these would be approximately 285 feet west of the 138 kV centerline, and the other would be approximately 175 feet east of the 345 kV centerline. The western house is screened by a number of mature trees that would not be affected by the new ROW, although trees along Ranch Lane would be removed. The proposed lines would pass directly over the mound system and mown yard associated with the house on the east. There is no vegetation to screen the residence from the new lines.

As Route Subsection C4-6 crosses through agricultural fields near the corner of Ranch and Culbertson Roads, there are ten residences along Ranch Road that are beyond 300 feet from the proposed centerlines. These residents would experience a visual impact on their rural view as a result of the new lines. The agricultural field west of Ranch Road and south of Culbertson that would be traversed by the proposed transmission lines also has two existing natural gas pipelines, owned by ANR and Guardian, crisscrossing through it (see Figure 8.3-7). The landowner states that adding another utility ROW to this property, especially an overhead transmission line, would impact the current agricultural use and the future planned residential development of the property.[117,118]

The applicant had provided additional routing options through this field in response to a Commission staff request for options that might increase the distance between the proposed transmission lines and the home at the northwest corner of Ranch and Culbertson Roads (see Figure 8.3-8). A consequence of increasing the distance between the transmission lines and this home is increased impact on the agricultural fields adjacent to this home (see Table 8.3-4). The landowner currently burdened by the cross-crossing natural gas pipelines south of Culbertson Road, would be impacted by either of the additional route options (C4-03.02a and C4-03.02b). Route option C4-03.02b would increase the impacted area by at least 0.37 acres because the poles would be farther into the agricultural field.[119] Route option C4-03.02a would increase the agricultural area affected by approximately 1.27 acres because the route would shift farther into the two properties on either side of Culbertson Road. The lines would cover more land to the west for the landowner north of Culbertson Road and adjacent to the home on the corner. However, the landowner that has the existing gas pipelines south of Culbertson Road (shown in Figure 8.3-7) would potentially have fewer impacts than with the applicant's original route or the later-proposed route C4-03.02b because one fewer set of structures would likely be placed on her property and the ROW would traverse the property in a north-south direction, which is probably more compatible with crop rows, rather than on a diagonal.

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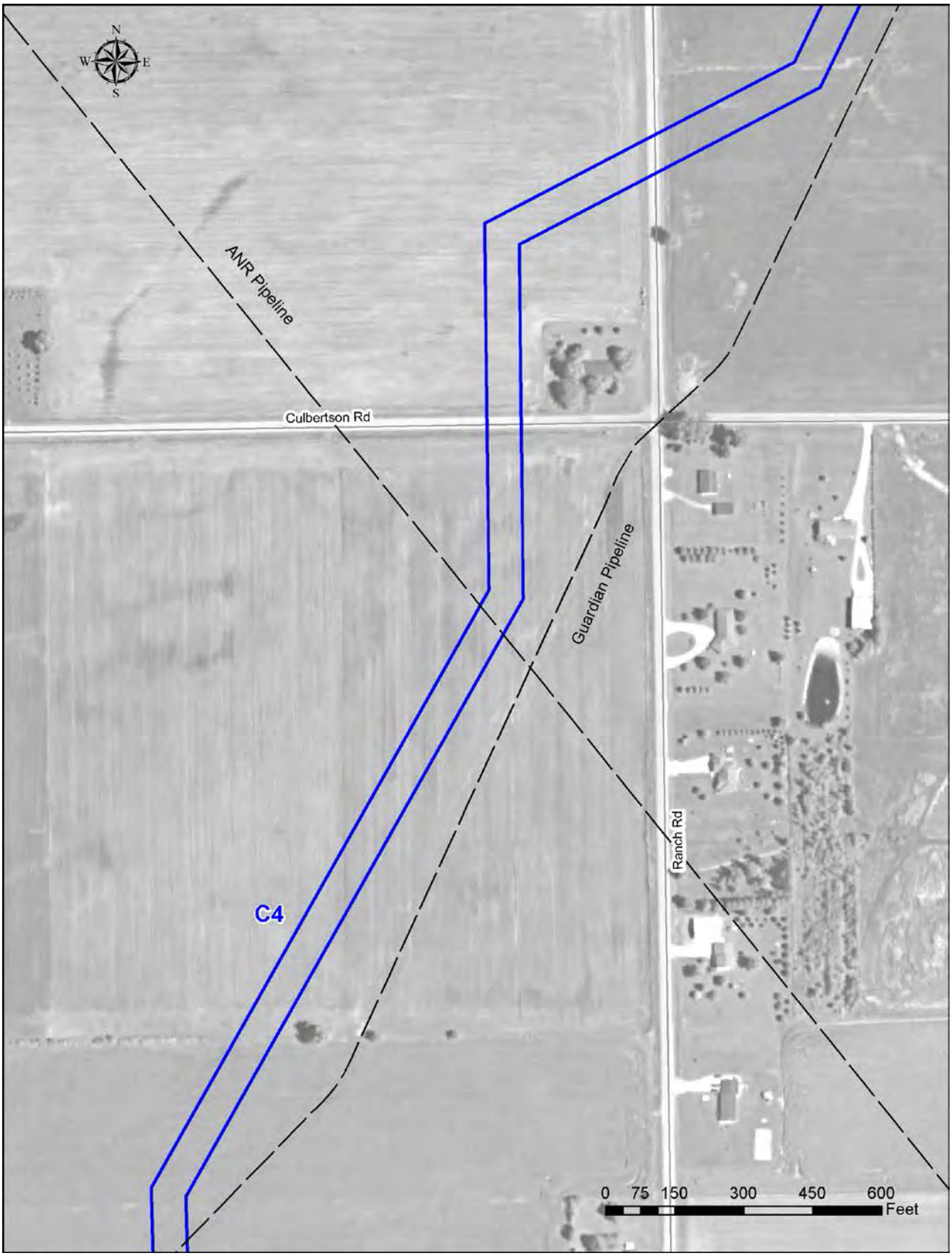
[117] Personal communication between landowner and PSC staff, November 14, 2014.
[118] PSC REF#: 224846.
[119] PSC REF#: 214396.

Figure 8.3-7 Route Section C4 and Option C4-03.02a



Route Subsection C4-7, as initially proposed, crosses Culbertson Road immediately adjacent to a residence on the corner of Ranch Road, then turns and passes behind the house to cross Ranch Road. This would result in the residents having two new transmission lines on two sides of their home, with the distance to the centerline on the western side at less than 150 feet. A few mature deciduous trees immediately next to the house could provide some limited screening and no vegetation associated with the property is planned for removal as part of ROW construction. This area has become the subject of two proposed route deviations from the proposed, as shown in Table 8.3-4 and Figure 8.3-8. Option C3-03.02a would shift the lines further west and decrease the number of angle structures, but bring the lines closer to the residences on the western side (close to 300 feet from the centerline to this western residence.) Option C3-03.02b would not move the line as far west from the initial residence but would add 85 feet in distance and avoid bringing it much closer to the residence on the western side. Both options would decrease costs by the using fewer angle structures, but both would increase impacted agricultural acreage.

Table 8.3-4 Details of additional route options in C4 to increase distances to some residences

Route Option	Added Distance to Centerline	Total Distance to Centerline from Residence	Change in Agricultural Impacts	Cost of Route Option
C4-03.02a	+ 175 feet	325 feet	Increase of 1.27 acres impacted	-$325,000 (cost savings)
C4-03.02b	+ 85 feet	235 feet	Increase of 0.37 acres impacted	-$200,000 (cost savings)
C4-02.02	+ 95 feet	340 feet	Increase of 1.3 acres impacted	$425,000

The proposed C4 route passes east of the city of Seymour and, part of Subsection C4-8, crosses Pearl Street between two residences on the southern side of the street. The house on the western side of the proposed lines is approximately 280 feet from the centerline of the138 kV line, and the house on the eastern side of the lines would be approximately 245 feet from the centerline of the 345 kV line. Neither property would require the removal or loss of any screening vegetation as part of the ROW construction.

Route Subsection C4-9 passes through a number of agricultural fields and crosses Linsmeyer Road east of a residence, just over 200 feet from the 138 kV centerline. No impacts to the residence's vegetation would occur, but there are no mature trees or shrubs on the property to provide screening of the proposed lines.

C4-9 continues north, and where it crosses Plain View Road west of Corput Road, the initially-proposed route crosses over the western edge of a farmstead. The 345 kV centerline would be approximately 245 feet from the house, and a number of mature trees on the western side of the property would be lost in an area that appears to be a working stockyard, causing significant impact to this area. This area has become the subject of a route option (C4-02.02 shown in Figure 8.3-9 and Table 8.3-4 above) that would create a "bump out" beginning south of Plain View Road, and increase the distance from the proposed centerline to the residence. This route option would increase costs due to additional angle structures and could have some farm field operation impacts, but would prevent the removal of the trees on the west side of the residence and avoid running the lines over the stockyard.

Route Subsection C4-9 continues north and, where it crosses CTH VV, the proposed 345 kV centerline would be located less than 90 feet to the west of a residence. Part of the proposed ROW would take up the western part of the parcel and two trees would need to be removed. A second house east of the first would fall within 245 feet of the proposed centerline.

Figure 8.3-8 Route Section C4 and Options C4-03.02a and C4-03.02b

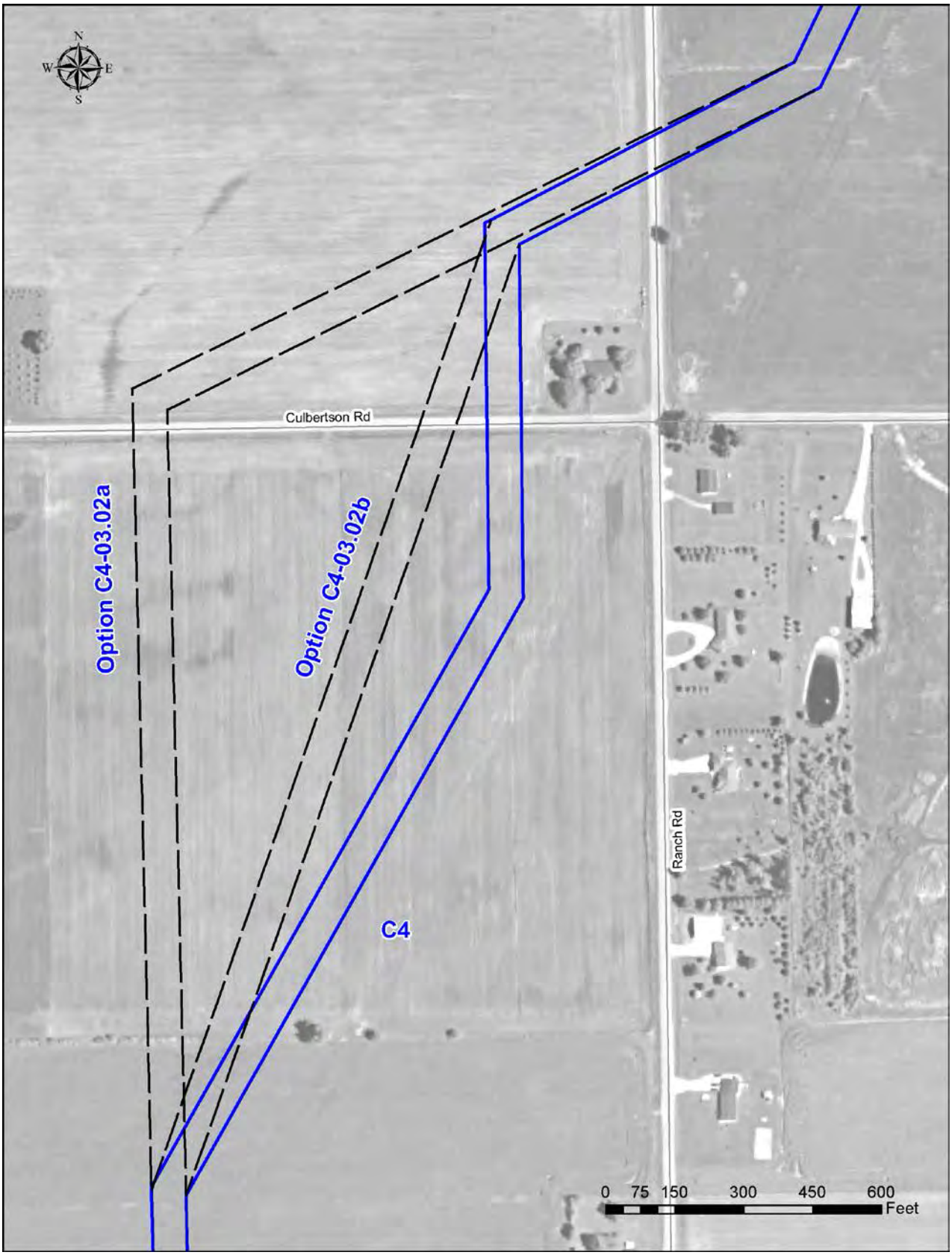


Figure 8.3-9 Route Section C4 and Option C4-02.02

Further north, as Subsection C4-9 crossed Shady Road into Shawano County, the proposed lines would be within 200 feet of residences on both sides of the road. A farmstead on the south side of the road would have two outbuildings within 100 feet of the 138 kV centerline, and the residence would be just under 200 feet from the centerline. No vegetation would be impacted here as part of the ROW construction but, at the residence on the northern side of Shady Road, a few mature trees that would screen the house from the lines would be removed. The house in this area would be approximately 155 feet from the 138 kV centerline. An additional house in this area is located on the north side of Shady Road on the eastern side of the proposed lines, approximately 400 feet from the centerline.

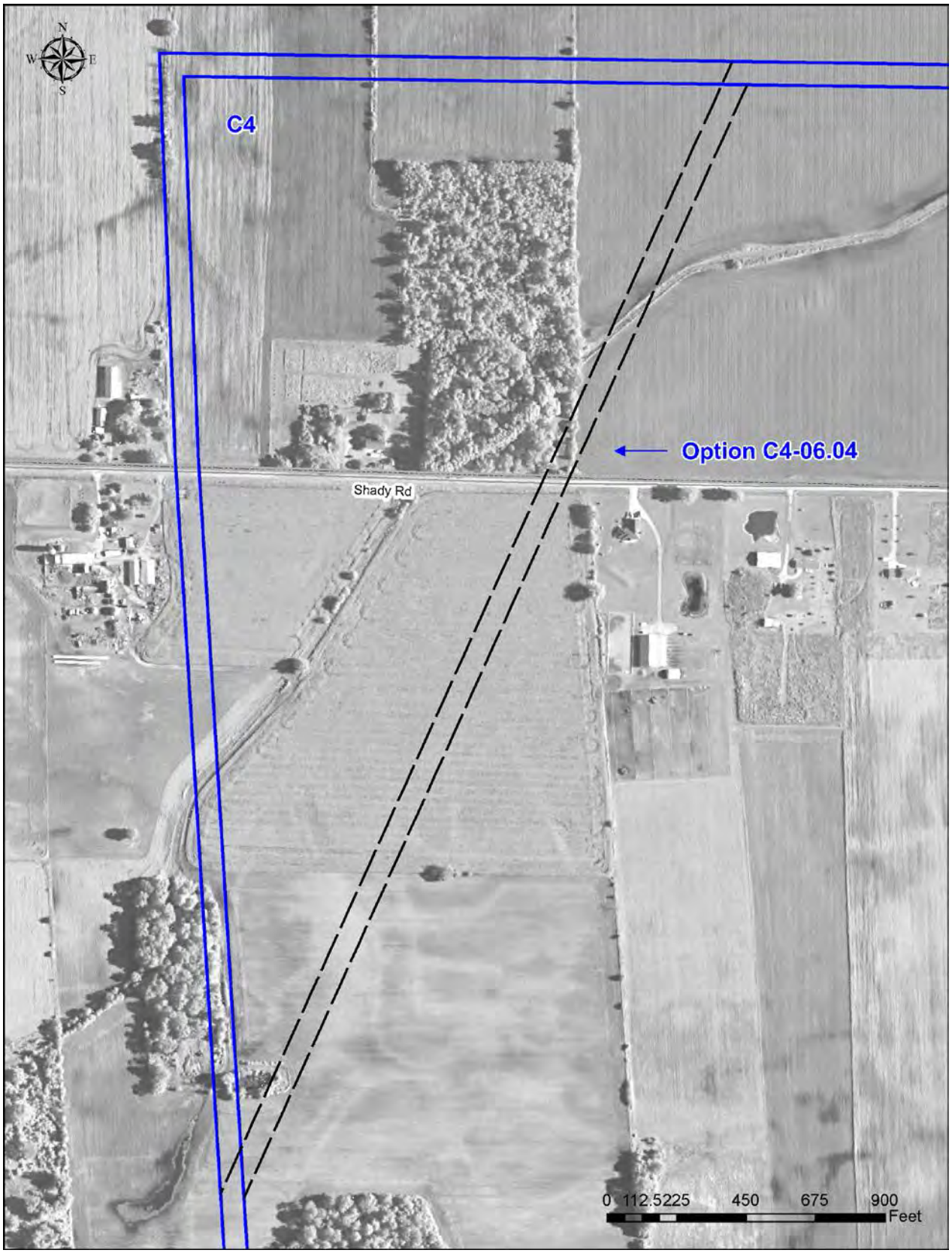
This area is the subject of an alternative route option provided by the applicant after reviewing comments made by a landowner. Route option C4-06.04 would increase the clearance between the proposed lines and an existing dairy and beef farm on the south side of Shady Road and west of the route. See Figure 8.3-10. This alternate route option would increase the distance between the proposed lines and the farm on the western side by 980 feet, however, it would bring the easternmost line from 1,335 feet to approximately 205 feet from a residence to the east. These landowners did not receive notification for the Phase 3 Open Houses or filing of the application. The proposed lines would also cross over a small unidentified building, that is not a residence, on the north side of Shady Road. The route option would result in a reduction of 5.3 acres of agricultural land impacts and 0.4 acres of forested land impacts, as well as a decrease in cost of approximately $150,000 due to a reduction in structures and line length.

Just before Route Subsection C4-9 meets C4-10, it crosses the southern edge of a residential property on Old Wisconsin 29 where the house is far back on the lot. This residence already has a 138 kV line crossing the property within 300 feet north of the house, crossing the wooded driveway, within a cleared ROW. The new transmission lines would run along the southern edge of the property, with the 138 kV centerline just over 150 feet from the residence. The new ROW would extend onto the property in an area that consists of grassland and some young planted conifer trees that would need to be removed (0.9 acres in total). This new line would result in having transmission lines along both the north and south sides of the house, and could increase the visual and noise impacts to this landowner.

Route Subsection C4-10 is located in Brown County, in the town of Pittsfield, and extends to the north, joining the ANR gas pipeline. The route crosses Old Wisconsin 29, STH 29, and Cottonwood Drive before terminating at the junction with the proposed North Route. There are numerous houses in this area, particularly along Old Wisconsin 29. The proposed route passes between several of them on agricultural fields as it crosses Old Wisconsin 29, with three houses located between 170 and 250 feet from one of the two centerlines. None of these residences would be affected by the ROW, and no screening vegetation would be lost in this area.

At the northern area of Subsection C4-10, the proposed route crosses Cottonwood Drive. In this area on the south side of the road, there is a residence located approximately 240 feet west of the proposed 138 kV centerline. The proposed route passes through a woodland owned by the residential property owner, and requires the removal of many mature trees to accommodate the new ROW, potentially impacting the ability of this land to remain enrolled in the MFL program. See Section 8.2.2 for more on forested lands impacts. Screening vegetation between the house and the new lines would not be impacted as the ROW would extend east.

Figure 8.3-10 Route Section C4 and Option C4-06.04



On the northern side of Cottonwood Drive, three houses are located east of the proposed route, with one of them within 250 feet of the 345 kV centerline. A small strip of buffer vegetation would not be impacted by the new ROW in this area, but much of the property is open to the western side facing the new lines, and there would likely be some visual impacts as a result of the new lines.

8.3.3.3. Electric and magnetic fields

The following section on EMF is provided to give readers an idea of the expected magnitude of the magnetic fields that could be produced by the proposed transmission lines under expected normal load and peak load conditions. More background information and a general discussion of EMF is found in Section 5.5.6 of Chapter 5 and Appendix B of this EIS. Because of questions and concerns from the public, the Commission requires applicants for transmission line projects to provide magnetic field data for locations where there are existing transmission lines along the project routes and the estimated magnetic fields at varying distances from the centerline of the proposed project, for both normal load and peak load conditions, at one and ten years after the new line is placed in operation.[120] Magnetic fields are proportional to the current flowing on a line at any given time. Staff has verified that the magnetic field estimates provided by the utility are reasonable estimates based on the modeling tools available.

Because current flow is highly variable, only an estimate of the magnetic fields can be provided.

Along part of Route Section C3 the two new transmission lines would run adjacent to an existing 138 kV transmission line, each line on its own structures; an H-frame for the majority of the existing 138 kV line, and delta configured monopoles for the two newly proposed lines. The existing magnetic fields of the 138 kV line (6851) range from 83 to 93 mG under normal and peak load conditions at the centerline respectively. This route has no residences within 50 feet of any centerline.

Estimated magnetic field levels for 2020 for areas with this configuration are 50 to 56 mG (average and peak loads respectively) for the western, 138 kV centerline (existing or rebuilt in locations), and 60 to 68 mG for the eastern, 345 kV centerline (average and peak loads respectively). At 50 feet from each respective centerline, the estimated magnetic field levels for 2020 would be; 13 to 15 mG for the 138 kV line, and 27 to 31 mG for the 345 kV line. At 200 feet from each centerline the levels decrease to 1.5 to 1.7 mG for the 138 kV line and 2.1 to 2.5 mG for the 345 kV line.

Route Subsection C3-13 would have the two proposed new transmission lines running north, parallel to St Augustine Road, both on delta configured monopoles. The estimated magnetic fields values for 2020 at each centerline are 35 mG at normal load to 34 mG at peak load for the 138 kV line and 61 mG at normal load to 71 mG at peak load for the 345 kV line. At 50 feet from each centerline the estimated levels would drop to 5.2 to 5.1 mG for the 138 kV line and 29 to 34 mG for the 345 kV line. At 200 feet from each centerline, the levels would drop to 0.50 mG to 0.62 mG for the 138 kV line and 2.7 to 3.2 mG for the 345 kV line.

Within Route Section C3, Subsection C3-12 would have the two proposed lines cross land north of STH 156, with each line in delta configured monopoles. Estimated magnetic field levels for 2020 would be 35 mG at the 138 kV centerline and 62 to 71 mG at the 345 kV centerline (average to peak load, respectively). At 50 feet from the centerlines the estimated magnetic field levels would decrease to 5.3 mG for the 138 kV line and 29 to 34 mG for the 345 kV lines. At 200 feet from each centerline these values decrease to 0.49 to 0.60 mG for the 138 kV line and 2.7 to 3.2 mG for the 345 kV line. The same line

[120] Peak load is defined as 100 percent of estimated peak, system normal configuration and normal load is defined as 80 percent of peak load. Values provided are for 2020, the anticipated initial year of operation.

configuration and estimated magnetic field values are given for the southernmost part of C3-1, Subsection C3-6, and Route Subsection C3-14 on this route.

The entirety of Route Section C4 would have the same line configuration and estimated magnetic field values as those described in C3-12 above. This route has no residences within 50 feet of the proposed centerlines. At 300 feet from each centerline, the estimated magnetic field values for 2020 would be; 0.23 mG at normal and 0.29 mG at peak loads for the 138 kV line, and 1.3 mG at normal and 1.6 mG at peak loads for the 345 kV line.

8.3.4. Aesthetics and visual impacts

Aesthetics and visual impacts are closely related and often used interchangeably. Aesthetics tends to encompass whole sensory experiences including sights, smells or sounds from the surrounding environment, while visual impact is more directly related to the observer's views, sightlines and viewsheds. More background discussion on the types and perception of aesthetic impacts can be found in Section 5.5.1. The following discussion of aesthetics is based on the following assumptions:

Different viewers may have different levels of visual sensitivity.

- The surrounding physical setting can influence the degree of visual impact.
- The viewing conditions can influence the degree of visual impact.

In general, aesthetic and visual impacts are difficult to measure and tend to be perceived as greater in more natural or scenic settings. However, homeowners in partially developed residential settings can also experience significant aesthetic and visual impacts related to transmission lines, especially if no other aboveground utility infrastructure is present in the area beforehand.

Both Central Route Sections cross areas where agriculture is the dominant landscape feature, interspersed with woodland and wetland areas, where the topography is generally flat or gently rolling hills. The proposed configuration of having the two new transmission lines each on their own structures, one at around 120 feet tall and the other around 85 feet tall, rather than double-circuiting the lines, is likely to result in higher visual impacts across both Central Routes. The impact of the heights of the new facilities would likely be only partially mitigated by the proposed oxidized coating on the structures, meant to blend in better with the northern woodlands.

Section C3

A long portion of Route Section C3 is adjacent to an existing 138 kV line, currently on H-frame structures. The proposed route uses this existing ROW, widened by 125 feet, to accommodate the two new lines. The proposed C3 route passes through agricultural fields, and along woodlots, west of the city of Seymour. The visual impact to residences would be greatest where the lines approached and crossed roads where residences were more common. Several homeowners, noted in Section 8.3.3, would lose some vegetation that screens the residence from the lines due to the increase in ROW width, which would increase aesthetic impacts. Where the lines were set back into agricultural fields, the presence of the existing line in the immediate area would mitigate the adverse visual impact to some extent. However, the new 345 kV line would be on poles that are 35 feet taller than the existing structures, which would increase the visual impact, particularly in areas near roads or residences.

West of the city of Seymour, the proposed route crosses the Newton Blackmour State Trail, used by a range of recreational activities in all seasons. An existing structure of the current 138 kV line is located approximately 215 feet north of the trail in an agricultural field, and the proposed project design would

have the two new structures adjacent to this structure. The new lines overhead and the structures visible in the field to the north would increase aesthetic impacts for trail users, but not as significantly as if the lines ran parallel to the trail or if significant changes to the surrounding vegetation (such as clearing a ROW through a woodland) were needed. Visitors or commuters to the area are likely to notice the structures as they drive along some of the smaller town roads, particularly where the three lines would cross overhead.

North of where the proposed route crosses Shady Road into Shawano County, the two new lines would leave the existing transmission line corridor and turn east, running parallel to STH 156, at the back of the parcels through agricultural fields. Visual impacts to those driving down STH 156 would be minimal as the lines would be set back behind many residential houses with accompanying vegetation along the highway. The location of the lines at the back of the agricultural fields might mitigate the new aesthetic impacts to the residences located on STH 156, which are typically closer to the roadside, although their occupants would likely see the line out their back windows. An exception to this potential mitigation is where the lines again cross roads where residences are adjacent and in these areas, the aesthetic impact of the two transmission lines and their associated ROWs would be more significant. Areas where this is likely to be the case are at the intersection with Fir Road, and where the lines would cross STH 29 and turn north to run immediately adjacent to St Augustine Road.

Section C4

Much of Route Section C4 follows the existing Guardian or ANR gas pipeline routes, or would travels cross country through agricultural fields. Similar to Section C3 above, most of the significant aesthetic impacts are likely to occur where the proposed lines would cross or run adjacent to roads that have existing residential development. The transmission lines in these areas would be new to the landscape as compared to the areas on C3 where the lines would run adjacent to an existing transmission line. This new addition to the landscape would likely be more intrusive to local perception. Some examples of areas where this new visual impact is likely are where the proposed lines would cross Old Wisconsin 29 and near the intersection of Ranch and Culbertson Roads, but it is applicable to all areas with residences. Screening vegetation can mitigate this visual impact where it is present around residences and it is not lost to ROW expansion or provided space is available for planting by the homeowner.

East of the city of Seymour, Route Section C4 crosses the Newton Blackmour State Trail, used for a range of recreational activities. The surrounding area is agricultural fields with few trees or natural vegetation. Introduction of two transmission lines to this area would create an aesthetic impact, but less than would be expected if there was significant vegetation changes in the area, or the lines were routed parallel or adjacent to the trail.

In areas where the proposed route shares ROW with the gas pipelines, significantly more ROW widening would take place (up to 170 feet), and more of these areas are wooded. Clearing areas of mature woodland and installing new transmission lines with their associated structures would be more likely to cause aesthetic impacts because there would be a more drastic change in vegetation and fragmentation of woodlands. Many of the areas to be cleared are not immediately adjacent to roads or residential areas, decreasing the potential for roadside viewing impacts along this route.

8.3.5. Public lands and recreation

Apart from ROWs associated with state, county, and local roads, the only publicly owned lands along this section are those associated with the Newton Blackmour State Trail, discussed above in Section 8.2.1.

Based on 2013-2104 maps of Outagamie, Shawano, and Brown Counties, both Route Sections cross local and statewide snowmobile trails. Communicating with trail managers prior to construction and adequate signage during construction, if needed, would minimize the potential for any accidents.

8.3.6. Airports and airstrips

There are no public or privately-owned airports or airstrips on Route Section C3.

A comment has been received that states there is a private airstrip that would be affected by Route Section C4—specifically, Subsection C4-10. A landowner whose property is west of Highway 32 has stated there is a private airstrip on his land, but was not specific to its location, and details regarding this landing strip have not been found on the WisDOT Bureau of Aeronautics website, nor is it visible on aerial imagery. Subsection C4-10 passes through the southwest corner of one parcel identified as being owned by this landowner, but without further information on the specific location and orientation of this private airstrip, an assessment of the potential impacts cannot be completed.

8.3.7. Communication towers

An initial assessment of the potential impact on communication facilities was conducted to determine whether a viable risk to communication operations is present. See Section 5.5.12 in Chapter 5.

Along both central route options, C3 and C4, no AM broadcast facilities are within 10 km (6.2 miles) of the proposed routes. There is one FM broadcast facility located within 10 km of Route Section C3, located on the north side of the city of Seymour (WKZG - 104.3 MHz, FM station). No TV broadcast facilities were located within 10 km of either central route.[121]

ATC provided a list of FCC-licensed structures found within 10 km of both of the proposed central routes. Along Route Section C3 there are the following structures: five cell towers, three microwave towers, and three shared cell/microwave towers. Five of these have been recommended by the project consultant to have additional analysis to determine any impacts. One of the cell towers, located on STH 156 near Seymour, has been recommended for grounding analysis because of its proximity to the proposed C3 route. Route Section C4 has seven cell towers and two shared cell/microwave towers within 10 km of the route, none of which have been identified as needing additional analysis to determine impacts.

8.3.8. Electric distribution lines

Along both Central Route Sections, there are distribution lines owned by Wisconsin Electric Power Company (WEPCO) and Wisconsin Public Service Corporation (WPSC) that would require relocation if the proposed project is approved. These existing distribution lines might be located in areas that would pose physical conflicts with either proposed route, or their proximity to one of the transmission lines might result in concerns about stray voltage resulting from NEV situations. (See Section 5.5.15 in the EIS.) No distribution lines are proposed to be underbuilt on either of the proposed new structures along either route.

Because of concerns about stray voltage and its potential effect on confined animals (such as dairy cows), all routes have been analyzed for areas where distribution lines might be located too close to the proposed transmission lines. There is a general consensus that distribution lines located less than 150 feet from a

[121] Data provided to ATC by Power Engineers, Communication Facility Impact Study, Phase 1, January 31, 2014.

transmission line and running parallel to a transmission line for a continuous distance greater than 1,000 feet can cause impacts to farms with confined animals. Further information on the cause, impact, and mitigation options of stray voltage or NEV is provided in Section 5.5.15.

All distribution modifications required as a result of the ordering of this project would be made by the distribution owners, including distribution line design, relocation, burial, and any associated permitting.

8.3.8.1. Route Section C3

Most of the distribution lines proposed to be relocated if Route Section C3 is approved are short lengths where the proposed transmission lines would cross existing distribution lines. See Table 8.3-5 below. Where there would be conflict between the height of the existing distribution lines and the clearance needed by the proposed new transmission lines, the distribution lines would be relocated or, more likely, buried. However, within Subsection C3-13, there is a 4,100-foot length of WEPCO distribution line along the east side of St Augustine Road that currently runs along the same route the proposed lines would take. This line would need to be relocated.

Table 8.3-5 Distribution lines that would be relocated at transmission line crossings for Route Section C3

Subsection	Location	Length (feet)
C3-1	To the west of French Road	630
C3-6	Along the east side of Lawn Road	510
C3-12	Along the west side of STH 55	480

8.3.8.2. Route Section C4

Route Section C4 would not run along roads where there are existing distribution lines, but rather, would tend to cross these features at various angles. Where there would be a conflict between the height of the existing distribution lines and the clearance needed for the proposed new transmission lines, the distribution lines would be relocated or, more likely, buried. Table 8.3-6 below lists the subsections and areas where distribution would be relocated if the C4 route was ordered.

Table 8.3-6 Distribution lines that would be relocated at transmission line crossings for Route Section C4

Subsection	Location	Length (feet)
C4-2	Along the west side of CTH C	540
C4-8	Along the north side of STH 54	270
C4-8	Along the north side of Pearl Road	280
C4-9	Along the south side of Plain View Road	600
C4-9	Along the south side of CTH VV	300
C4-10	Along the north side of Cottonwood Drive	250

CHAPTER

9

9. Environmental Analysis: North Routing Area

The North Routing Area in Brown, Shawano, and Oconto Counties encompasses ten Route Sections: N4, N6, N7, N8, N13, N14, N15, N16, and N18.. There are two primary route options in the North Routing Area that start with Route Section N17 in the town of Pittsfield, Brown County, and end with Route Section N16 at the Morgan Substation near Oconto Falls, Oconto County. The two primary route options are dominated by Route Section N18 (western) and Route Section N4 (eastern), with three western routing options and one eastern routing option proposed by the applicant:

- North Option West with N15: N17-N18-N14-N15-N6-N16
- North Option West with N13: N17-N18-N13-N6-N16
- North Option West with N7: N17-N18-N14-N7-N8-N16
- North Option East: N17-N4-N8-N16

The North Routing Area route options are presented from south to north in Sections 9.1.1 through 9.1.10. The route sections and North Options are shown on the maps in Figures Vol. 2-1.01 through 2-1.06.

9.1. ROUTE SECTION COMPARISONS

9.1.1. Route Section N17

9.1.1.1. Detailed route section description

Route Section N17 is a common segment connecting the Central and North Routing Areas. There are no alternatives to this route section. See Figure Vol. 2-1.04. Section N17 is located in the town of Pittsfield, Brown County, and has one structure configuration. From the endpoints of Route Sections C3 or C4, this section heads northwest through an agricultural field along an ANR gas pipeline for approximately 0.3 miles.

9.1.1.2. Structures and rights-of-way

Route Section N17 would use single-circuit, delta-configured, monopole structures. See Appendix A Figure 19. It would require a total of 5.2 acres of new ROW, approximately five percent of which would be shared with the existing ANR gas line ROW. Throughout this route section, the structures would be installed east of the existing pipeline, and the ROW width would increase 170 feet.

9.1.1.3. Topography, geology, and soils

Route Section N17, along with the entire North Routing Area, is located entirely within the Northern Lake Michigan Coastal ecological landscape as described by DNR in planning documents and publications. See

Figure Vol. 2-8. This overall landscape represents only 3.6 percent of the land area of the state. This area is comprised of sedimentary and igneous bedrock of Silurian, Ordovician, Cambrian, and Proterozoic periods with a depth to bedrock between 5 and 100+ feet. One geological feature of interest in this region of the state is the occurrence of the St. Peter Sandstone bedrock layer, running in a north-south orientation, particularly in areas of Winnebago, Outagamie and Brown Counties.

The landforms of this region, created mostly by glaciers, are till plains that have resulted in a nearly level to gently undulating topography that slopes gently toward the east. The dominant soil is moderately well drained and loamy with a silt loam surface, moderate permeability, and moderate available water capacity.

9.1.1.4. Existing land use

More than 99 percent of this route consists of agricultural land primarily used for crop production. Route Section N17 does not contain any forested areas or wetlands. There is one anticipated waterway crossing.

9.1.1.5. Off-ROW access

There are no currently planned off-ROW access areas along Route Section N17.

9.1.1.6. Staging and laydown areas

Temporary staging areas would be utilized to store vehicles and trailers, construction material and equipment, transmission line structures, conductors, cables and equipment, and other related material either within the ROW or at laydown yards outside of the project ROW. Additionally, wire-stringing setup areas would be necessary for construction of the project.

There are currently no planned laydown yards adjacent to, or in the area, of Route Section N17. However, two laydown yards (Sites 4 and 5) are proposed nearby. Refer to Section 8.1 for more details as they are located closer to Route Section C4.

9.1.2. Route Section N18

9.1.2.1. Detailed route section description

Route Section N18 is the primary western route section in the North Routing Area. See Figure Vol. 2-1.02, 1.03, and 1.04. It is approximately 12.9 miles long and is broken up into nine route subsections (N18-1 through N18-9). This route section has one structure configuration and generally travels northwest along the ANR pipeline from N17 cross-country primarily through agricultural lands. From the town of Pittsfield in northwestern Brown County, the proposed route extends northwest into Shawano County, running along the western edge of the village of Pulaski across STH 160, through the town of Angelica, and ends in the town of Green Valley in northeastern Shawano County. It would cross the pipeline three times. The route section ends and splits into two new route sections (N13 and N14) just north of a bend on CTH E in the town of Green Valley, Shawano County.

Route Section N4 is the general alternative section to N18.

9.1.2.2. Structures and rights-of-way

Route Section N18 would use single-circuit, delta-configured, monopole structures. See Appendix A Figures 1, 18, and 19. It would require a total of 265.9 acres of new ROW, less than 6 percent of which would be shared with the existing ANR natural gas pipeline ROW. Throughout this route section, the existing ROW width would increase between 105 and 180 feet. At Route Subsections N18-2, N18-4, and N18-8, the existing and new ROW width sharing varies from 0 feet to 75 feet as the proposed transmission line crosses the pipeline. In addition, at Route Subsection N18-6, the centerline of the

proposed ROW diverges from the existing pipeline ROW to avoid a gas regulator station and the existing ROW's wide angle at a former railroad track crossing (presently the Mountain-Bay State Trail). Between Route Subsections N18-1 and N18-7 and not including N18-6, the proposed electric transmission line would be constructed east of the existing natural gas pipeline (See Appendix A, Figure 19). For Route Subsection 18-9, the proposed transmission line would be constructed west of the existing gas pipeline (See Appendix A, Figure 18).

9.1.2.3. Topography, geology, and soils

Route Section N18, along with the entire North Routing Area, is located entirely within the Northern Lake Michigan Coastal ecological landscape as described by DNR in planning documents and publications. This overall landscape represents only 3.6 percent of the land area of the state.

This area is comprised of sedimentary and igneous bedrock of Silurian, Ordovician, Cambrian, and Proterozoic periods with a depth to bedrock between 5 and 100 feet. One geological feature of interest in this region of the state is the occurrence of the St. Peter Sandstone bedrock layer, running in a north-south orientation, particularly in areas of Winnebago, Outagamie and Brown Counties.

The landforms of this region were created mostly by glaciers. The area is dominated by till plains that have resulted in a nearly level to gently undulating topography that slopes gently toward the east. The dominant soil is moderately well drained and loamy with a silt loam surface, moderate permeability, and moderate available water capacity.

9.1.2.4. Existing land use

Approximately 86 percent of this route section consists of agricultural land used for crop production or pasture, with some old field. More specifically, Route Subsection N18-7 impacts an existing 0.91 acre hop trellis. The proposed ROW would be cleared and maintained free of woody vegetation and large structures, likely resulting in the loss of this crop.

Proposed Route Section N18 impacts approximately 29 acres of forested area. Eighteen percent is comprised of upland forest, and 82 percent is comprised of forested wetland. Current forested areas range from small scattered woodlots to large expanses of forest. Upland forests are characterized as northern dry-mesic to mesic forests dominated by red pine, white pine, and sugar maple. Forested wetlands are common along waterways and in large depressional areas, and characterized as southern hardwood swamp and floodplain forest dominated by red maple, box elder, green ash, silver maple, and eastern cottonwood. In addition, several parcels along the proposed route section in the towns of Maple Grove, Angelica, and Green Valley in Shawano County are currently enrolled in the MFL land program which restricts certain harvesting activities on these properties.

Approximately 29 acres of wetland (24 acres of forested wetland and five acres of non-forested wetland) would be impacted by proposed Route Section N18. Of the wetlands impacted, three are considered by DNR to be high-quality, significant wetlands. In addition, this route section crosses 31 waterways, including the Little Suamico River which is designated as an ASNRI.

Route Subsection N18-6 crosses the Mountain-Bay State Trail in the town of Angelica in Shawano County north of Deer Drive and west of Green Valley Road. The Mountain-Bay State Trail is an 83-mile recreational trail that crosses north-central Wisconsin from Green Bay (Brown County) to Rib Mountain (Marathon County).

Route Subsections N18-1 and N18-2 are located in the EAB quarantine area in Brown County; therefore, the movement of ash wood products from quarantine areas to non-quarantine areas are restricted, as per Wis. Admin. Code § ATCP 21.17. Tree clearing activities must adhere to this regulation.

9.1.2.5. Off-ROW access

The majority of route sections of the project intersect public roads. Wherever possible, the applicant's direct access to the project ROW would be from the public roads. Staying within the project ROW would be the preferred method of access, unless the contractor was able to arrange for alternative access that would minimize environmental and/or landowner impacts. If this route is approved by the Commission, the preliminary access plan may be amended based on further review, negotiations with local landowners, and/or contractor requirements. There are no currently planned off-ROW access areas along Route Section N18.

9.1.2.6. Staging and laydown areas

Temporary staging areas would be utilized to store vehicles and trailers, construction material and equipment, transmission line structures, conductors, cables and equipment, and other related material either within the ROW or at laydown yards outside of the project ROW. Additionally, wire-stringing setup areas would be necessary for construction of the project.

There are currently no planned laydown yards adjacent to or in the area of Route Section N18.

9.1.3. Route Section N4

9.1.3.1. Detailed route section description

Route Section N4 is the primary eastern route section in the North Routing Area. See Figures Vol. 2-1.01, 1.04, 1.05, and 1.06. It is approximately 15.5 miles long and is broken up into nine route subsections (N4-1 through N4-9). This route section has two structure configurations. From the endpoint of Route Section N17 in the town of Pittsfield in northwestern Brown County, the proposed route extends east, crossing STH 32 and generally following property lines, until it heads north after crossing Kunesh Road N. Here the route crosses the Mountain-Bay State Trail and runs north cross-country, generally following property lines until it turns northeast to meet CTH B. Route Section N4 then continues north along the west side of CTH B for less than 1.0 mile, following it as it turns west. The proposed route then crosses CTH B and heads north cross-country into Oconto County. The route turns west abruptly following the property lines on Franks Lane, and then continues north through agricultural lands and large blocks of contiguous forest. Eventually, Route Section N4 crosses an active quarry before it ends in the town of Morgan in Oconto County just northwest of the intersection of CTH E and CTH C.

Route Section N18 is the general alternative route section to N4.

9.1.3.2. Structures and rights-of-way

Route Section N4 uses two structure configurations, primarily single-circuit delta-configured monopole structures but also single-circuit, vertical-configured monopoles where the line would span a large quarry filled with water (in N4-1) and the Pensaukee River. See Appendix A Figures 1, 2, 14, and 22. It would require a total of 331 acres of new ROW, less than two percent of which would be shared with the existing roadway (CTH B) and distribution line ROWs. Throughout this route section, the ROW would be 180 feet wide, except for Route Subsections N4-6, N4-7, and N4-8 where the ROW would vary between 145 and 180 feet.

9.1.3.3. Topography, geology, and soils

Route Section N4, along with the entire North Routing Area, is located entirely within the Northern Lake Michigan Coastal ecological landscape (see Figure Vol. 2-8) as described by DNR in planning documents and publications. This overall landscape represents only 3.6 percent of the land area of the state.

This area is comprised of sedimentary and igneous bedrock of Silurian, Ordovician, Cambrian, and Proterozoic periods with a depth to bedrock between 5 and 100+ feet. See Figure Vol. 2-9. One geological feature of interest in this region of the state is the occurrence of the St. Peter Sandstone bedrock layer, running in a north-south orientation, particularly in areas of Winnebago, Outagamie and Brown Counties.

The landforms of this region, created mostly by glaciers, are till plains that have resulted in a nearly level to gently undulating topography that slopes gently toward the east. The dominant soil is moderately well drained and loamy with a silt loam surface, moderate permeability, and moderate available water capacity.

9.1.3.4. Existing land use

Approximately 65 percent of this route consists of agricultural land used for crop production and pasture, with some old field. More specifically, Route Subsections N4-2 and N4-5 would impact two certified organic farming operations. The applicant states that it would work with the landowners to minimize potential impacts to their organic farming status during transmission line routing and construction. In addition, several parcels along Route Section N4 are enrolled in the FPP, forever protecting the use of agriculture on these lands.

Proposed Route Section N4 would impact approximately 75 acres of forested area. Forty-one percent is comprised of upland forest, and 59 percent is comprised of forested wetland. Current forested areas range from small scattered woodlots to large expanses of forest. Upland forests are characterized as northern dry-mesic to mesic, and southern dry-mesic forests dominated by red pine, white pine, red oak, white oak, and sugar maple. Forested wetlands are common along waterways and in large depressional areas, and characterized as southern hardwood swamp and floodplain forest dominated by red maple, box elder, green ash, silver maple, and eastern cottonwood. In addition, several parcels along the proposed route section in the towns of Pittsfield, Brown County, and Chase, Oconto County, are currently enrolled in the MFL land program which restricts certain harvesting activities on these properties.

Approximately 61 acres of wetland (44 acres of forested wetland and 17 acres of non-forested wetland) would be impacted by N4. Of the wetlands impacted, 11 are considered by DNR to be high-quality, significant wetlands. In addition, this route segment crosses 38 waterways, including the Little Suamico River which is designated as an ASNRI.

Route Subsection N4-1 crosses the Mountain-Bay State Trail in the town of Pittsfield, Brown County, northeast of the intersection of CTH U and Kunesh Road N. The Mountain-Bay State Trail is an 83-mile recreational trail that crosses north-central Wisconsin from Green Bay to Rib Mountain.

In proposed Route Subsection N4-5, the town of Chase owns a 40-acre former landfill that is being developed into a town park for residents. Hiking and skiing trails as well as a picnic area are to be constructed. The proposed transmission line would run north-south along the western boundary of this park, impacting approximately 3.0 acres of the proposed park that would be within the project ROW.

Route Subsections N4-1, N4-2, N4-3, N4-4, and a portion of N4-5 are located in the EAB quarantine area of Brown County; therefore, the movement of ash wood products from quarantine areas to

non-quarantine areas are restricted, as per Wis. Admin. Code § ATCP 21.17. Tree clearing would need to adhere to this regulation.

In addition, an archaeological site and an airstrip for the Carter Airport have been identified near proposed Route Section N4.

9.1.3.5. Off-ROW access

The need for potential off-ROW access paths has been identified by the applicant based on its preliminary review of the route sections. Wherever possible, the applicant's direct access to the project ROW would be from the public roads. Staying within the project ROW would be the preferred method of access, unless the contractor was able to arrange for alternative access that would minimize environmental and/or landowner impacts. If this specific route section is approved by the Commission, the preliminary access plan may be amended based on further review of the chosen route, negotiations with local landowners, and/or contractor requirements.

Route Section N4 includes two off-ROW access roads approximately 20 feet wide based on typical construction practices. Depending on equipment requirements and site conditions, additional width for safe and efficient movement of construction equipment along these paths may be needed. At Route Subsection N4-1, an off-ROW access road 1,581 feet in length would be constructed along the edge of a large unnamed waterbody within the an agricultural field. Construction matting might be necessary in the agricultural field depending on site conditions. At Route Subsection N4-9, another off-ROW access road 1,222 feet long would be used along an existing access road to an active quarry. There is a large unnamed waterbody just south of the quarry access road (and the applicant's proposed off-ROW access road) that cannot be spanned by a TCSB. Therefore, construction equipment would use the off-ROW access path, potentially disrupting mining activities.

The utility might need some off-ROW access paths for long-term maintenance and safe operation of the transmission lines. ATC intends to evaluate permanent access roads after the order is issued.

9.1.3.6. Staging and laydown areas

Temporary staging areas would be utilized to store vehicles and trailers, construction material and equipment, transmission line structures, conductors, cables and equipment, and other related material either within the ROW or at laydown yards outside of the project ROW. Additionally, wire-stringing setup areas would be necessary for construction of the project.

Laydown yards would be required throughout construction for the set-up of job trailers and storage of construction equipment and materials. The applicant has identified potential laydown yards based on the construction requirements of the project, proximity to work areas, and environmental and landowner impacts. ATC states that, when identifying potential laydown yards, it made attempts to minimize the amount of disturbance and preparation required to provide suitable surfaces for temporary storage of construction equipment and materials. The amount of grading and clearing at these sites would be kept to a minimum because the sites were chosen with these considerations in mind. For example, sites like parking lots, old gravel pits, or fields that have already been paved or that have been previously graded and cleared of vegetation would be ideal locations for laydown yards.

There is one currently planned laydown yard west and outside of the ROW nearest to Route Subsection N4-5 in the town of Chase, Oconto County. See Figure 9.1-1. The laydown yard (Site 6) is approximately 80 acres in size and contains a quarry with a wetland located in the southeastern corner of the property.

Figure 9.1-1 Proposed staging and laydown area Site 6

9.1.4. Route Section N13

9.1.4.1. Detailed route section description

Route Section N13 is a proposed option connecting to N18 in the North Routing Area in the town of Green Valley in Shawano County. See Figure Vol. 2-1.02. It was added by the applicant in response to public comment after the Phase III open house. It is approximately 3.1 miles long and is broken up into three Route subsections (N13-1 through N13-3). This route section has one structure configuration. From the endpoint of Route Section N18 in northeastern Shawano County, the proposed route extends northwest across agricultural fields generally following the ANR pipeline to the west of it, but it would be located between zero and 360 feet west of the gas pipeline. After approximately 0.7 miles, the proposed route turns northeast for approximately 0.4 miles, crosses the ANR pipeline, and heads towards the existing double-circuited Highway 22-Morgan/White Clay-Morgan 345/138 kV transmission lines. Here Route Section N13 travels eastward, for approximately 2.0 miles, across agricultural fields and CTH BB along the southern edge of the existing transmission line ROW. This route section ends after crossing Green Valley Road.

Route Section N14 is the alternate to Route Section N13.

9.1.4.2. Structures and rights-of-way

Route Section N13 would use single-circuit, delta-configured structures. See Appendix A Figure 1, 7, and 18. It would require a total of 59.7 acres of new ROW, less than 15 percent of which would be shared with the existing gas line (ANR) and transmission line (Highway 22-Morgan/White Clay-Morgan 345/138 kV) ROWs. In Route Subsection N13-1, the existing ROW width would be increased from 75 feet to 180 feet to the west and in Route Subsection 13-3, the existing ROW width would increase between 150 and 180 feet.

9.1.4.3. Topography, geology, and soils

Route Section N13, along with the entire North Routing Area, is located entirely within the Northern Lake Michigan Coastal ecological landscape as described by DNR in planning documents and publications. This overall landscape represents only 3.6 percent of the land area of the state.

This area is comprised of sedimentary and igneous bedrock of Silurian, Ordovician, Cambrian, and Proterozoic periods with a depth to bedrock between 5 and 50 feet. The landforms of this region were created mostly by glaciers. The area is dominated by till plains that have resulted in a nearly level to gently undulating topography that slopes gently toward the east. The dominant soil is moderately well drained and loamy with a silt loam surface, moderate permeability, and moderate available water capacity.

9.1.4.4. Existing land use

Approximately 88 percent of this route consists of agricultural land used for crop production, pasture and old field. Approximately 7.1 acres of wetland (4.3 acres of forested wetland and 2.8 acres of non-forested wetland) would be impacted by proposed Route Segment N13. Forested wetlands that would be impacted by this route are characterized as southern hardwood swamp dominated by red maple, box elder, and green ash. In addition, this route segment crosses four waterways, including the North Branch of the Pensaukee River which is designated as an ASNRI.

9.1.4.5. Off-ROW access

There are no currently planned off-ROW access areas along Route Section N13.

9.1.4.6. Staging and laydown areas

There are currently no planned laydown yards adjacent to or in the area of Route Section N13.

9.1.5. Route Section N14

9.1.5.1. Detailed route section description

Route Section N14 is a proposed option connecting to N18 in the North Routing Area in the town of Green Valley in Shawano County. See Figure Vol. 2-1.02. It is approximately 2.1 miles long and has one structure configuration. From the endpoint of Route Section N18 in northeastern Shawano County, the proposed route travels north for approximately 1,200 feet and then turns ninety degrees and travels east through agricultural fields, crossing CTH BB and ending at Green Valley Road in Shawano County.

Route Section N13 would be the route section alternative to N14.

9.1.5.2. Structures and rights-of-way

Route Section N14 would use single-circuit, delta-configured, monopole structures. See Appendix A Figure 1. The proposed ROW would be a completely new 180-foot wide ROW, encompassing about 46 ROW acres.

9.1.5.3. Topography, geology, and soils

Route Section N14, along with the entire North Routing Area, is located entirely within the Northern Lake Michigan Coastal ecological landscape as described by DNR in planning documents and publications. This overall landscape represents only 3.6 percent of the land area of the state.

This area is comprised of sedimentary and igneous bedrock of Silurian, Ordovician, Cambrian, and Proterozoic periods with a depth to bedrock between five and 50 feet. The landforms of this region were created mostly by glaciers, and are dominated by till plains that have resulted in a nearly level to gently undulating topography that slopes gently toward the east. The dominant soil is moderately well drained and loamy with a silt loam surface, moderate permeability, and moderate available water capacity.

9.1.5.4. Existing land use

Approximately 92 percent of this route consists of agricultural land used for crop production and old field. Several fields have been identified along Route Section N14 that use GPS-controlled, driverless tractors as a part of farming practices. Installing transmission structures in these agricultural fields could adversely impact the use and activity of driverless tractors in these fields. In addition, a few parcels along this route section are enrolled in the FPP, forever protecting the use of agriculture on these lands.

Section N14 would impact approximately 3.4 acres of upland forest characterized as northern dry-mesic and southern dry-mesic forest dominated by red pine, white pine, red and white oak, and sugar maple. Forested wetlands are common along waterways and are characterized as southern hardwood swamp dominated by red maple, box elder, and green ash. Less than approximately 0.2 acres of wetland would be impacted by N14.

9.1.5.5. Off-ROW access

There are no currently planned off-ROW access areas along Route Section N14.

9.1.5.6. Staging and laydown areas

There are currently no planned laydown yards adjacent to or in the area of Route Section N14.

9.1.6. Route Section N15

9.1.6.1. Detailed route section description

Route Section N15 is a proposed option connecting to N14 in the North Routing Area in the town of Green Valley in Shawano County. See Figure Vol. 2-1.02. It is approximately 0.6 miles long and is broken up into three route subsections (N15-1 through N15-3). Route Section N15 has one structure configuration. From the endpoint of N14 in northeastern Shawano County, N15 extends east for short distance until it reaches Green Valley Road. Here, the proposed route section turns ninety degrees and runs north along the west side of Green Valley Road, eventually crossing it before joining the existing double-circuited Highway 22-Morgan/White Clay-Morgan 345/138 kV transmission lines.

9.1.6.2. Structures and rights-of-way

Route Section N15 would use single-circuit, delta-configured, monopole structures. See Appendix A Figure 14. It would require 13.6 acres of ROW, 20.6 percent of which would be shared with the existing roadway (Green Valley Road) and distribution line ROWs. The structures would be installed primarily on the west side of Green Valley Road. In Route Subsections N15-2 and N15-3, the ROW width would increase between 114 and 180 feet.

9.1.6.3. Topography, geology, and soils

Route Section N15, along with the entire North Routing Area, is located entirely within the Northern Lake Michigan Coastal ecological landscape as described by DNR in planning documents and publications. This overall landscape represents only 3.6 percent of the land area of the state. The landforms of this region were created mostly by glaciers, and are dominated by till plains that have resulted in a nearly level to gently undulating topography that slopes gently toward the east. The dominant soil is moderately well drained and loamy with a silt loam surface, moderate permeability, and moderate available water capacity.

9.1.6.4. Existing land use

Approximately 79 percent of this route consists of agricultural land used for crop production and old field. In addition, approximately 2.0 acres of wetland (75 percent forested wetland and 25 percent non-forested wetland) would be impacted. Forested wetlands that would be impacted by this route are characterized as southern hardwood swamp dominated by red maple, box elder, and green ash. In addition, this route segment crosses three waterways.

Route Section N15 also comes within 200 feet of the Wiouwash State Trail in the town of Green Valley in Shawano County. The recreational trail consists of two separate segments, the northern segment (nearest to the proposed project ROW) travels 19 miles between Birnamwood and Split Rock, connecting with the Mountain-Bay State Trail in Eland.

9.1.6.5. Off-ROW access

There are no currently planned off-ROW access areas along Route Section N15.

9.1.6.6. Staging and laydown areas

There are currently no planned laydown yards adjacent to or in the area of Route Section N15.

9.1.7. Route Section N7

9.1.7.1. Detailed route section description

Route Section N7 is a proposed option connecting to N14 in the North Routing Area near Green Valley Road in the town of Green Valley in Shawano County. See Figures Vol. 2-1.01 and 1.02. This section is

approximately 3.9 miles long and has one structure configuration. From the endpoint of Route Section N14 in northeastern Shawano County the proposed route extends east for a short distance, crossing Green Valley Road. Here, the route continues east cross-country, primarily through agricultural lands, crossing the Wiouwash State Trail and STH 32. This route section ends northeast of the intersection of CTH C and CTH E, in the town of Morgan in Oconto County.

Route Section N6 is an alternative route section to N7.

9.1.7.2. Structures and rights-of-way

Route Section N7 would use single-circuit, delta-configured, monopole structures. See Appendix A Figure 1. The proposed ROW would be completely new, 180 feet wide, and approximately 85 total acres.

9.1.7.3. Topography, geology, and soils

Route Section N7, along with the entire North Routing Area, is located entirely within the Northern Lake Michigan Coastal ecological landscape as described by DNR in planning documents and publications. This overall landscape represents only 3.6 percent of the land area of the state. This area has a depth to bedrock between five and 50 feet. The landforms of this region were created mostly by glaciers, and are dominated by till plains that have resulted in a nearly level to gently undulating topography that slopes gently toward the east. The dominant soil is moderately well drained and loamy with a silt loam surface, moderate permeability, and moderate available water capacity.

9.1.7.4. Existing land use

Approximately 44 percent of this route consists of agricultural land used for crop production and old field. In addition, the proposed N7 is comprised of large undeveloped areas including native prairies and grassland, upland forests, and wetlands (nonforested and forested), as well as a developed ATV trail. All could be impacted by the proposed transmission lines. The forested areas are comprised of large wooded areas (greater than 80 acres in size). Upland forests are characterized as northern dry and northern dry-mesic forest dominated by red and white pine, red oak, and red maple. In addition, several parcels along the proposed route segment in the town of Morgan are currently enrolled in the MFL land program which restricts certain harvesting activities on these properties.

Approximately 42 acres of wetland (53 percent forested wetland and 47 percent non-forested wetland) would be impacted by proposed Route Section N7. Forested wetlands that would be impacted by this route are found along waterways and in large depressional areas and are characterized as southern hardwood swamp dominated by red maple, box elder, and green ash. In addition, this route segment crosses six waterways. Of the wetlands impacted, six are considered high-quality, significant wetlands.

N7 also crosses the Wiouwash State Trail just west of Green Valley Road in the town of Green Valley in Shawano County. The recreational trail consists of two separate segments, the northern segment (within the proposed project ROW) travels 19 miles between Birnamwood and Split Rock, connecting with the Mountain-Bay State Trail in Eland.

The Oconto County Sportsmen's Alliance (Alliance) owns a total of 440 acres of upland and wetland forests in the town of Morgan. Route Section N7 crosses portions of three separate 40-acre parcels owned by the Alliance, impacting approximately 8.6 acres of upland and lowland forest that would be cleared for transmission line construction and maintenance.

9.1.7.5. Off-ROW access

There are no currently planned off-ROW access areas along Route Section N7.

9.1.7.6. Staging and laydown areas

There are currently no planned laydown yards adjacent to or in the area of Route Section N7.

9.1.8. Route Section N8

9.1.8.1. Detailed route section description

Route Section N8 is a proposed option in the North Routing Area that connects to either N4 or N7 northwest of the intersection of CTH C and CTH E in the town of Morgan in Oconto County and extends northward toward the Morgan Substation. See Figure Vol. 2-1.01. Section N8 is approximately 2.9 miles long and has four route subsections (N8-1 through N8-4). This route section has one structure configuration.

From the endpoint of Route Section N7 or N4, Route Subsection N8-1 runs slightly northwest for approximately 1,820 feet across agricultural fields and Morgan Marsh Road. From here, the route turns slightly northeast for another 730 feet (approximate) and then continues north generally following property lines through agricultural lands. Southwest of the intersection of CTH C and Morgan River Road, N8 turns ninety degrees to the east, then northwest and crosses CTH C. Here, Route Subsection N8-2 travels north along the east side of CTH C. After approximately 1,900 feet, Route Subsection N8-3 heads west, crosses CTH C, goes through agricultural fields and then turns ninety degrees north. From here, N8 travels north and slightly northwest until it ends at the intersection with the existing double-circuited Highway 22-Morgan/White Clay-Morgan 345/138 kV transmission lines.

9.1.8.2. Structures and rights-of-way

Route Section N8 would use single-circuit, delta-configured, monopole structures. See Appendix A Figures 1 and 15. It would require a total of approximately 64.6 acres of ROW, less than 2 percent of which would be shared with the existing roadway (CTH C) and distribution line ROWs. In Route Subsections N8-1 and N8-3, the new ROW would be 180 feet wide. In Route Subsection N8-2, the existing ROW would be constructed on the east side of CTH C and would be increased by 145 feet in width.

9.1.8.3. Topography, geology, and soils

Route Section N8, along with the entire North Routing Area, is located entirely within the Northern Lake Michigan Coastal ecological landscape as described by DNR in planning documents and publications. This overall landscape represents only 3.6 percent of the land area of the state. The landforms of this region were created mostly by glaciers. The area is dominated by till plains that have resulted in a nearly level to gently undulating topography that slopes gently toward the east. The dominant soil is moderately well drained and loamy with a silt loam surface, moderate permeability, and moderate available water capacity.

9.1.8.4. Existing land use

Approximately 72 percent of this route section consists of agricultural land used for crop production or pasture, with some old field. In addition, several parcels along Route Section N8 are enrolled in the Farmland Preservation Program (FPP) forever protecting the use of agriculture on these lands.

In Route Subsection N8-1 there is developed land for residential, farming operations, and a quarry.

Current forested areas within proposed Route Section N8 are comprised of 40 to 80 acre woodlots. The proposed route would impact approximately 3.0 acres of upland forest characterized as northern dry and northern dry-mesic forest dominated by red and white pine, red oak, and red maple. In addition, a few

parcels along the proposed route segment in the town of Morgan (in Oconto County) are currently enrolled in the MFL land program which restricts certain harvesting activities on these properties.

Approximately 9.3 acres of wetland (18 percent forested wetland and 82 percent non-forested wetland) would be impacted by proposed Route Section N8. Forested wetlands impacted by this route are found along waterways and are characterized as northern wet-mesic forest dominated by white cedar. Of the wetlands impacted, two are considered by DNR to be high-quality, significant wetlands. In addition, this route segment crosses three waterways.

9.1.8.5. Off-ROW access

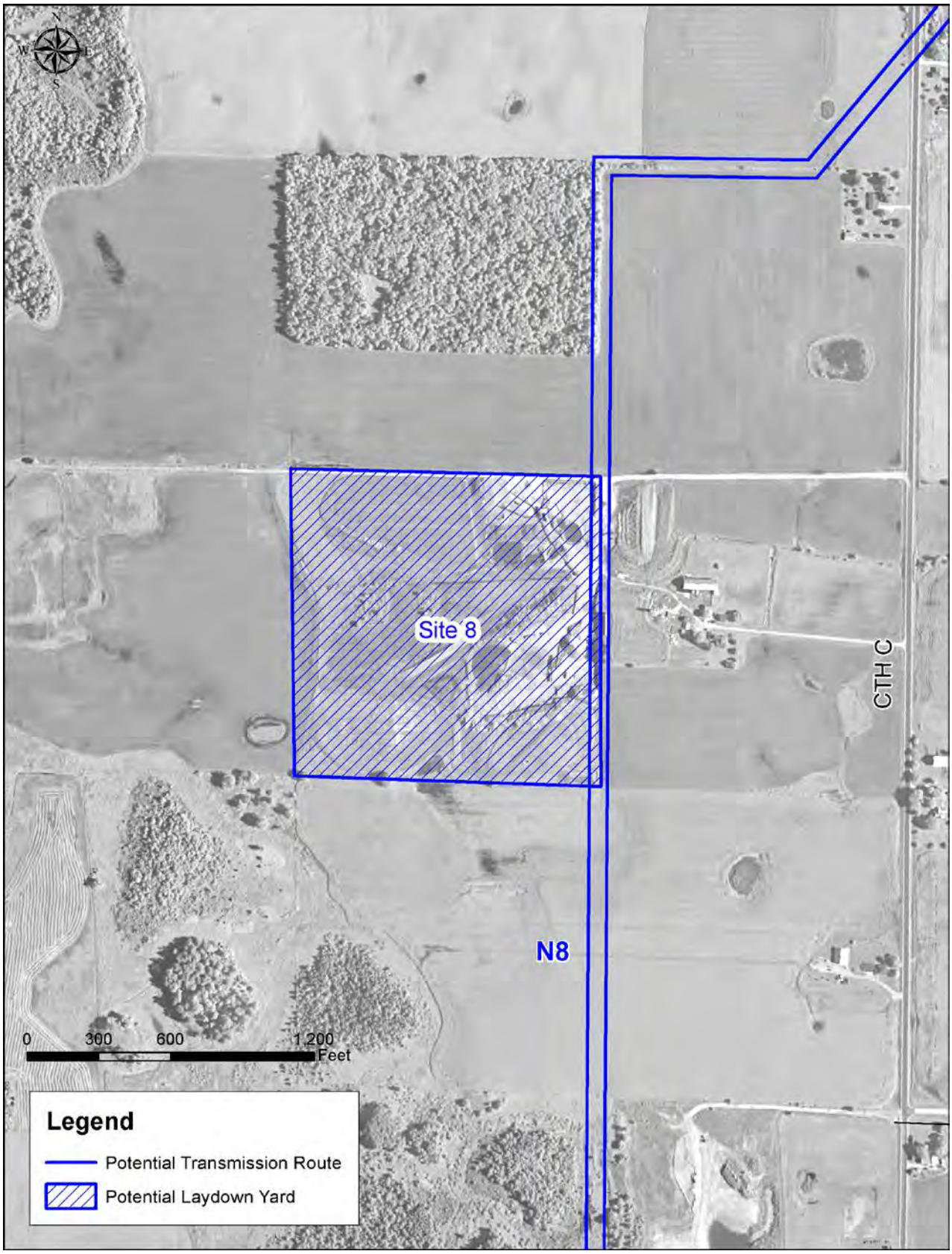
There are no currently planned off-ROW access areas along Route Section N8.

9.1.8.6. Staging and laydown areas

Temporary staging areas would be utilized to store vehicles and trailers, construction material and equipment, transmission line structures, conductors, cables and equipment, and other related material either within the ROW or at laydown yards outside of the project ROW. Additionally, wire-stringing setup areas would be necessary for construction of the project.

There is one currently-planned laydown yard within the ROW of Route Subsection N8-1 in the town of Morgan. The laydown yard (ATC's Site 8) is approximately 40 acres in size and contains an unnamed waterway and a large non-forested wetland. See Figure 9.1-2.

Figure 9.1-2 Proposed staging and laydown area Site 8



9.1.9. Route Section N6

9.1.9.1. Detailed route section description

Route Section N6 is a proposed northern option connecting to N13 or N15 in the North Routing Area, at Green Valley Road in the town of Green Valley in Shawano County. See Figures Vol. 2-1.01 and 1.02. Route Section N6 is approximately 4.6 miles long and has four route subsections (N6-1 through N6-4). This route section has two structure configurations.

From the endpoint of Route Sections N13 or N15, the proposed Route Subsection N6-1 runs north along the east side of Green Valley Road and the existing double-circuited Highway 22-Morgan/White Clay-Morgan 345/138 kV transmission lines. Within this subsection, the proposed route runs along the Wiouwash State Trail and crosses over to the west side of Green Valley Road, between two residences, before turning east and crossing back over Green Valley Road. Here, Route Subsection N6-3 continues northeast along the existing transmission line ROW through agricultural lands and crosses an ANR pipeline, STH 32, and Morgan River Road. From here Route Subsection N6-4 continues northeast along the existing transmission line ROW, crosses Wery and Morgan River Roads, and continues northeast through agricultural lands and large contiguous blocks of forest. This route section ends a short distance south of the Morgan Substation.

9.1.9.2. Structures and rights-of-way

Route Section N6 would use single-circuit, delta-configured or vertical-configured, monopole structures. See Appendix A Figure 7, 8, and 9. In some instances, portions of the existing double-circuit Highway 22-Morgan/White Clay-Morgan345/138 kV transmission lines would be rebuilt offset to the west or north to allow the routing of the new proposed transmission lines to the east and south without expanding the eastern or southern edge of the existing ROW towards dwellings.

N6 would require a total of approximately 123 acres of ROW, less than 31 percent of which would be shared with the ROWs for the existing Highway 22-Morgan/White Clay-Morgan 345/138 kV transmission line and Green Valley Road. Within Route Section N6, the project ROW width would vary between 180 and 270 feet. In Route Subsection N6-1, the existing transmission line ROW width would be increased from 120 feet to between 180 feet and 270 feet. In Route Subsections N6-2 and N6-3, the existing ROW width would be increased from 120 and 130 feet to 270 feet. In Route Subsection N6-4, the existing transmission line ROW would increase between 140 and 230 feet.

9.1.9.3. Topography, geology, and soils

Route Section N6, along with the entire North Routing Area, is located entirely within the Northern Lake Michigan Coastal ecological landscape as described by DNR in planning documents and publications. This overall landscape represents only 3.6 percent of the land area of the state. The landforms of this region were created mostly by glaciers. The area is dominated by till plains that have resulted in a nearly level to gently undulating topography that slopes gently toward the east. The dominant soil is moderately well drained and loamy with a silt loam surface, moderate permeability, and moderate available water capacity.

9.1.9.4. Existing land use

Approximately 56 percent of this route section consists of agricultural land used for crop production or pasture, with some old field. More specifically, along proposed Route Section N6, there is a registered organic farming operation. The applicant should work with the landowners to try to avoid potential

impacts to their organic farming status during transmission line routing and construction. In addition, a few parcels along this route section are enrolled in the FPP, forever protecting the use of agriculture on these lands.

Current forested areas within N6 are comprised of 40 to 80 acre woodlots. The proposed route would impact approximately 17 acres of upland forest characterized as northern dry-mesic, northern mesic, and southern dry-mesic forest dominated by red and white pine, red and white oak, and red maple. In addition, several parcels along the proposed route segment in the town of Morgan are currently enrolled in the MFL land program which restricts certain tree harvesting activities on these properties.

Approximately 23 acres of wetland (42 percent forested wetland and 58 percent non-forested wetland) would be impacted by N6. Forested wetlands impacted by this route are found along waterways and are characterized as southern hardwood swamp and floodplain forest dominated by red maple, box elder, green ash, silver maple, and eastern cottonwood. Some of the wetlands impacted are considered by DNR to be high-quality, significant wetlands. In addition, this route segment crosses 16 waterways including the North Branch of the Pensaukee River which is designated as an ASNRI.

The project centerlines for Route Subsections N6-1 and N6-2 run directly over the Wiouwash State Trail for approximately 900 feet in the town of Green Valley in Shawano County, with the project ROW overlapping the trail for approximately 1,400 feet. The recreational trail consists of two separate segments, the northern segment (nearest to the proposed project ROW) travels 19 miles between Birnamwood and Split Rock in Shawano County, connecting with the Mountain-Bay State Trail in Eland.

Approximately 6.0 acres of developed or urban lands would be impacted by the project ROW. These lands include an ATV trail, residential lots, and a quarry.

9.1.9.5. Off-ROW access

There are no currently planned off-ROW access areas along Route Section N6.

9.1.9.6. Staging and laydown areas

Temporary staging areas would be utilized to store vehicles and trailers, construction material and equipment, transmission line structures, conductors, cables and equipment, and other related material either within the ROW or at laydown yards outside of the project ROW. Additionally, wire-stringing setup areas would be necessary for construction of the project.

There is one currently-planned laydown yard within the ROW for Route Subsection N6-3 located in the town of Green Valley (Shawano County). The laydown yard (ATC's Site 7) is approximately 20 acres in size and contains an area of wooded floodplain along the North Branch of the Pensaukee River (ASNRI) on the east side of the property. See Figure 9.1-3.

Figure 9.1-3 Proposed staging and laydown area Site 7

9.1.10. Route Section N16

9.1.10.1. Detailed route section description

Route Section N16 is a common section connecting all route alternatives to the Morgan Substation in Oconto County. There are no alternatives to this route section. See Figure Vol. 2-1.01. Section N16 connects to N6 or N8 just south of the Morgan Substation in the town of Morgan. Section N16 is approximately 1,312 feet long and extends a short way north through agricultural land along the existing double-circuited Highway 22-Morgan/relocated White-Clay-Morgan 345/138 kV lines and the existing Morgan-Falls 138 kV line. This configuration would result in four parallel structures that would extend northward across agricultural fields south of the Morgan Substation.

9.1.10.2. Structures and rights-of-way

Route Section N16 would use single-circuit, delta-configured, monopole structures. See Appendix A Figure 2. The proposed configuration of Route Section N16 at the Morgan Substation would include the co-location of the existing double-circuited Highway 22-Morgan 345 kV and White Clay-Morgan 138 kV lines, the new double-circuited Morgan-Stiles 138 kV and North Appleton-Morgan 138 kV lines, the rebuilt existing Morgan-Falls 138 kV line, and the new North Appleton-Morgan 345 kV line.

This short route section would require a total of approximately 9.9 acres of ROW, about 55 percent of which would be shared with the existing transmission line (Highway 22-Morgan/White Clay-Morgan 345/138 kV) ROW.

9.1.10.3. Topography, geology, and soils

Route Section N16, along with the entire North Routing Area, is located entirely within the Northern Lake Michigan Coastal ecological landscape as described by DNR in planning documents and publications. This overall landscape represents only 3.6 percent of the land area of the state. This area is comprised of sedimentary and igneous bedrock of Silurian, Ordovician, Cambrian, and Proterozoic periods with a depth to bedrock between 5 and 100+ feet. The landforms of this region were created mostly by glaciers. The area is dominated by till plains that have resulted in a nearly level to gently undulating topography that slopes gently toward the east. The dominant soil is moderately well drained and loamy with a silt loam surface, moderate permeability, and moderate available water capacity.

9.1.10.4. Existing land use

More than 99 percent of this route consists of agricultural land primarily used for crop production. In addition, a few parcels along this route section are enrolled in the Farmland Preservation Program (FPP) forever protecting the use of agriculture on these lands. Route Section N16 does not contain any forested areas or wetlands, and there are no anticipated waterway crossings.

In addition, the Community Memorial Hospital Heliport in Oconto Falls is approximately 3.7 miles from Route Section N16.

9.1.10.5. Off-ROW access

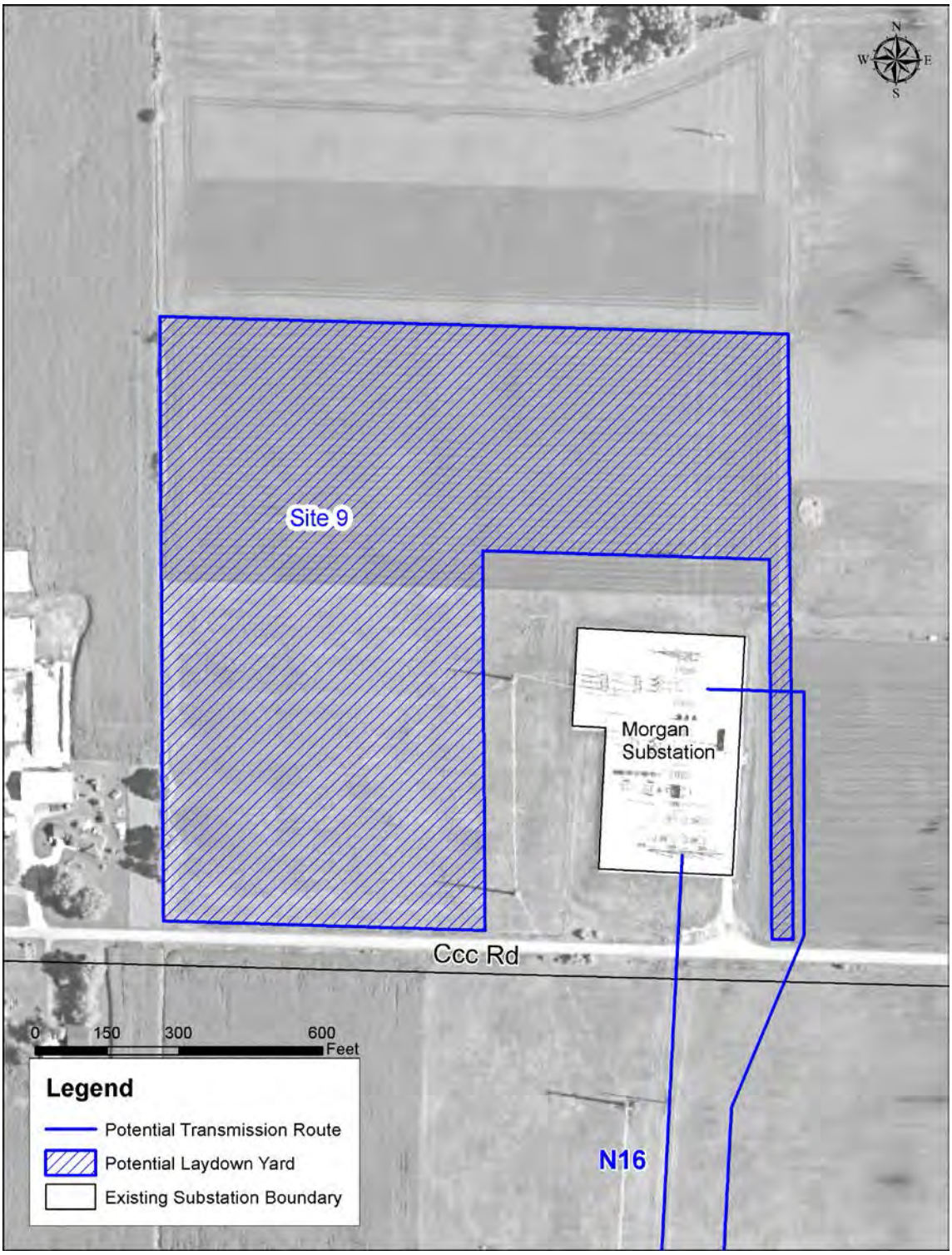
There are no currently planned off-ROW access areas along Route Section N16.

9.1.10.6. Staging and laydown areas

Temporary staging areas would be utilized to store vehicles and trailers, construction material and equipment, transmission line structures, conductors, cables and equipment, and other related material either within the ROW or at laydown yards outside of the project ROW. Additionally, wire-stringing setup areas would be necessary for construction of the project.

There is one currently-planned laydown yard located within the ROW for Route Section N16. It surrounds the Morgan Substation. The laydown yard (ATC's Site 9) is approximately 30 acres in size and has a waterway running around the perimeter of the property along the north and west boundaries. See Figure 9.1-4.

Figure 9.1-4 Proposed staging and laydown area Site 9



9.2. NATURAL RESOURCES AND POTENTIAL IMPACTS

9.2.1. Natural resource properties (local, county, state, and federal lands)

Two state recreational trails are located within the North Routing Area. One is the Mountain-Bay State Trail, and is located along portions of both Route Sections N4 and N18. It is a DNR state trail and is one of the longest rails-trails in Wisconsin. A former railroad corridor, it is 83 miles long and travels between the two geologic features it's named for, Rib Mountain and Green Bay. Permitted recreational uses along the trail include biking, hiking, horseback riding (Shawano County only), and snowmobiling in the winter (except for Brown County). The trail is maintained by the Shawano and Brown County Parks Departments within the project area.

Both Route Subsections N18-6 and N4-1 would cross the trail. The area of the trail within the ROW of Route Section N4 is approximately 0.4 acres, and the area of the trail within the ROW of Route Section N18 is approximately 0.5 acres. The crossing at Route Section N4-1 would occur just west and north of the South Branch of the Suamico River. The crossing at Route Section N18-6 would occur west of Green Valley Road where both the trail and route section pass through a small forested wetland. Immediately north and south of the crossings of the trail and natural areas is mostly agricultural land.

No structures would be placed directly on the trail at either crossing. There are no existing transmission lines at either of the proposed crossings, so the new visual impact would be similar in both locations. Impacts to the trail, other than the new visual impact, would occur only during construction. Once wire was installed, there would be no impacts to the use of the trail at either of the crossings.

Route Subsections N6-1, N6-2, and N7-1 cross a second trail, the Wiouwash State Trail in Shawano County. This recreational trail currently consists of two separate segments. The northern segment (nearest to the proposed project ROW) travels 19 miles between Birnamwood and Split Rock in Shawano County, connecting with the Mountain-Bay State Trail in Eland. The proposed transmission ROW would impact approximately 1.3 acres along Route Subsection N7-1, and 2.11 acres along Route Subsections N6-1 and N6-2. Removal of large trees and vegetation would be required at both crossings, significantly impacting the aesthetics and natural character of the trail in these locations, especially along Section N6 where the proposed route runs parallel to and spans the trail for approximately one-quarter of a mile. Because Section N6 runs parallel to the trail and not perpendicular, structures could be located near the trail. These structures should be located in such a way that minimizes impacts as much as possible.

The Oconto County Sportsmen's Alliance owns 440 acres of wooded wetland and upland in the town of Morgan. Route Section N7 crosses portions of three 40-acre parcels owned by the Alliance. An area of approximately 8.61 acres of property owned by the Alliance would be within the ROW of Route Section N7. Of the 8.61 acres, approximately 5.72 acres of wooded wetland and upland would be cleared of trees and maintained in a cleared state.

The town of Chase, in Oconto County, owns a 40-acre former town landfill site that is being developed for recreational and educational use for the town residents. The town plans to develop recreational trails for hiking and skiing, along with a picnic area. The parcel currently consists of an open field and forested wetland and upland. Route Subsection N4-5 runs north-south along the western boundary of the parcel, and approximately 3.4 acres of new ROW would be required on the parcel if the transmission line were built.

As a means of mitigating impacts to the town and county properties described above, the applicant states that short-term impacts could be addressed by activities such as relocating existing trails on the property to maintain or improve their recreational value and/or performing construction during the season(s) of lowest use in each area.

9.2.2. Forested lands

For the purposes of this project, forested lands are defined as areas where mature trees are present forming mostly closed stands (greater than 20 percent canopy cover and trees with dbh of 6.0 inches or more). Narrow tree lines (*e.g.*, wooded fence rows) and windbreaks are not included as forested cover and would be considered under the subject of agriculture. Nearly all of the forested land impacts of the project occur within new ROW because the existing ROW for an electric transmission line or natural gas pipeline has generally been kept clear of trees.

As in Chapters 7 and 8 of the EIS, the following tree size classification system is being used:

- "Saplings" refers to live trees from 1.0 to 5.0 inches dbh.
- "Structure timber" ranges from 5.0 to 9.0 inches dbh for softwoods and from 5 to 11 inches dbh for hardwoods.
- "Saw timber" is greater than 9.0 inches dbh for softwoods, and greater than 11 inches dbh for hardwoods.

The North Appleton-Morgan project area is located in the Green Bay Till and Lacustrine Plain ecoregion. This region is characterized by a mixture of wetlands, outwash plains, lake plains, and ground moraines. The potential natural vegetation of this ecoregion would consist of a transition from maple, oak, and basswood forests in the south to northern hardwoods and conifer swamps in the north. Current vegetation of this region is comprised of agricultural fields with interspersed hardwood woodlots in uplands and forested wetlands in the lower elevations. Generally, forested areas are dominated by structure timber and saw timber.

Table 9.2-1 shows relative amounts of upland, wetland, and total acreages of forest land in the North Routing Area. Ownership of forested lands within the project area is primarily private. The town of Chase owns a 40-acre site that is partially comprised of upland and wetland forest. The parcel and potential impact of a transmission line across it is described in Section 9.2.1 of this document. Land use on the forested lands is primarily recreational, and many woodlots are used as a private source for firewood.

Table 9.2-1 Upland vs. wetland forested areas in the North Routing Area

Section	Total Acres of Forested Area	Percent Upland Forest	Percent Wetland Forest
N4	74.54	41	59
N6	27.29	64	36
N7	25.20	14	86
N8	4.90	62	38
N13	4.37	0	100
N14	3.36	99	1
N15	1.48	0	100
N18	29.21	18	82

Table 9.2-1 shows that the potential ROW of Route Section N4 would include over 40 more acres of forested area than that of Route Section N18, although a higher percentage of the forests along Route Section N18 are wetland forests. The potential ROW acreage that contains forest along Route Sections N6 and N7 is similar, although Route Section N7 is 86 percent wooded wetland while only 36 percent of Route Section N6 is wooded wetland. Route Sections N13 and N15 are both 100 percent wooded wetlands while Route Section N14 contains only one percent wooded wetlands. Potential wooded wetland impacts are discussed in the next section of this chapter. Woodlands in the North Routing Area are discussed below.

9.2.2.1. Route Section N18

Section N18 is the major western option in the North Routing Area. Existing forested areas in the N18 ROW area range from small (up to 40 acres in size), scattered woodlots to large expanses of forest (greater than 80 acres in size). Upland forests are primarily northern dry-mesic and northern mesic forest dominated by red pine, white pine, and sugar maple. Forested wetlands occur along waterways and in large depressional areas and are comprised of southern hardwood swamp and floodplain forest dominated by red maple, box elder, green ash, silver maple, and eastern cottonwood.

9.2.2.2. Route Section N4

Section N4 is the major eastern option in the North Routing Area, an alternative to Route Section N18. Existing forested areas in the projected N4 ROW range from small (up to 40 acres in size), scattered woodlots to large expanses of forest (greater than 80 acres in size). Upland forests are primarily northern dry, northern dry-mesic, and southern dry-mesic forest dominated by red pine, white pine, red oak, white oak, and sugar maple. Forested wetlands occur along waterways and in large depressional areas, and are comprised of southern hardwood swamp and floodplain forest dominated by red maple, box elder, green ash, silver maple (*A. saccharinum*), and eastern cottonwood (*Populous deltoides*).

9.2.2.3. Route Section N8

Section N4 would likely be combined with Section N8 in the eastern route option of the North Routing Area. Existing forested areas are comprised of small (up to 40 acres in size) to medium-sized (40 to 80 acres in size) woodlots. Upland forests are primarily northern dry and northern dry-mesic forest dominated by red pine, white pine, red oak, and red maple. Forested wetlands occur along waterways and are primarily northern wet-mesic forest dominated by white cedar.

9.2.2.4. Route Section N6

Existing forested areas are comprised of medium-sized (40-80 acres) woodlots. Upland forests are primarily northern dry-mesic, northern mesic, and southern dry-mesic forest dominated by red pine, white pine, red oak, white oak, and sugar maple. Forested wetlands occur along waterways and are comprised of southern hardwood swamp and floodplain forest dominated by red maple, box elder, green ash, silver maple, and eastern cottonwood.

9.2.2.5. Route Section N7

Section N7 would be a likely alternate to Section N6. Existing forested areas in the N7 ROW area are comprised of large forested areas (greater than 80 acres in size). Upland forests are primarily northern dry and northern dry-mesic forest dominated by red pine, white pine, red oak, and red maple. Forested wetlands occur along waterways and in large depressional areas and are primarily southern hardwood swamp dominated by red maple, box elder, and green ash.

9.2.2.6. Route Section N13

Current forested areas are comprised of forested wetlands that occur in floodplains and along waterways, and are primarily southern hardwood swamp dominated by red maple, box elder, and green ash.

9.2.2.7. Route Section N14

Section N14 would probably be an alternate to Section N13 in the western options of the North Routing Area. Existing forested areas in what would be the N14 ROW are comprised of small (up to 40 acres in size), scattered woodlots. Upland forests are primarily northern dry-mesic and southern dry-mesic forest dominated by red pine, white pine, red oak, white oak, and sugar maple. Forested wetlands occur along waterways and are primarily southern hardwood swamp dominated by red maple, box elder, and green ash.

9.2.2.8. Route Section N15

Existing forested areas are comprised of forested wetlands that occur along waterways, and are primarily southern hardwood swamp dominated by red maple, box elder, and green ash.

9.2.3. Wetlands

Potential wetland impacts along the different route sections in the North Routing Area are discussed here. This analysis includes a special focus on route sections that are alternatives to each other in the proposed project. These pairs of alternatives include Route Sections N18 versus N4, Route Sections N13 versus N14, and Route Sections N6 versus N7.

9.2.3.1. Section N17

Section N17 is a small connector section between the South and North Routing Areas. No wetlands are located in Section N17.

9.2.3.2. Section N18

As the project routes continue north, existing disturbance from row-crop agriculture becomes less common; woodlots and old field habitats are more common, and the frequency of larger wetland complexes increases. Route Section N18 follows an existing natural gas pipeline ROW for its entire length. Following an existing utility ROW versus a new cross-country route can lessen impacts to wetlands by reducing the amount of overall clearing required. Paralleling an existing corridor allows more wetland edges to be cleared instead of less-disturbed interior wetlands.

Section N18 crosses 34 wetlands with 35 total wetland crossings totaling 28.72 acres of potential wetland impacts. Due to the increased frequency of wetlands and the overall length of this route section, many wetland types are present, including wet meadow, sedge meadow, emergent marsh, shrub carr, hardwood forest, and floodplain forest wetland. Much of the forested wetlands have previously been cut.. Also present are riparian wetlands, located adjacent to waterways.

One riparian wetland is located south of Nichols Drive, adjacent to the Pensaukee River. This wetland is 332 feet in length and is composed of floodplain forest. This wetland helps to buffer the Pensaukee River from runoff and provides habitat to terrestrial and aquatic species. Two structures are proposed to be located at the southern edge of this wetland. These structures should be located outside of the wetland, to reduce construction impacts.

Just north of Town Line Road is another high-quality wetland complex. This wetland is composed of hardwood swamp and is 1,275 feet long. Three structures are proposed to be located in this wetland. Clear-cutting forested wetlands such as this would result in a permanent conversion to herbaceous

wetlands, eliminating specific wildlife habitat that only forested wetlands provide. A similar hardwood swamp is located approximately 0.5 miles to the north. Two waterways run through this second wetland.

An additional high quality forested wetland would potentially be impacted by Route Section N18. The wetland is bisected by CTH E where the road curves from a north-south orientation to an east-west orientation. Two transmission line structures are proposed to be placed in this wetland with one structure placed on either side of the highway. About 722 feet of the wetland would be crossed by the transmission line.

Efforts must be taken to minimize impacts to both the wetland and the waterways. If the forested wetland areas must be cleared, BMPs should be implemented that minimize changes to the hydrology and the spread of invasive species.

9.2.3.3. Section N4

Section N4 travels east and then north from the Central Routing Area. Differing from Section N18, Section N4 travels cross country, general following property lines for most of its length and a county highway for approximately one mile. Wetlands are much more numerous along N4 compared to N18, including large tracts of forested wetland.

Section N4 crosses 42 wetlands totaling 61.25 acres of potential wetland impacts. Similar to Section N18, it also contains many wetland types; N4 contains wet meadow, sedge meadow, emergent marsh, shrub carr, hardwood forest, and floodplain forest. Also like Section N18, Section N4 contains large tracts of forested wetlands and many riparian wetlands. Unlike Section N18, Section N4 cuts a new corridor through most of these wetlands, fragmenting the forested wetlands into essentially two different wetland complexes.

From the south, the first significant riparian wetland is composed of floodplain forest. This wetland crossing is 836 feet long and is located next to the West Branch of the Suamico River. Being adjacent to the river, this wetland helps to buffer the river from runoff from adjacent farm fields. This portion of Section N4 runs cross country on new ROW and would completely fragment this otherwise relatively-intact complex. Furthermore, two structures would be located at the edge of this wetland. These structures should be located outside of the wetland to reduce impacts.

Going north along the route section, there is another large wetland crossing located south of County Highway S. This wetland complex is composed of wet meadow, shrub carr, and hardwood swamp and is 3,731 feet long. In addition, nine waterways plus one ephemeral pond are located in or near this complex. Ten transmission structures are proposed to be installed in this wetland. Because the wetland is so large and contains large amounts of forested wetland and many waterways, impacts would be substantial. Clearing this forested wetland would result in large permanent losses of wildlife habitat and would reduce the quality of buffers for the numerous waterways.

Farther north along N4, another large forested wetland complex intermixed with upland forest is located between County Highway S and Van Dornick Road. This wetland complex is 4,727 feet long. Nine structures are proposed to be located in the complex. It is also crossed by two waterways. As with other large forested complexes, tree clearing in this large, unfragmented system would reduce wildlife habitat and increase the chances of establishment of invasive species. Impacts would be great if this forested wetland crossing was cleared.

Another large forested wetland is located further north of Van Dornick Road. This complex is 4,605 feet long and composed of hardwood swamp, with some wet meadow present. Two waterways cross the complex, including an unnamed tributary to the Suamico River, which runs parallel to and in the middle of the proposed ROW for 1,200 feet. Ten structures are proposed to be installed within the complex. As with the previous wetland communities above, fragmenting such a large forested wetland would greatly affect quality of the wildlife habitat available, since the conversion to a wet meadow would be permanent. Also, fragmenting habitats can increase the chance of establishing invasive species, possibly further reducing the quality of the remaining habitat present.

The final high-quality wetland complex of note on Section N4 is 820 feet long and is significant as it is composed of wet meadow and floodplain forest wetlands adjacent to the Pensaukee River. The Pensaukee is a larger river draining a large area, and forested wetland clearing adjacent to it could greatly increase sedimentation and nutrients entering it via overland flow. In addition to a large amount of wetland impact in a previously unfragmented area, Route Section N4 has not been accessed by the applicant because it is mostly located on private property. This lack of access means that most wetland impacts were approximated using aerial photos, soils data, and the WWI. Without completing actual wetland delineations, the wetland impacts and the quality of habitats could be underestimated or misrepresented.

9.2.3.4. Summary of wetland impacts of Sections N18 and N4

Table 9.2-2 below provides a summary comparison of these two alternative route sections in the North Routing Area. Section N4 would result in more forested wetland impact, more non-forested wetland impact, and more total wetland impact than Section N18. The difference in forested wetland acreage impacted is large, with forested wetland impacts on N4 nearly twice as much as on N18. Not only would impacted acreages be greater on N4, but the impacts could affect more types of wetlands on N4. The N4 impacts would occur in wetlands where no existing utility or transportation corridor is present. In many places on Section N4, the new ROW would fragment wetland complexes that are currently intact. Overall, wetland impacts on N4 would be significant regardless of how the applicant attempts to minimize them.

Table 9.2-2 Comparison of wetland impacts between Route Sections N18 and N4 in the North Routing Area, in acres

	Forested Wetland				Non-Forested Wetland					
Segment	Existing Shared ROW Area Not Cleared (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Non-forested Wetland Impact (acres)	Total Wetland Impact (acres)	Wetlands Crossed	Significant/High-quality Wetlands
N18	1.28	1.28	22.79	24.07	.32	4.33	4.65	28.72	35	3
N4	0	0	43.94	43.94	.08	17.23	17.31	61.25	42	11

9.2.3.5. Section N13

Section N13 crosses six wetlands over a total length of 1,808 feet. A total of 7.21 acres of wetland impact is possible. Wet meadow and hardwood swamp wetlands are the two wetland types present along Section N13. This section first parallels an existing gas pipeline ROW and then parallels an existing transmission line ROW where the route turns east. Its location next to existing ROWs would lessen the forested wetland impacts compared to going cross country through previously unfragmented wetland complexes.

One large, quality wetland where there would be forested wetland impacts is 1,349 feet long and composed of wet meadow in the existing ROW and forested wetland in the proposed new ROW. The North Branch of the Pensaukee River flows through the western end of the wetland complex. This river

is an ASNRI for state-listed species. Because of its diversity of habitats and connectivity to the North Branch of the Pensaukee, impacts to this complex should be minimized. Four structures are proposed to be constructed in the complex, although two would be located at the western edge. Building these structures outside of the wetland could reduce impacts not only to the wetland, but also to the waterway.

9.2.3.6. Section N14

Section N14 crosses one wetland. This wetland is 74 feet long and consists of a small corner of hardwood swamp surrounded by an agricultural field. No other wetland impacts are likely on Section N14, though this section was not field delineated because it is located on private property.

9.2.3.7. Summary of Wetland Impacts of Sections N13 and N14

Table 9.2-2 shows a comparison of the acreages of impact between Route Sections N13 and N14. Section N13 includes 7.21 acres of total wetland impact compared to only 0.07 acres of total wetland impact for Section N14. The difference in both forested, unforested, and total wetland impact is substantial. Use of Section N14 would minimize impacts to wetlands compared to Section N13.

Table 9.2-3 Comparison of wetland impacts between Route Sections N13 and N14 in the North Routing Area

	Forested Wetland				Non-Forested Wetland					
Segment	Existing Shared ROW Area Not Cleared (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Non-forested Wetland Impact (acres)	Total Wetland Impact (acres)	Wetlands Crossed	Significant/High-quality Wetlands
N13	.48	.48	3.89	4.37	1.25	1.59	2.84	7.21	6	0
N14	0	0	.01	.01	0	.06	.06	.07	1	0

9.2.3.8. Section N15

Section N15 is a short connector section between Sections N14 and N6 and Sections N13 and N7. Section N15 crosses two wetland complexes totaling 780 feet in length and 1.97 acres of potential wetland impact. One wetland located just east of Green Valley Road adjacent to the North Branch of the Pensaukee River is ecologically significant. This river is an ASNRI as state-listed species are present in it. The wetland complex is composed of wet meadow and hardwood swamp wetland. If this wetland were converted to all wet meadow, wildlife habitat and treatment of runoff flowing into the river would be permanently altered. Four structures are proposed to be placed in the wetland.

9.2.3.9. Section N6

Section N6 continues north and east from Section N15. For most of its length it parallels an existing double-circuit 345/138 kV transmission line ROW. Section N6 crosses 20 wetlands totaling 4,982 feet and would result in 23.32 acres of wetland impact. In general, Section N6 crosses large forested floodplain wetlands associated with the North Branch of the Pensaukee River and its tributaries.

The first wetland of note that would be impacted by Section N6 is a large forested wetland located west of State Highway 32. This wetland complex is 2,273 feet long and is composed of wet meadow and floodplain forest wetland. Seven structures are proposed to be located in this complex, though one on the west end and three on the east end are currently sited at the very edge of the wetland and should be moved to upland. Also, an agricultural drainage ditch is located in the western part of the complex and, although most likely a channelized ditch, it should still be avoided.

Continuing northeast, the section again crosses the North Branch of the Pensaukee River and its associated wetlands, south of Perkel Road. This riparian wetland complex is composed of hardwood swamp and sedge meadow and is 1,357 feet long. Two poles are proposed in the wetland. Because it is located adjacent to the river and partially composed of floodplain forest, all impacts on it should be minimized to ensure the related waterway is not further degraded.

9.2.3.10. Section N7

Unlike Section N6 to the north, Section N7 is located completely on new ROW; it runs cross-country over parcels not previously fragmented by a utility ROW. Despite its relatively short length, Section N7 crosses 14 wetland complexes, many of which are relatively undisturbed. It crosses 9,982 feet of wetlands totaling 41.62 acres of potential wetland impact. Wetland types crossed include wet meadow, shrub carr, and hardwood swamp wetland.

One of the largest and most diverse wetland complexes on the entire project is located parallel and north of County Highway E. It is 4,520 feet in length and primarily composed of wet meadow, shrub carr, and hardwood forest wetlands. In addition, upland pockets are scattered throughout the larger complex, adding to its habitat diversity and function. Twelve transmission structures are proposed to be constructed in this complex. Six of these structures would be located at the edge of wetlands. Though moving these six structures to upland would reduce impacts from construction, the impacts resulting from forested wetland clearing, which would happen regardless of structure locations, would be significant. Clear cutting the ROW through this forested wetland would fragment and degrade the larger wetland complex that extends off-ROW, reducing wildlife habitat and increasing the likelihood of invasion by nonnative species.

Going east from State Highway 32, another large wetland complex is encountered. It is 2,793 feet long and composed of wet meadow and hardwood swamp. As with the previously mentioned wetland, this complex also extends off-ROW in some locations. These off-ROW wetlands would still be affected due to the increased edge habitat created by fragmentation. The remaining off-ROW wetlands would be more susceptible to invasive species and would provide less habitat to plants and animals that require undisturbed, interior habitats. Six structures are proposed to be built in the complex.

A third large diverse wetland complex is located further east along the proposed ROW. In total this complex is 4,694 feet in length. Thirteen structures are proposed to be located in this complex, though several are currently sited on the edges of wetlands and should be constructed in uplands to minimize wetland impacts. Because of the size of this wetland complex, forested wetland clearing would again severely damage the wildlife habitat and overall function of the wetland.

The three large wetland complexes discussed above are similar in size and composition. Although they have been logged in the past, they still are composed of large, contiguous areas of forest. Many of these complexes are much larger than the areas that would be impacted by the proposed ROW. These large wetlands provide wildlife habitat, flood attenuation, and maintain water quality. Clearing a new ROW, which along Section N7 would be, on average, 180 feet wide, would fragment these large forested wetlands and change the composition of them, both on- and off-ROW. The ROW clearing would also reduce wetland functions, impacting plant and animal species that benefit from these functions.

9.2.3.11. Summary of wetland impacts of Sections N6 and N7

As shown in Table 9.2-4, Section N7 impacts significantly more wetlands than Section N6. Not only are the impacts larger in acreage on N7 than along N6, but the types of impacts on N7 are more severe. Large impacts on N7 would result from forested wetland clearing for new ROW, because the clearing would

occur through the middle of previously unfragmented forested wetlands. Clearing through the middle of wetland complexes often has more impact than clearing along the edge of wetlands. Forested wetland wildlife and plant species would be isolated from their preferred habitat by the fragmentation from the new ROW. The new ROW would also become a corridor for the introduction and spread of new invasive species populations. Because of this, wetland impacts along Section N7 would be overall much greater than the Section N6 wetland impacts.

Table 9.2-4 Comparison of wetland impacts between Route Sections N6 and N7 in the North Routing Area

	Forested Wetland				Non-Forested Wetland					
Segment	Existing Shared ROW Area Not Cleared (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Non-forested Wetland Impact (acres)	Total Wetland Impact (acres)	Wetlands Crossed	Significant/High-quality Wetlands
N6	.68	.68	9.18	9.86	6.79	6.67	13.46	23.32	20	2
N7	0	0	21.69	21.69	0	0	19.93	41.62	14	6

9.2.3.12. Section N8

Section N8 crosses 10 wetlands over a total of 2,534 feet. These crossings could result in up to 9.26 acres of wetland impact.

This section crosses one ecologically-significant complex that is a wet meadow and floodplain forest wetland located adjacent to the North Branch of the Pensaukee River. Two structures would be constructed in the wetland. They could be moved outside of the complex to reduce impacts to it and to the river.

9.2.3.13. Section N16

Section N16 is the northernmost route section of the project, leading into the Morgan Substation. No wetlands are located on this section.

9.2.4. Waterways

Potential waterway impacts along the different route sections in the North Routing Area are discussed here. Waterway crossings can be seen in Figure Vol. 2-10. This analysis includes a special focus on route sections that are alternatives to each other in the proposed project. These pairs of alternatives include Route Sections N18 versus N4, Route Sections N13 versus N14, and Route Sections N6 versus N7.

9.2.4.1. Section N17

Section N17 is a short section common to all routes. It crosses one waterway, an unnamed tributary to the West Branch of the Suamico River. This waterway is an agricultural ditch and is proposed to be crossed by a TCSB. Since the waterway is most likely a result of agriculture and has low ecological value, impacts would likely be minor.

9.2.4.2. Section N18

Section N18 intersects 31 waterways, all of which would be crossed by TCSBs. There are few large waterways on this route section, most likely due to its position in the landscape and the dominance of agricultural fields and pastures. One waterway, the Little Suamico River, located southwest of the village of Pulaski, is an ASNRI for state-listed species. Even though it is an ASNRI, at this crossing it is relatively small in size. It is also surrounded by agricultural fields giving it low ecological value at this location. But,

because its quality and size increase downstream, any TCSB constructed here should be in place for the minimum time necessary and all installation standards and erosion control BMPs should be followed.

9.2.4.3. Section N4

In terms of waterway impacts, Section N4 is very similar to its alternative Section N18. Section N4 intersects 38 waterways, 28 of which would be crossed by TCSBs. All waterways are in some ways tributaries to the Little Suamico River. Even though Section N4 crosses the Little Suamico only once, it plays an important role in the hydrology on this part of the project. As on N18, the Little Suamico River is an ASNRI for state-listed species on this route section as well. Impacts should be minimized to ensure that the quality of the stream is not affected.

9.2.4.4. Summary of Waterway Impacts of Sections N18 and N4

Section N18 crosses 31 waterways, all of which would be crossed by TCSB. Section N4 crosses 38 waterways, 29 of which would be crossed by a TCSB. Both Section N18 and N4 cross one ASNRI waterway that would be crossed by a TCSB. Both sections are located in similar agricultural settings. All of these similarities show that both Section N18 and N4 have very similar impacts to waterways. Neither are particularly severe since most waterways crossed by the line would be bridged.

9.2.4.5. Section N13

Section N13 intersects four waterways, all of which are proposed to be crossed by TCSB. Only one waterway, the North Branch of the Pensaukee River, is an ASNRI. Crossing any waterways should be avoided if possible, though, as installing bridges of any sort can still affect the waterways. No other activities that could impact waterways are proposed on this route section.

9.2.4.6. Section N14

Section N14 does not intersect any waterways.

9.2.4.7. Summary of Waterway Impacts of Sections N13 and N14

Section N13 crosses four waterways by TCSBs. One of the waterways, the North Branch of the Pensaukee River, is an ASNRI. Section N14 does not intersect any waterways. Impacts would most likely be minor for either alternative.

9.2.4.8. Section N15

Section N15 intersects three waterways. Only one, an unnamed tributary to the North Branch of the Pensaukee River, would require a TCSB. As with all listed waterways, even though it is proposed to be crossed by a TCSB, the bridge should be properly installed and removed as quickly as possible after construction is complete.

9.2.4.9. Section N6

Section N6 intersects 16 waterways, nine of which would be crossed by TCSBs. One ASNRI is present on the section, the North Branch of the Pensaukee River. Though there are no specially-designated waterways, many of them are located in undeveloped areas, often in large tracts of forested wetlands. Because of this they are less disturbed than other waterways on the project. All efforts should be taken to minimize any impacts, including from bridges, as these streams have only been minimally disturbed in the past.

9.2.4.10. Section N7

Section N7 intersects six waterways, none of which are specially-designated. Three waterways are proposed to be crossed by construction equipment and would be crossed using TCSBs. As with Section N6, waterways along Section N7 are relatively undisturbed. Because of this, the number of waterway crossings should be limited. If TCSBs are required, placement and removal must be completed such that impacts are minimized.

9.2.4.11. Summary of Waterway Impacts of Sections N6 and N7

Section N6 intersects 16 waterways. Nine of these waterways are proposed to be crossed by TCSBs. One ASNRI waterway, the North Branch of the Pensaukee River, is present on this section. On Section N7, six waterways intersect the ROW, one of which would be crossed by a TCSB, and none are ASNRIs. Thus, Section N6 would impact more waterways, as nine would be crossed by TCSBs and one requires a TCSB on N7. Both sections are similar in the types, quality, and sizes of waterways present. Because of the relatively undisturbed nature of these waterways on both sections, impacts must be minimized.

9.2.4.12. Section N8

Section N8 intersects three waterways, none of which would need to be crossed by a TCSB.

9.2.4.13. Section N16

Section N16 does not cross any waterways and no other Chapter 30-regulated activities, such as grading on the bank or miscellaneous structures in the waterways, are proposed.

9.2.5. Endangered resources

This section discusses the potential impacts to endangered resources that might be affected by construction or operation of the proposed project in the North Routing Area. Endangered resources, as discussed in Chapter 5, Section 5.5.7, are tracked via the state's NHI database, which is maintained by the DNR Bureau of Natural Heritage Conservation. The project area evaluation consists of both the specific route and a buffer of one mile for terrestrial and wetland species and a two-mile buffer for aquatic species.

The combined presence of natural habitat and man-made disturbances must be taken into consideration to evaluate whether there is a likelihood that rare species are present and the potential for negative impacts to those species. While the existing sources of information are important for estimating impacts to rare species, they are incomplete. Additional rare species beyond those identified may actually be present in potentially impacted areas.

9.2.5.1. Birds

Almost all bird species are protected by the MBTA. Under the MBTA, it is unlawful to take, capture, kill, or possess migratory birds, their nests, eggs, and young. This may apply to birds nesting in or adjacent to the ROW if construction disturbance results in nest abandonment. According to landowners, there is at least one sandhill crane nesting site near this route or within the proposed ROW. Avoidance of impacts to nesting birds can be achieved if construction activities are scheduled in habitat areas outside the breeding and nesting season from approximately March through August.

9.2.5.2. Plants

Wisconsin's Endangered Species Law protects only state-listed endangered and threatened plant species on public lands, and utility, agriculture, forestry, and bulk sampling projects are exempted from plant protection. Therefore, additional surveys and avoidance or minimization measures for rare plant species are encouraged but can only be recommended. Potential avoidance measures could include:

1) conducting plant surveys to determine presence or absence, and/or 2) avoiding areas where known plants occur. Other measures, such as winter construction, use of mats to limit direct disturbance, or relocation, could minimize losses. DNR would also recommend that ATC and landowners with rare plant species on their properties develop plans to protect these areas.

One plant species of special concern has been recorded as occurring near Route Section N18, in Subsections 5 through 7. This species is found in oak forests, dry prairies, and along railroad grades and rivers, which may be present along these subsections.

9.2.5.3. Herptiles – amphibians and reptiles

North Option West (N13, N14, and N15)

The NHI database indicates a special concern turtle occurring within the vicinity of Route Sections N13, N14, and N15. This species prefers a wide variety of aquatic habitats and their associated uplands. These route sections cross several waterbodies (N13 and N15), wetlands (N13 and N15) and their associated uplands (N13, N14, and N15). If either of these options is selected, turtle habitat will likely be encountered.

Voluntary avoidance or minimization measures include:

- Staying out of occupied habitat areas workspace during the appropriate times of year.
- Installing exclusion fencing in areas of suitable habitat before the species becomes active and moves into the workspace.
- Scheduling construction activities outside of hibernation areas during winter.

When conditions preclude timely and effective installation of exclusion fencing, monitoring and removal can be effective if the ground surface is visible and the space to be cleared is relatively small.

North Option West (N6 and N7)

The NHI database indicates a special concern turtle occurring within the vicinity of both Route Sections N6 and N7. These route sections cross several waterbodies (N6 only), wetlands (N6 and N7), and their associated uplands (N6 and N7) which would all be considered suitable habitat. If either of these West Options is selected, turtle habitat will likely be encountered. Voluntary avoidance or minimization measures would be the same as those described above for Route Sections N13, N14, and N15.

The NHI database also indicates one state threatened turtle within the vicinity of Subsegment N6-4 and Subsegment N7-1. This species prefers medium to large rivers and streams and adjacent wetland and upland habitat. It overwinters in streams and rivers in deep holes or undercut banks and becomes active in spring and remains active until fall. It nests in sand or gravel. Although it is listed for the area around Subsegment N7-1, there is no suitable habitat occurring for this species. However, Subsegment N6-4 crosses the North Branch of the Pensaukee River, which would be considered suitable habitat. Its associated wetlands and uplands would also be considered suitable foraging and nesting habitat. So, construction along Route Section N6 as opposed to Route Section N7 could adversely affect the turtle's habitat or the turtle. Where suitable habitat occurs, required avoidance measures for this species may include:

- Working in uplands or wetlands during their inactive season.
- Installing exclusion fencing in areas of suitable habitat outside of the active period.

Impacts to overwintering sites would be unlikely to occur if temporary bridges were used and there was no disturbance below the OHWM. However, any work done below the OHWM in Route Section N6 may need an Incidental Take Permit since the species can be present there year-round.

North Option East (N4)
The NHI database indicates a special concern turtle occurring within the vicinity of Route Section N4. Landowners have also indicated observing this turtle in this area. This species prefers a wide variety of aquatic habitat and associated uplands, and this route section crosses several streams, wetlands and associated uplands that would be considered suitable habitat. The North Option East passes through some turtle habitat, and construction could potentially encounter turtles. Voluntary avoidance or minimization measures would include the same measures as those delineated above in the North Option West discussion.

The NHI database also indicates a state threatened turtle occurring within the vicinity of Route Section N4. This species prefers medium to large rivers and streams and adjacent wetland and upland habitat. It overwinters in streams and rivers in deep holes or undercut banks and becomes active in spring and remains active until fall. It nests in sand or gravel. Subsegment 5 crosses the Little Suamico River, and Subsegment 7 crosses the Pensaukee River, both of which would be considered suitable habitats for this species. Their associated wetlands and uplands in Subsegments 5 through 8 would also be considered suitable foraging and nesting habitat. Where suitable habitat occurs, required avoidance measures for this species may include:

- Working in uplands or wetlands during their inactive season.
- Installing exclusion fencing in areas of suitable habitat outside of the active period.

Impacts to overwintering sites would be unlikely to occur if temporary bridges were used and there was no disturbance below the OHWM. However, any work done below the OHWM may need an Incidental Take Permit since the species can be present there year-round.

It could be noted that no rare species or their habitat have been identified in the vicinity of Route Section N18, the alternative route section to N4.

North Option East (N8)
The NHI database indicates a special concern turtle occurring within the vicinity of Route Section N8, in Subsegment 1 through 3. This species prefers a wide variety of aquatic habitat and associated uplands, and all three subsegments could all be considered to include suitable habitat. Voluntary avoidance/minimization measures would be as described for the special concern turtle discussed above.

The NHI database also indicates a state threatened turtle in the vicinity of Route Section N8, Subsegments 1 through 4. This species prefers medium to large rivers and streams and adjacent wetland and upland habitat. It overwinters in streams and rivers in deep holes or undercut banks, and becomes active in spring and remains active until fall. It nests in sand or gravel. Subsegment N8-2 crosses the North Branch of the Pensaukee River, which would be considered suitable habitat for this species. Its associated wetlands and uplands along Subsegments N8-1 and 2 would also be considered suitable foraging and nesting habitat. Where suitable habitat occurs, required avoidance measures for this species might include the measures described above for the state threatened turtle potentially present on Route Section N4. Again, however, any work done below the OHWM may need an Incidental Take Permit since the species can be present there year-round.

North Option East (N16)
The NHI database indicates one state threatened turtle within the vicinity of Route Section N16, but this section does not contain suitable habitat for this species and so no required actions would be necessary.

9.2.5.4. Aquatic invertebrates

North Option East (N4)
Route Section N4, Subsegments 1 through 6 has a state threatened mussel that is documented within the vicinity. However, only the ROW of Subsegment 5, which crosses the Little Suamico River, would include suitable habitat for this species. If the North Option East was approved for construction, impacts to this species could be avoided by using alternative access routes or structure locations that do not cause disturbance below the OHWM. If disturbance below the OHWM could not be avoided, further assessments would be needed to determine if this species is present. If it was determined to be present, avoidance measures could include removal and relocation of individuals within the impact area to an upstream location. Otherwise, an Incidental Take Permit may be necessary. Regardless, if construction activities were conducted above the OHWM, the implementation of strict erosion control practices would be required.

9.2.5.5. Mammals

The northern long-eared bat is currently proposed for federal listing and is expected to be listed as either endangered or threatened at the time this project is proposed to begin. During the summer, northern long-eared bats typically roost singly or in colonies in a wide variety of forested habitat, in cavities or crevices, or underneath loose bark of both live trees and snags greater than three inches dbh. They forage for insects in upland and lowland woodlots and tree lined corridors. During the winter, northern long-eared bats predominately hibernate in caves and abandoned mine portals. Suitable habitat for the northern long-eared bat is likely present within the proposed project areas, and this species may be impacted. Therefore, at this time, it is recommended that the applicant, in coordination with USFWS and DNR, determine species presence or if impacts can be avoided or minimized by use of conservation measures. Where suitable habitat occurs, avoidance measures for this species may include presence/absence surveys and/or no tree clearing during the species' active period from April 1to September 30.

9.2.6. Invasive species

ATC's assessment of invasive species has been done on a project-wide scale. Because invasive species are identified in order to avoid their spread through the project area, it is less important to identify their precise locations prior to beginning construction. It is more important to know which species have been observed in the project area so that strategies or measures can be included in the construction plan to eliminate or reduce their populations and avoid their spread.

ATC states that it evaluated the ROW for invasive plant species during field surveys along existing corridors during the growing seasons of 2012 and 2013. The general locations and composition of dominant invasive species present within the ROW were identified and mapped with GPS instruments during wetland delineations and natural habitat evaluations. However, targeted surveys to identify and map all invasive species were not completed as part this assessment.

Invasive plant species were commonly observed along the route sections evaluated by the applicant in the field. Overall, 16 invasive plant species were identified along the route sections, all falling into the "Restricted" category of Wis. Admin. Code ch. NR 40 as of May 2013. There were no "Prohibited" species found.

The observed invasive species included:

- Garlic mustard (*Alliaria petiolata*)
- Creeping bellflower (*Campanula rapunculoides*)
- Spotted knapweed (*Centaurea biebersteinii*)
- Canada thistle (*Cirsium arvense*)
- Common teasel (*Dipsacus fullonum*)
- Autumn olive (*Elaeagnus umbellata*)
- Honeysuckle species (*Lonicera spp.*)
- Purple loosestrife (*Lythrum salicaria*)
- Wild parsnip (*Pastinaca sativa*)
- Common reed (*Phragmites australis*)
- Common buckthorn (*Rhamnus cathartica*)
- Glossy buckthorn (*Rhamnus frangula* or *Frangula alnus*)

The most commonly observed "Restricted" plant species along the route sections included narrowleaf cattail (*T. angustifolia*), Canada thistle, multiflora rose, common reed, and honeysuckles.

ATC states that it would comply with Wis. Admin. Code ch. NR 40 by implementing BMPs when encountering species listed as "Restricted" or "Prohibited." This is appropriate because standard BMPs have been developed by DNR and interested stakeholders to avoid and minimize the spread of listed species. The BMPs would vary throughout the ROW based on the degree of invasiveness, severity of the current infestation, and susceptibility of non-infested areas to invasion.

BMPs would include:

- Avoidance through construction timing and alternate access.
- Proper management of construction vehicles and materials (*i.e.*, storage, cleaning).
- Minimization of ground disturbance.
- Placement of a barrier between construction vehicles and plants (*i.e.*, construction matting or geotextile fabric).
- Proper storage and disposal of plant materials.
- Promotion of native regeneration using short-term stabilization measures.
- Retainment of cut vegetation on-site where it is cut (*i.e.*, mowing shrubs).

Additional evaluation would be conducted if a particular route was chosen to further identify where site-specific BMPs would be appropriate. ATC states that those BMPs would be incorporated into environmental access plans implemented during construction.

Besides plant species, there are other invasive species that would bear monitoring and prevention of spread during the transmission construction.

- Portions of Route Sections N4, N17, and N18 are in the EAB, *Agrilus planipennis*) quarantine areas, specifically in Brown County. Practices that minimize the spread of EAB include avoiding movement of ash wood products (logs, posts, pulpwood, bark and bark products, slash and

chipped wood from clearing) and hardwood firewood from EAB quarantine areas to non-quarantine areas, as per Wis. Admin. Code § ATCP 21.17. Where ash wood products cannot be left on-site, ATC states that alternate plans would be developed to meet the requirements to prevent spread of the EAB.

- The rusty crayfish (*Orconectes rusticus*) is an invasive crayfish species whose populations began to increase swiftly in Wisconsin around 1960. It was likely introduced by fishermen who used it as live bait. It eats native aquatic plants and fish eggs in lakes and streams, which would severely damage native aquatic ecosystems by destroying habitat, limiting the reproduction of native fish species and wildlife, and negatively affecting the health of the waters they inhabit.

  Construction of a transmission line could have the potential to allow further spread of the rusty crayfish if work were to occur in streams or lakes below the OHWM. If any equipment, boats, or tools that would be used for the project contained rusty crayfish or its eggs, the species could be spread into a waterbody that was currently free from the pest.

  Several medium-sized rivers are crossed by North Routing Area route sections (*e.g.*, North Branch of the Pensaukee River), along with numerous other smaller waterways. Work below the OHWM of waterways is not anticipated at any locations along the route sections, although some waterways might need to be waded or crossed with boats during wire stringing operations if a TCSB is not built to cross the waterway. The rusty crayfish is present in the North and West Branches of the Suamico River and the Pensaukee River. If equipment was to be placed below the OHWM in one of these waterways prior to moving equipment between waterway construction locations, ATC states in its application that standard inspection and disinfection procedures would be incorporated into construction methods as applicable. These would be appropriate measures to control the crayfish.

9.2.7. Archaeological and historic resources

Pursuant to Wis. Stat. § 44.40, a reconnaissance of the project area was conducted to determine the potential presence of archaeological and historic sites in the North Routing Area and overall project area. ATC contracted CCRG to conduct an archival and literature review of cultural resources, architectural/historic resources, and previously-recorded archaeological and burial sites along the route sections and substation sites of the project. To assess the potential effects of the project on archaeological and cemetery/burial sites and architectural/historic resources, the Archaeological Site Inventory, the Architecture and History Inventory and associated site files, and the national and state registers of historic places were reviewed.

CCRG's review identified a total of two previously recorded archaeological sites within or adjacent to the proposed ROWs in the North Routing Area. One is along Route Section N4 and the other is along Route Section N16.

The site along Route Section N4 is a site of unknown cultural affiliation that is bisected by the route section in Oconto County. The site is reported to consist of an argillite calumet that was collected from the site location sometime prior to 1939. The calumet is currently housed in the collection of the Neville Public Museum in Green Bay, Wisconsin. The integrity of the site is unknown. The NRHP eligibility of the site has not been evaluated.

The second site identified in the North Routing Area is along Route Section N16 at the far northern end of the project. The site is a prehistoric site of Middle Archaic stage Old Copper Complex cultural affiliation. The site is reported to consist of two copper spear points that were collected from somewhere on the farmstead site. Both of the copper implements are currently housed in the collections of the Neville Public Museum in Green Bay. A portion of the site was surveyed less than ten years ago for the

ATC Morgan-Werner West (also known as GCMW) transmission line project,[122] but no evidence of the site was found. The NRHP eligibility of the site has not been evaluated.

If a route was chosen that could affect one of the potential sites listed above, additional archaeological surveys would need to be undertaken to determine the presence and extent of any identified archaeological sites in the routing areas. If it were determined that a site did exist in any location, further measures for avoidance or minimization of impacts would be prescribed at that time by WHS to be implemented under direction of the Commission.

No above-ground NRHP-eligible or listed architectural/historic resources were identified in the North Routing Area. No cemetery or burial sites were identified in the North Routing Area. No NRHP-listed or NRHP-eligible archaeological sites were identified in the North Routing Area.

9.3. COMMUNITY RESOURCES AND POTENTIAL IMPACTS

9.3.1. Agriculture

The North Routing Area has a lower percentage of land in agricultural use than the South or Central Routing Areas. Wetlands, waterways, and other undeveloped lands become more prominent than in the south. Approximately 72 percent of the proposed ROW within the North Routing Area is in agricultural land use, with row crops comprising the majority of this area. Like the South and Central Routing Areas, the majority of the crops are corn and soybeans, but alfalfa and hay fields are also present. Pasture, old fields, and a specialty crop (hops) comprise the remainder of the agricultural land.

As a portion of total route section area, about 86 percent of the total ROW area of Route Section N18 crosses agricultural land, while about 65 percent of N18's alternate Route Section, N4, crosses agricultural land. Of the remaining route sections in the North Routing Area, more than 99 percent of Route Sections N16 and N17, 92 percent of Section N14, 88 percent of Section N13, 79 percent of Section N15, 72 percent of Section N8, 56 percent of Section N6, and 44 percent of Section N7 are comprised of agricultural land. The majority of agricultural land that the route sections cross is row crop land. Agricultural land in the North Routing Area is comprised of 89 percent crop land, 9.0 percent old field, and 2.0 percent pasture.

Nearly all of the land that is actively being farmed in the area of the proposed project ROW is comprised of NRCS-classified prime farmland. PSC staff has reviewed GIS information to analyze and confirm the locations of prime farmland along the project routes. Prime farmland is land that contains soils with certain characteristics that allow for high yields of a variety of commonly grown agricultural crops. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding. Prime farmland, as described here, is a categorization based on environmental factors. It is not a program, certification, or an easement category. The geologic history of the area has played a large role in the formation of these farmlands.

Potential construction-related impacts on agriculture would generally be short-term in nature, and could consist of crop losses, soil mixing, and/or soil compaction along equipment access routes and around

[122] PSC docket 137-CE-123.

structure installation sites. ATC would likely mitigate these short-term impacts by providing compensation to the property owner or person leasing the land for farming and/or by restoring agricultural lands to the extent practicable. Where appropriate, mitigation techniques such as deep tilling could be utilized. Wisconsin Stat. § 182.017(7)(c) through (h) is a list of landowner rights, many of which address issues important to farm fields, and these rights include required construction impact mitigation measures such as proper segregation of topsoils, post-construction restoration of the field, repair of damaged fences or drainage tile, payment for crop damage and others. A detailed discussion of landowners' statutory rights is included in Section 5.3 in Chapter 5 of the EIS.

Agricultural land use in the North Routing Area is summarized in Table 9.3-1. Comparisons between alternate Sections N4 versus N18, N13 versus N14, and N6 versus N7 are illustrated. It appears that there is slightly more farm crop land crossed on Section N18, Section N13, and perhaps Section N7. Although the combination of N4 plus N8 would have slightly more than N18, the combinations of N18 plus either N13 or N14 plus either N6 or N7 would have notably more than the combination of N4 and N8. Thus, the proposed ROW for the western options in the North Routing Area appear to have notably more agricultural land than the proposed ROW for the eastern option.

Table 9.3-1 Agricultural land use along route sections in the North Routing Area

Route Section	Agricultural Land Use											
	Crops			Pasture			Old Field			Specialty		
	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)	Length (feet)	Existing ROW (acres)	New ROW (acres)	Length (feet)	Existing ROW Shared (acres)	New ROW (acres)
N4	49,373	0.4	196.1	749	--	2.3	4,360	3.3	19.7	--	--	--
N6	10,081	12.9	34.4	1,239	2.6	3.9	1,476	7.5	6.5	--	--	--
N7	9,308	--	35.0	--	--	--	486	--	2.5	--	--	--
N8	9,112	0.1	38.6	1,043	0.3	3.9	732	--	3.8	--	--	--
N13	13,714	6.2	49.1	0.0	0.0	0.1	1,271	0.9	3.9	--	--	--
N14	10,763		42.2	--	--	--	23	--	0.1	--	--	--
N15	3,102	--	9.1	--	--	--	73	1.2	0.4	--	--	--
N16	1,312	6.8	3.1	--	--	--	--	--	--	--	--	--
N17	1,332	0.3	5.2	--	--	--	--	--	--	--	--	--
N18	54,654	11.5	213.7	752	0.6	2.5	3,392	1.8	12.3	207	0.0	0.9

Database research and comments received by the Commission about the project indicate that there are three, possibly four, organic farming operations along the North Route Sections. Two of the farms are located along Section N4, one is along N6, and possibly a fourth operation is located along Section N18. Commission staff have received comments from both of the organic farmers along Section N4. One of the operations is located just north of some residential homes that were the subject of a data request by Commission staff in this case.[123] Two detailed public comments were also provided.[124, 125] The residential homes are along Franks Lane. ATC has provided routing options that would increase the distance from the homes and bisect the organic farm field in different configurations. Crossing the field with a transmission line could impact the operation by compacting the soils that have been worked for good tilth in recent years, damaging existing drain tile systems, preventing the use of GPS technology in the fields and the associated efficiencies, precluding development potential at some time in the future, along with other reasons described in the comments. Additional discussion of this area is located in Section 9.3.3.1.

[123] PSC REF#: 214393
[124] PSC REF#: 224775
[125] PSC REF#: 209701

Chapter 5 of this document contains some description of issues associated with construction of transmission lines across organic farms. If tree lines separate organic farm parcels from farm operations not under organic management, removing the tree lines could increase the chances of herbicide drift from herbicide applications on non-organic parcels to organic parcels. Soil-borne pests, diseases, and/or chemicals in the soils of non-organic farmlands could possibly be transferred to organic farmlands if construction equipment and vehicles aren't properly cleaned prior to entering the organic fields. Chemicals used for construction, hydraulic fluids, or other fluids from vehicles and equipment used for construction that could spill onto organic farm lands could jeopardize an organic farmer's certification status.

ATC documents in its application several methods it would implement to mitigate or minimize impacts to organic farming operations if the project were constructed. It indicates that it would work with landowners to understand their particular operation and its unique concerns. Methods to minimize impacts could include offsetting the transmission line structures from property lines so tree lines or other buffers are maintained. Construction vehicles should be cleaned prior to entering the organic parcels, if preferred by the landowner. To protect organic farms during vegetation management activities once a line would be in operation, ATC has stated that it would not apply herbicide within portions of an easement on which the landowner wishes not to introduce it. (This choice is a statutory right of the landowner under Wis. Stat. § 182.017(7)(d). See Section 5.3 in this EIS.)

Approximately 0.9 acres of a property that contains a large hops trellis would be impacted by Route Section N18. If the transmission lines are approved and built on Section N18 there could be a concern about adequate ground clearance for the conductors.

Multiple agricultural landowners in the North Routing Area have expressed concerns about the effect new transmission lines would have on their current and future farming operations. Other agricultural practices that could be affected by the proposed project include windbreaks, drainage tiles, center pivot irrigation, and automated tractor use.

Based on reports of the applicant's conversations with the public and information received by Commission staff from the local farm operators in public scoping meetings, there are several fields along Route Section N14 where GPS-controlled, driverless tractors are used as part of farming practices. Installing structures in fields where this practice is used would likely add obstacles and decrease field operating efficiencies. In addition, along Route Section N14, the proposed transmission lines would bisect a 160 acres of cropland, that would prohibit the landowner's plans for a center pivot irrigation system in those fields.[126]

The farm owners in the northern portion of N18 and N14 also have existing and planned underground piping for central pivot irrigation and nutrient application and transfer. See Figure 9.3-1 for a rough picture of the planned facility locations.[127] Soil compaction, ground disturbance, excavation activities, and structures that are obstacles to the pivot systems are potential disturbances to these systems. With recent technological advancements in water purification and nutrient concentration systems, the landowners suggest there is a high probability that underground piping system installations could occur in the near future. These systems can reduce the amount of methane, a potent greenhouse gas that would be emitted from this large farm. Construction of a transmission line could possibly delay implementation or even eliminate the landowners' ability to implement these systems on their operations.

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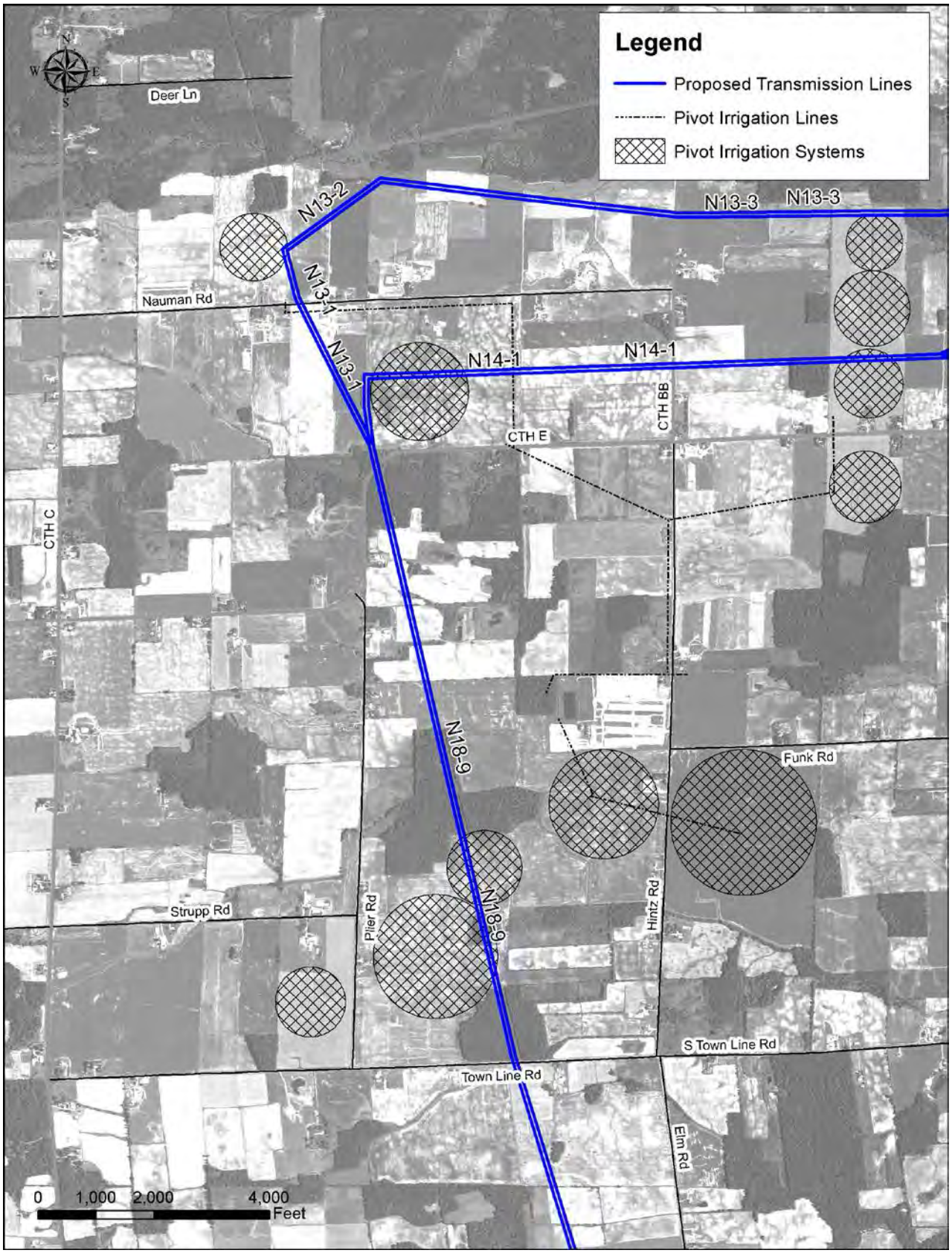
[126] PSC REF#: 213522

[127] Provided as an attachment to public comments from the John Jacobs Family, August 8, 2014.

Figure 9.3-1 Existing and planned underground piping for central pivot irrigation



ATC describes in the application the types of construction practices that could be used and how it would work with landowners in final design stages to attempt to minimize the types of impacts described above. During the final design process, ATC could and should work with landowners to place structures in such a way that impacts to drain tiles are avoided or minimized to the extent practicable. During construction, matting could be used to distribute the weight of heavy equipment more evenly, and/or low-ground-impact construction equipment could be used. After construction was completed, ATC would work with landowners to repair any damaged drain tiles so agricultural fields drain properly. (Again, this is the landowners' right under Wis. Stat. § 182.017(7)(c)6. See Section 5.3 of the EIS.)

Land enrolled in the FPP is an indicator of farmland quality and value. Although electric transmission lines are permitted on lands enrolled in the FPP and are considered to be compatible with agricultural use, the number and size of parcels enrolled in the FPP along each route have been identified from a database obtained from DATCP. The database lists landowners who have voluntarily filed a FPP agreement with DATCP. Thirteen landowners have been identified in the North Routing Area as having FPP property. The number and locations of these landowners are: six along Section N4; one along Section N14; three along Section N8; two along Section N6; and one on Section N16. Thus, there are ten farm owners with FPP agreements along the eastern route option and possibly four along the western route options, depending on the route sections considered. Regardless, all FPP parcels impacted by the project would be identified during the easement acquisition process if the project is approved.

In general, in advance of any construction for the project, ATC would and should coordinate with each agricultural landowner regarding their farm operation, including field facilities like drainage tiles, locations of farm animals and crops, current farm biological security practices, landowner concerns, and use of access routes. Potential impacts to each farm property along a given route would need to be identified and, where practicable, construction impact minimization measures would need to be agreed upon and implemented. Site-specific practices would vary according to the practices and activities of the landowner/farm operator, the type of agricultural operation, the susceptibility of site-specific soils to compaction, the degree of construction occurring on the parcel, and the ability to avoid areas of potential concern. ATC has stated in its CPCN application that it would complete this process.

There is a confined animal dairy operation within 300 feet of the outermost centerline in two locations along portions of Route Sections N4 and N13. Route Sections N8 and N18 each have one confined animal dairy operation within 300 feet of the outermost centerline on their routes.

NRCS easement data show that there are no properties in the North Routing Area that have NRCS easements, such as for the wetland reserve program or grassland reserve program.

Wisconsin's forest tax laws encourage sustainable forest management on private lands by providing a property tax incentive to landowners. Two forest tax law programs, both administered by DNR, currently exist: the MFL and the FCL. No properties along the project are shown to be currently enrolled in the FCL program, but several are enrolled in the MFL.

DNR records show that there are 19 individual land parcels along Route Section N4 that are currently enrolled in the MFL program, while there are 12 along Route Section N18, six along Section N7, five along Section N6, and two on Section N8. Thus, there are about 21 such parcels along the eastern route option and likely 17 or 18 along the western option, depending on the route sections used.

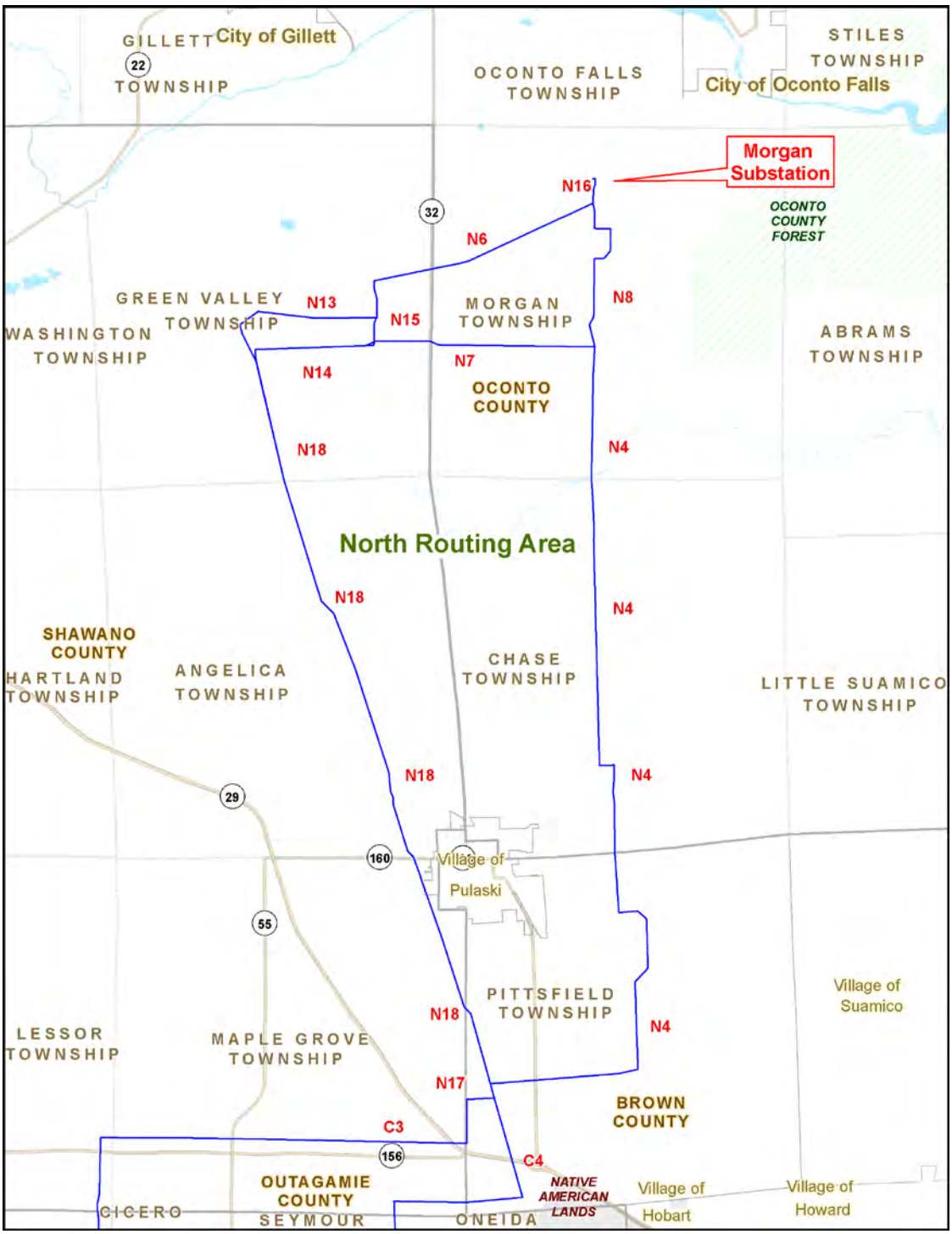
The full extent to which MFL program participation may be affected by a possible chosen route is unknown at this time. During the easement negotiation process, any conflicts between the terms and conditions of the MFL program agreement and ATC's proposed easement would need to be addressed. If any landowner became unable to continue participation in the program, or if the level of participation was impacted, ATC would and should compensate the landowner as appropriate. If there were conflicts

between a transmission line easement and the obligations of a landowner under the terms of the program, land in the easement area would possibly have to be removed from the program.

9.3.2. Land use plans

Figure 9.3-2 shows the municipalities potentially affected by the project in the North Routing Area.

Figure 9.3-2 Municipalities potentially affected by the project in the North Routing Area



In general, residential land use is considered to be more sensitive to impacts from electric transmission lines than commercial or industrial land uses, primarily due to potential adverse aesthetic effects such as visual impacts or noise. Urban areas or areas where land use planning indicates future urban or high density residential developments have the potential for more conflict with regards to the suitability of transmission lines and land use plans. Other land uses that are less compatible with transmission lines are parks or recreational lands, where aesthetic effects such as visual impacts or noise and the creation of ROW corridors into the landscape which can fragment habitats and introduce invasive species may impair the ability of an area to be a high quality park or recreational area.

Corridor-sharing with other types of infrastructure such as existing transmission lines and multi-lane highways can mitigate new transmission line impacts by creating incremental impacts instead of the entirely new impacts associated with a brand new corridor and its new easements. Narrower roads, distribution lines, and smaller gas pipelines typically have smaller and less disturbed ROWs than transmission lines and highways, and may not be as suitable at reducing impacts from new transmission lines.

Most areas along both of the proposed northern route options are rural in nature and primarily made up of agricultural lands, with the northern portion becoming much more forested. Neither primary route option (using N18 or N4) passes directly through an urban center or dense residential development, but scattered farmsteads and single-family residences are likely to experience visual impacts of the proposed routes. The potential impact of those route sections would be similar to those discussed for routes in the Central Routing Area in Section 8.3.3.

9.3.2.1. Common Route Sections (N17, N16)

Route Section N17 is a very short common route section that connects the Central Routing Area to the North Routing Area. This section is located in the town of Pittsfield (in Brown County) and travels northwest, sharing less than 1 percent of the existing ANR gas pipeline ROW and crossing an active agricultural field and navigable waterway. Brown County has classified the northern portion of this route section as an ESA, which includes "wetlands from the DNR Wetlands Inventory Map, existing mapped floodplain areas, and areas 75 feet back from streams not having mapped floodplain which are protected under the Wisconsin Shoreland Management Program."[128] ESAs are defined by the Brown County Planning commission as "portions of the landscape consisting of valuable natural resource features that should be protected from intensive development". The plan further states that:

> "Development and associated filling, excavation, grading, and clearing are generally prohibited within ESAs. Farming and landscaping are allowed within ESAs and certain non-intensive uses, such as public utilities and public recreation, are often allowed within these areas."

Brown County has further stated that land-disturbing activities including development may not occur in an ESA. However, transmission lines are considered a public utility, which is exempt from ESA restrictions provided that BMPs are followed during construction and post-construction.[129]

Issues relating to wetland and waterway impacts are further addressed in Section 5.5 in the EIS.

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[128] Town of Pittsfield Comprehensive Plan, Brown County Planning Commission, Adoption Date: August 14, 2007.
[129] Letter from Brown County Planning Commission (PSC REF#: 223280, p. 6).

Route Section N16 is another short common route section that connects all route alternatives to the Morgan Substation in the town of Morgan in Oconto County. It travels north through agricultural land along an existing transmission line, increasing the existing ROW width from 190 feet to 330 feet. According to the comprehensive plan for the town of Morgan, the future general plan design of this area is designated as agricultural. An objective of this plan includes maintaining large contiguous prime agricultural tracts and open spaces to preserve the town's rural atmosphere and large farming operations.[130]

9.3.2.2. Eastern Route Sections (N4, N8)

Route Section N4 is the primary eastern route section in the North Routing Area. It travels east and then north from the town of Pittsfield in Brown County, through the town of Chase in Oconto County, and ends in the town of Morgan in Oconto County.

Route Subsection N4-1 starts in the town of Pittsfield and travels east through agricultural lands, a large block of contiguous forest, wetlands, and a few navigable waterways generally following property lines before it turns north. Some of the parcels along this route are designated as ESAs (see Section 9.3.2.1), whereas the comprehensive plan for the town of Pittsfield notes that development and associated filling, excavation, grading, and clearing are generally prohibited within ESAs.[131] Brown County also states that transmission lines are considered public utility facilities, which are exempt from ESA restrictions provided BMPs are followed during construction and post-construction.[132]

Just after Route Subsection N4-1 turns north, it crosses the Mountain-Bay State Trail. The Mountain-Bay State Trail is an 83-mile recreational trail that crosses north-central Wisconsin from Green Bay (Brown County) to Rib Mountain (Marathon County). Impacts to this state trail are addressed in Section 9.3.5.

Route Subsections N4-5 and N4-6 travel north through the town of Chase in Oconto County. Route Subsection N4-5 continues north through an area with extensive contiguous forest blocks and forested wetlands. Wetlands such as these, as well as 100-year floodplains and slopes greater than 12 percent, are designated environmental corridors in the town of Chase's comprehensive plan. These areas of the town are most sensitive to development and are intended to be preserved. In the 20-year comprehensive plans for the towns of Chase and Morgan, future developments are advised to stay back from environmental corridors as much as possible to minimize the negative effect on water resources, wildlife habitats, and the overall character of the towns.

More specifically, the town of Chase has expressed concern about the impact the proposed project would have on sensitive and wetland areas, opposing the destruction of these habitats. Also along proposed Route Subsection N4-5, the town of Chase owns a 40-acre former landfill along Chase Town Hall Lane that is being developed into a multi-use town park for residents. Hiking and skiing trails, as well as a picnic area, will be constructed. The proposed transmission lines would run north-south along the western boundary of this park, impacting approximately three acres of the proposed park that would be within the project ROW. The town has stated that "…clear-cutting the amount of footage needed for the towers would eliminate [their] future vision for the site." It has also expressed concern about the potential disruption caused by proposed construction activities within and near the decommissioned landfill. In the comprehensive plan for the town of Chase, future development projections and plans state that the denser residential areas are expected to occur within the southern and southeastern areas of the town. As it

[130] Town of Morgan, Oconto County, Wisconsin 20-Year Comprehensive Plan. Bay-Lake Regional Planning Commission. August 2008.
[131] Town of Pittsfield Comprehensive Plan, Brown County Planning Commission, Adoption Date: August 14, 2007.
[132] Letter from Brown County Planning Commission (PSC REF#: 223280, p. 6).

stands, Route Subsections N4-5 and N4-6 would travel north through the center of the entire township, potentially impacting this future development.[133]

Where Subsection N4-7 travels north through more agricultural lands and crosses the Pensaukee River, it enters into the town of Morgan just west of the unincorporated community of Sampson. As stated in the town of Morgan's comprehensive plan, redevelopment and investment in Sampson, as well as the area near the intersection of CTH C and CTH E, offer the opportunity for increased tax generation and are identified as smart growth areas. Both areas are located less than 0.5 mile to the east of the proposed transmission lines, which could potentially impede future growth. Further north, along Route Subsection N4-9, the proposed ROW would cross an active quarry. As mentioned in the town of Morgan's 20-year comprehensive plan, reclamation of current quarry sites for future residential and/or recreational activities have been identified as smart growth areas. If Route Subsection N4-9 is ordered, the potential future redevelopment of this active quarry could be impacted.[134]

9.3.2.3. Western Route Sections (N18, N14, N13, N15, N7, N8, N6)

From the town of Pittsfield in northwestern Brown County, Route Section N18, the main route section for the western options in the North Routing Area, extends to the northwest through the northeastern corner of the town of Maple Grove in Shawano County, primarily through agricultural lands along the existing ANR gas pipeline ROW, sharing less than six percent of the ROW and increasing the ROW's width from 75 feet to 180 feet. As stated in the town of Maple Grove's comprehensive plan, one of its overall goals is to accommodate limited high quality residential and commercial land uses in the town, while preserving the majority of the town's land for agriculture.[135] Future smart growth areas for the town have been identified near Hofa Park and selected areas along the STH 29 corridor. Both of these areas are not within the project ROW, and would not be directly impacted.

The towns of Maple Grove and Angelica identify the area immediately surrounding the western edge of the village of Pulaski as an "agricultural transition area", where the greatest residential density increase is anticipated. Route Subsection N18-3 would bisect this area and could impact future residential development here. In addition, according to the village of Pulaski Comprehensive Plan, the North Pulaski Industrial Park, near the intersection of STH 29 and Green Valley Road, is planning to expand south and west.[136] This area would be crossed by Route Subsection N18-4, directly impacting this planned expansion. Also, the Crest Drive and CTH B area south of Pulaski has been identified for urbanization and residential development due to the increasing population of the village. This area is in the direct vicinity of Route Subsection N18-3.

As Route Section N18 continues northwest along the ANR gas pipeline, it enters the town of Angelica. Here, the proposed western route primarily crosses open lands, agricultural, and future residential areas with environmental corridors encompassing navigable waterways and wetlands. Route Subsection N18-6 crosses the Mountain-Bay State Trail. Potential impacts to this state trail are addressed in Section 9.3.5. From here the proposed route continues northwest, crosses a few waterways associated with the Pensaukee River, and runs adjacent to large contiguous blocks of forest and wetland. According to the town of Angelica's comprehensive plan, environmental corridors are "…generally continuous open space areas including sensitive natural resources, WDNR-identified wetlands subject to existing state-mandated

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[133] Public comment, PSC REF#: 213286 (p. 10). Town of Chase, Oconto County, Wisconsin.
[134] Town of Morgan, Oconto County, Wisconsin 20-Year Comprehensive Plan. Bay-Lake Regional Planning Commission. August 2008.
[135] Town of Maple Grove Comprehensive Plan. Shawano Area Communities Comprehensive Planning Project. August 2008.
[136] Village of Pulaski Comprehensive Plan. Brown County Planning Commission. October 2007.

zoning, FEMA designated floodplains, shoreland setback areas, and steep slopes. "[137] As stated in the comprehensive plan, new development should be avoided within mapped environmental corridors; although if developed, the owner/developer would be responsible for determining the exact boundaries of the corridor.

N18 continues northwest and crosses into the town of Green Valley where alternate section options N14 and N13 run east and north across agricultural lands toward the town of Morgan. Route Section N13 follows an existing transmission line ROW, just south of a large block of contiguous forest block and forested wetlands. Here N13 would share less than 15 percent of the existing transmission line ROW. Route option N14 ends near the unincorporated community of Green Valley, which has been identified in the comprehensive plan as an area to promote commercial, light industrial, and residential growth.[138] If ordered, Route Sections N15 and N17 would likely impact growth in this community because they begin in the northwestern corner of town.

The proposed ROW for Route Subsections N6-1 and N6-2 overlap the Wiouwash State Trail for approximately 1,400 feet just north of the town of Green Valley. Route Section N17 is along the northern border of Green Valley, also crossing the Wiouwash State Trail. Potential impacts to this state trail are addressed in Section 9.3.5.

Route Sections N7 and N6 continue east into the town of Morgan. As Route Section N7 runs east, it bisects large blocks of contiguous forest and forested wetland. Route Section N6, on the other hand, continues northeast along an existing transmission line ROW towards the Morgan Substation, but sharing less than 31 percent of the existing ROW. In the 20-year comprehensive plans for the town Morgan, future developments are advised to stay back from environmental corridors as much as possible to minimize the negative effect on water resources, wildlife habitats, and the overall character of the towns. In addition, the future general plan design for the town of Morgan expresses that this area is designated primarily as agricultural land, with scattered residents and open areas. An objective of this plan includes maintaining large contiguous prime agricultural tracts and open spaces to preserve the town's rural atmosphere and large farming operations.[139]

9.3.3. Proximity to residences and sensitive populations

This section discusses the proposed project's proximity to residences and farmsteads along the North Routing Area. In the north routing section, none of the proposed route options would come within 300 feet of a school, daycare, or hospital. Information for this section came from the tables submitted in the project application that categorize the number of residences within specified distances of the proposed centerline of the transmission lines and the estimated magnetic fields associated with the different proposed transmission line configurations. Additionally, Commission staff reviewed comments submitted by the public, reviewed aerial imagery, and conducted site visits along the routes. A summary of the number of residences within 300 feet of the proposed centerlines for all north routing area alternatives is found below in Table 9.3-2. Distances were measured from the outermost transmission line centerline in the proposed ROW.

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[137] Town of Angelica Comprehensive Plan. Shawano Area Communities Comprehensive Planning Project. August 2008.
[138] Town of Green Valley Comprehensive Plan. Town of Green Valley Plan Commission. 2004.
[139] Town of Morgan, Oconto County, Wisconsin 20-Year Comprehensive Plan. Bay-Lake Regional Planning Commission. August 2008.

Table 9.3-2 Number of residential structures within 300 feet of the proposed centerline of route alternatives within the North Routing Area

Route Alternatives	Route Sections	Distance to Proposed Centerline (feet)				Total
		0-50	51-100	101-150	151-300	
A, E, I, M (West)	N17, N18, N13, N6, N16	0	0	1	15	16
B, F, J, N (West)	N17, N18, N14, N15, N6, N16	0	0	2	16	18
C, G, K, O (West)	N17, N18, N14, N7, N8, N16	0	2	1	11	14
D, H, L, P (East)	N17, N4, N8, N16	0	5	7	17	29

The proximity of properties to high-voltage transmission lines is important because of real and perceived concerns about local aesthetics, changes to valued viewsheds, personal enjoyment and use of one's property, potential impacts to property values, magnetic fields and other electrical phenomenon, and personal and public safety. A generalized discussion of some of these issues is contained in Chapter 5.

Commission staff recognizes that individuals and families have substantial financial, physical, and emotional investments in their homes and properties, and that the discussions in this document will most likely not adequately address all the issues felt by many individuals owning property along the proposed routes. This section is not addressing impacts that are restricted to agricultural (see Section 8.3.1) or other open land types such as woodlands or wetlands (see Section 8.2), where these potential impacts are discussed in more detail.

Finally, the personal sense of loss and unfairness related to burdening individuals and specific communities with the long-term presence of these high-voltage transmission lines cannot be adequately addressed in this document. There will be an opportunity for personal comment and testimony from landowners later in this process at the public hearings. Nevertheless, a discussion of some special concerns that have been raised follows in the sections below.

9.3.3.1. Residential impacts

Common Route Sections N17 and N16

There are no churches, schools, hospitals, residences, or known daycare facilities located within 300 feet of the proposed centerline on either Route Section N17 or N16. Distances were measured from the outermost transmission line centerline in the proposed ROW.

Route section N17 is a very short common route section that does not come within 300 feet of any residences.

Route section N16 is another very short common route section, in the town of Morgan, that travels north through agricultural land along an existing transmission line, increasing the existing ROW width from 190 feet to 330 feet. This route does not come within 300 feet of any residences. Although this segment is relatively short, the visual impact of four separate high-voltage transmission lines running alongside one another would impact the view of this rural landscape as seen from the local residences.

Eastern Route Sections N4 and N8

There are no churches, schools, hospitals, or known daycare facilities located within 300 feet of the proposed centerline on either Route Section N4 or N8. The numbers of residences are tallied in Table 9.3-3. Distances were measured from the outermost transmission line centerline in the proposed ROW.

Table 9.3-3 Number of residential structures within 300 feet of the proposed centerline of eastern option route sections in the North Routing Area

Route Section	Distance to Proposed Centerline (feet)				Total
	0-50	51-100	101-150	151-300	
N4	0	3	6	13	22
N8 (East or West)	0	2	1	4	7

Route Section N4

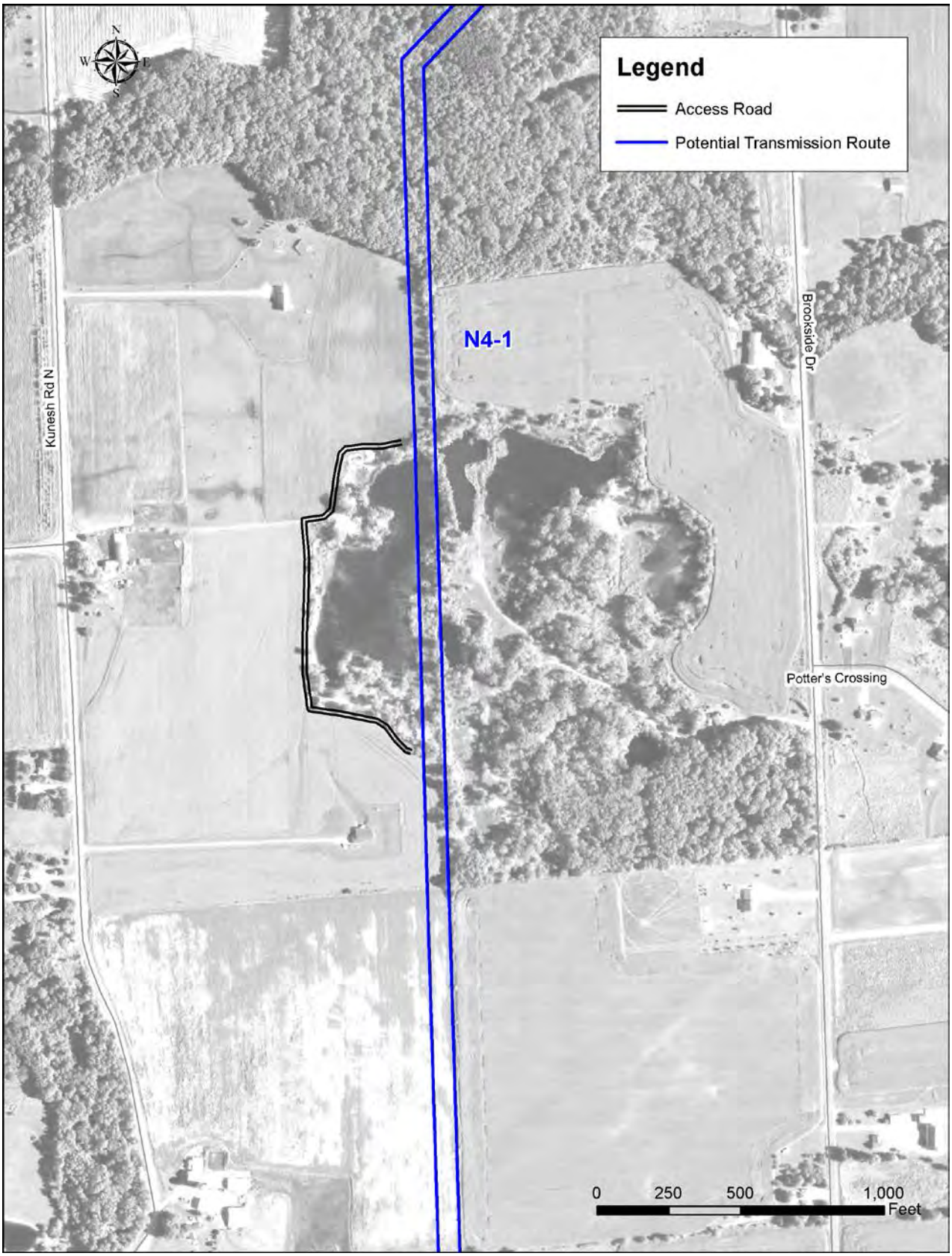
Route Section N4, approximately 15.5 miles long, is the primary eastern route section in the North Routing Area from the town of Pittsfield in Brown County to the town of Morgan in Oconto County. Along route section N4, the residences located within 300 feet of the proposed centerlines are scattered and often isolated from one another. The proposed structures and the 180 feet of cleared ROW would change the landscape and aesthetics significantly for local homeowners in this part of the project area.

After the proposed route crosses STH 32 in the town of Pittsfield, it crosses two parcels just west of STH 32 that are currently zoned light commercial/industrial in preparation of the future development along the STH 32 corridor in the town of Pittsfield.[140] Beyond the crossing of STH 32, there is a residence less than 100 feet south of the proposed 345 kV transmission line. This landowner would lose a large portion of their lawn and woody vegetation in the northeastern corner of their property. As the transmission lines continued east and crossed Kunesh Road N, there would be another residence less than 300 feet south of the 345 kV centerline. Here the landowner would lose the buffer of trees along the north side of their property.

After the proposed route turns north, it passes another residence approximately 200 feet west of the 138 kV centerline. The house is set back from Kunesh Road approximately 750 feet, which could reduce the undesirable impacts from the road. This landowner is involved in the conservation efforts of a state special concern turtle species which is known to occur on the property.[141] The proposed 345 and 138 kV transmission lines would be constructed along the edge of a contiguous forest less than 250 feet east of the homestead and continue north bisecting and spanning a water-filled quarry that is actively used for recreation.[142]. In addition to the impact of the proposed ROW, the applicant has proposed an off-ROW access road about 20 feet wide and 1,600 feet in length that would be constructed between the edge of the quarry and the adjacent agricultural field, north of the house. The removal of trees and vegetation in this area could adversely affect the conservation efforts of this landowner and the recreational use of the quarry. See Figure 9.3-3.

[140] PSC REF#: 210359.
[141] PSC REF#: 213286.
[142] PSC REF#: 223745.

Figure 9.3-3 Quarry and access road impacts along Section N4-1 by Kunesh Road



As Route Subsection N4-2 travels north, it parallels the west side of CTH B near a cluster of rural residences and an active agricultural field that is zoned and planned for residential development. The houses along the west side of CTH B are set back further than those on the east side, providing a slightly greater distance between the homes and the proposed ROW. The presence of the large new electric transmission lines would impact all residences along CTH B; however, it would impact the residences on the west side of CTH B more. The proposed transmission lines would increase the existing road ROW another 130 to 180 feet, would cross many private driveways, and would come less than 200 feet away from a few residences.

Where Route Subsection N4-5 crosses Brown County Line Road, it bisects two large CAFOs that would be within 150 feet of the 345 kV centerline. This would likely result in daily impacts to farming operations and rural living. Continuing north, just south of South Chase Road, the proposed transmission lines cross rows of planted trees and an undeveloped parcel along the Little Suamico River. The presence of the transmission lines on this property would prevent the owners from building a house.[143] In addition, on the north side of South Chase Road, the proposed transmission lines would pivot westward around an existing home, coming within 100 feet and requiring removal of the tree line along the western portion of the residence.

Route Section N4-5 continues to run north along agricultural fields, making a ninety degree turn to the west near several properties along Franks Lane. From here, it makes another ninety degree turn north through organic agricultural fields. It could continue to run north parallel to Jaworski Road. See Figures Vol. 2-1.05 and Figure 9.3-4 As proposed, the ROW would extend into the tree line separating the residential development and the organic farming fields. Removing these trees would increase the visual and aesthetic impact to the existing landowners, as well as remove the vegetative screen between the organic farming practices and the adjacent residential properties.

Because the proposed line would be near to multiple residences along Franks Lane, Commission staff requested route alternatives for this area. In response, the applicant provided three route options that would increase the distance between the proposed route and the existing homes along Franks Lane. See Figure 9.3-4. These options would still impact the daily operations of the registered organic farm to the north.[144] as discussed in Section 9.3.1 in this chapter. Figure 9.3-4 illustrates the situation and the options now proposed for consideration by the Commission.[145] Table 9.3-4 illustrates impacts of the proposed route options.

[143] PSC REF#: 214234
[144] PSC REF#: 209701
[145] PSC REF#: 214393

Figure 9.3-4 Options to move the proposed line in Route Section N4 farther from residences at Franks Lane

Table 9.3-4 Details of additional route options in N4 to increase distance from residences

Route Option	Total Distance to Centerline from Residence	Additional Agricultural Impacts	Cost of Route Option
N4-02.06a	795 feet	Increase of 0.10 acres impacted	$125,000
N4-02.06b	785 feet	Reduction of 2.4 acres impacted	-$300,000
N4-02.06c	350 feet	Reduction of 1.1 acres impacted	$350,000

Additional information about the potential impacts on organic farming is available in Section 9.3.1 and in Chapter 5, Section 5.5.2. Specific comments about the organic farming activities that would be affected by the project can be found in Section 9.3.1. In addition, the owner of the organic field pictured in Figure 9.3-2 is strongly opposed to the newly proposed route options N4-02.06a, N4-02.06b, and N4-02.06c that would increase the distances between the new homes and the proposed transmission lines.[146]

After Route Subsection N4-5 crosses CTH S, it would traverse approximately one mile of contiguous mixed upland and lowland deciduous forest. The town of Chase owns property in this area, refer to Section 9.3.3.2. In addition a private landowner within this forest complex has managed their property as a 'certified wildlife habitat' through the National Wildlife Federation, and the property has recently been certified as a "Monarch Waystation" through Monarch Watch. Although these designations do not confer any legal protections, they do show that this landowner takes considerable effort to preserve the ecological integrity of their property.[147] If this route section is ordered, this property would also lose a hedgerow of over 2,500 trees, as well as have degraded further the adjacent wildlife habitat that has been home to badgers, blue and green herons, minks, otters, coyotes, and black bear.[148]

North of Van Dornick Road, the proposed transmission lines and ROW on Route Subsection N4-5 would cross over and travel along a private driveway for approximately 250 feet, passing by a residence less than 60 feet from the 138 kV centerline. In addition, a small grove of trees in the backyard would be cleared for the proposed ROW.

Where Route Subsection N4-5 crosses Gohr Road, it angles slightly northeast to pass in between a farmstead and a residence. The proposed ROW of the 345 kV line would border a farm building on the south side of Gohr Road and a house on the north side of Gohr Road. The owner of the residence on the north side of the road also owns property to the east that is part of a registered organic farm.[149]

After Route Subsection N4-9 crosses Delzer Lane in the town of Morgan, the ROW of the 345 kV line comes within 20 feet of a residence on the north side of the road. The hedgerow and scattered trees on the west side of this property that separate this homestead from the agricultural fields to the west, as well as a significant portion of their yard, would be cleared for the proposed ROW.

In addition, PSC Data Request 07.02 seeks to evaluate the feasibility of the route alternative for N4-1 to N4-5 proposed in PSC REF#: 224730. At the time of this final EIS going to print, no response from the applicant is available.

Route Section N8

Route Section N8 starts just north of CTH E. As Route Subsection N8-1 crosses Morgan Marsh Road, it angles slightly northwest between two rural residences and a farmstead. The centerline of the 345 kV line

[146] PSC REF#: 224775
[147] PSC REF#: 209896
[148] PSC REF#: 224844
[149] PSC REF#: 213234

would be less than 100 feet from one residence, clearing the southwest corner of their property. On the north side of Morgan Marsh road, the 345 kV centerline would be 200 feet from one house requiring large tree removal on the west side of the property. As the proposed transmission lines continued north, they would make an obtuse angle through an agricultural field avoiding residences and a large block of forested wetland. This configuration, however, would directly impact the viewshed of a residence less than 250 feet from the centerline of the 345 kV line along Morgan Marsh Road as well as require the removal of many large trees in the northwestern corner of their property. In addition, slightly north of here Route Subsection N8-1 crosses an active quarry where the ROW spans directly over a farm outbuilding.

To minimize clearing a large block of wooded wetland associated with the North Branch of the Pensaukee River (ASNRI), Route Subsection N8-1 travels east to intersect CTH C. Here the proposed ROW would come within 300 feet of a few residences and farming operations.

Western Route Sections (N18, N14, N13, N15, N7, N8, N6)

There are no churches, schools, hospitals, or known daycare facilities located within 300 feet of the proposed centerline on route sections N18, N13, N14, N15, N6, N7, or N8. There are residences, however, as tallied in Table 9.3-5. Distances in Table 9.3-5 are measured from the outermost transmission line centerline in the proposed ROW.

Table 9.3-5 Number of residential structures within 300 feet of the proposed centerline of route sections within the North Routing Area

Route Section	Distance to Proposed Centerline (feet)				Total
	0-50	51-100	101-150	151-300	
N18*	0	0	0	5	5
N13	0	0	0	0	0
N14	0	0	0	0	0
N15	0	0	1	1	2
N6	0	0	1	10	11
N7	0	0	0	2	2
N8 (East or West)	0	2	1	4	7

*Designates the main western route through the north routing area.

In addition, PSC Data Request 07.01 requests route alternatives that increase the distance from the existing homes along Morgan Marsh Road and the proposed transmission lines. At the time this EIS has gone to print, no response from the applicant is available.

Route Section N18

Route Section N18, approximately 13 miles long, is the primary western route section in the north routing area that travels northwest from the town of Pittsfield generally along the ANR natural gas pipeline cross-country through agricultural lands to an ending in the town of Green Valley. See Figures Vol. 2-1.04, 2-1.03, and 2-1.02. Where the proposed route shares the ROW with the gas pipeline, the ROW would increase from 75 feet to 180 feet. Throughout Route Section N18, the proposed transmission lines would traverse agricultural fields diagonally southeast-to-northwest, impacting farming operations throughout the area. The residences within 300 feet of the proposed centerlines are scattered and often isolated throughout this part of the project area.

Just north of the intersection of Greenacre Drive and St. Augustine Road, Route Subsections N18-2 and N18-3 pass by a farmstead to the east that would be less than 300 feet from the 345 kV centerline. This is an area where the route does not follow the existing gas pipeline ROW, and in fact the gas pipeline travels along the east side of this property. This property is surrounded by utility ROW, permanently impacting

its aesthetics and possibly its use. As the route continues northwest, Route Subsection N18-3 crosses through a large agricultural field to the east of a cluster of homes along Green Valley Road. These houses are more than 300 feet from the centerline of the proposed transmission lines; however, the views of the countryside from the homes could be permanently interrupted by high-voltage transmission lines. As Route Subsection N18-3 crosses STH 160, it comes within 160 feet of a farmstead to the east. Where the proposed route crosses STH 160 and before it crosses Green Valley Road, the ROW would come within 250 feet of a residence and require the removal of a significant amount of forested area around their property.

Further north, Route Subsection N18-7 travels on the east side of a few residences along Elm Road. Two homes would be less than 300 feet from the 138 kV centerline. Both properties would lose one or multiple trees that would need to be cleared for the proposed ROW. After the proposed route crosses Elm Road, it passes behind a farmstead through an agricultural field approximately 250 feet from the 345 kV centerline.

Just east of CTH E, Route Subsection N18-9 passes by a residence to the west less than 300 feet from the 138 kV centerline. The proposed route would have a major impact on this property that already has a natural gas pipeline bisecting it.[150] The proposed co-located transmission lines would bisect a large contiguous woodlot, significantly impacting the landowner's sugar bush operation and timber management practices now and well into the future.

Route Section N13
Route Section N13 is a relatively short section connecting to N18 in the town of Green Valley. It runs northwest generally paralleling the ANR natural gas pipeline through agricultural fields, increasing the existing ROW in places from 75 feet to 180 feet, and does not come within 300 feet of any residences.

Route Section N14
Route Section N14 is another relatively short section connecting to N18 in the town of Green Valley. This route section does not come within 300 feet of any residences.

Route Section N15
Route Section N15 is a very short section connecting to N14 in the town of Green Valley. The majority of this proposed route travels along the west side of Green Valley Road, increasing the existing ROW from 66 feet to 180 feet. The proposed Route Subsections N15-1 and N15-2 meet near the intersection of Pearl Street and Green Valley Road, near the developed part of town. Here the proposed centerlines come within 100 feet of one residence and within 250 feet of another. One of these residences would lose a portion of the grove of trees in the front yard that separates the home from Green Valley Road. This route section ends where it meets N6, on the east side of Green Valley Road just north of the North Branch of the Pensaukee River.

Route Section N6
Route Section N6 connects to either N13 or N15 in the town of Green Valley. The proposed route travels north along Green Valley Road and then east-northeast along the existing double-circuited 345/138 kV transmission lines, coming within 300 feet of a few residences along Green Valley Road, and the centerlines would span directly over and existing barn. East of its crossing of STH 32, it travels within 300 feet of multiple residences along Morgan River Road. In many places, the new ROW comes close to a

[150] PSC REF#: 220476

few buildings, significantly increasing the potential for impact by increasing the burden of two existing high voltage transmission lines to four.

Route Section N7
Route Section N7 connects N14 in the town of Green Valley with N8 south of Morgan Marsh Road. Route Subsection N7-1 is within 200 feet of one residence on Green Valley Road. Just west of STH 32, the proposed transmission lines would bisect a property preventing the owners from planned future development.[151]

9.3.3.2. Electric and magnetic fields

The following section on EMF is provided to give readers an idea of the expected magnitude of the magnetic fields that could be produced by the proposed transmission lines under expected normal and peak load conditions. More background information and a general discussion of EMF is found in Section 5.5.6 of Chapter 5 and Appendix B of this EIS. Due to questions and concerns from the public, the Commission requires applicants for transmission line projects to provide magnetic field data for locations where there are existing transmission lines along the project routes and the estimated magnetic fields at varying distances from the centerline of the proposed project, for both normal and peak load conditions, and at one and ten years after the new line is placed in operation. Magnetic fields are proportional to the current flowing on a line at any given time. Staff has verified that the magnetic field estimates provided by the utility are reasonable estimates based on the modeling tools available.

Below are brief summaries of the estimated magnetic field levels in the North Routing Area including Route Sections N17, N4, N8, N16, N18, N13, N14, N15, N6, and N7. More detailed estimates and background modeling information can be found in Appendix G of the North Appleton-Morgan project application.

Because current flow is highly variable, only an estimate of the magnetic fields (and not the electric fields) can be provided.

Common Route Sections (N17, N16)
Common Route Section N17 would have two proposed new transmission lines running north on delta configured monopoles. The estimated magnetic field values at each centerline would be 35 mG at the 138 kV line, and would range from 62 to 71 mG for the 345 kV line under normal load and peak load conditions, respectively. At 50 feet from each centerline, the estimated levels would drop to 5.3 mG beyond the 138 kV line and to 29 mG to 34 mG beyond the 345 kV line. At 200 feet from each centerline, the levels would drop to between 0.5 mG and 0.6 mG for the 138 kV line, and to between 2.7 and 3.2 mG for the 345 kV line. These estimated magnetic field values also apply to portions of route sections N4, N18, N13, N8, and all of N7 and N14.

Common Route Section N16 would be co-located with numerous existing lines as it entered the Morgan Substation property. The estimated magnetic field values at the centerlines of the outermost transmission lines would range from 54 to 78 mG for the existing double-circuited 345/138 kV lines, and between 58 and 67 mG for the proposed 345 kV line under normal load and peak load conditions, respectively. At 200 feet from the outermost centerlines, the levels would drop to between 3.8 and 2.8 mG for the existing double-circuited 345/138 kV lines and to between 2.9 to 3.3 mG for the proposed 345 kV line.

[151] PSC REF#: 224249

Eastern Route Sections (N4, N8)
The majority of the primary eastern route section, N4, would have magnetic levels similar to those described for above for route section N17. Estimated magnetic field values for route subsections N4-2 and N4-4 differ from the values along the majority of route N4. The estimated magnetic field values at each centerline for route subsection N4-2 would be 36 mG for the 138 kV line, and would range from 64 to 74 mG at peak load for the 345 kV line. At 50 feet from each centerline, the estimated levels would drop to between 5.7 and 5.8 mG for the 138 kV line, and to between 23 and 25 mG for the 345 kV line. At 200 feet from each centerline, the levels would drop to between 0.7 and 0.9 mG for the 138 kV line, and to between 5.4 and 6.5 mG for the 345 kV line. In addition, the estimated magnetic field values at each centerline for route subsection N4-4 are slightly lower than N4-2. Magnetic field values would be 36 mG for the 138 kV line, and range from 63 to 73 mG for the 345 kV line under normal load and peak load conditions, respectively. At 50 feet from each centerline, the estimated levels would drop to between 5.6 and 5.7 mG for the 138 kV line and to between 23 and 26 mG for the 345 kV line. At 200 feet from each centerline, the levels would drop to between 0.6 and 0.8 mG for the 138 kV line, and to between 4.8 and 5.8 mG for the 345 kV line.

Route Section N8 would have two proposed new transmission lines running north on delta configured monopoles. The majority of Route Section N8 would have magnetic levels similar to those described for above for route section N17; however, estimated magnetic field values for Route Subsection N8-2 differ slightly from that of the majority of Section N8. The estimated magnetic field values at each centerline would be 35 mG for the 138 kV line, and range from 61 to 70 mG for the 345 kV line under normal load and peak load conditions, respectively. At 50 feet from each centerline, the estimated levels would drop to between 6.1 and 6.2 mG for the 138 kV line, and to between 29 and 34 mG for the 345 kV line. At 200 feet from each centerline, the levels would drop to between 1.2 and 1.6 mG for the 138 kV line, and to between 2.8 and 3.3 mG for the 345 kV line.

Western Route Sections (N18, N14, N13, N15, N7, N6)
The majority of the primary western route section, Route Section N18, would have magnetic levels similar to those described for above for route section N17; however, estimated magnetic field values for Route Subsection N18-4 differ slightly from that of the majority of N18. The estimated magnetic field values at each centerline would be 35 mG at normal and peak loads for the 138 kV line, and range from 61 to 71 mG for the 345 kV line. At 50 feet from each centerline, the estimated levels would drop to 5.3 mG for the 138 kV line and to between 29 and 33 mG for the 345 kV line. At 200 feet from each centerline, the levels would drop to between 0.5 and 0.6 mG for the 138 kV line, and to between 2.8 and 3.2 mG for the 345 kV line.

Route Section N13 would have two proposed transmission lines running north on delta configured monopoles, parallel with the gas pipeline. This portion of N13 would have magnetic levels similar to those described above for Route Section N17; however, estimated magnetic field values change where Route Subsection N13-3 intersects and travels east with the existing double-circuited 345/138 kV transmission lines. Along this portion of N13, three separate high voltage transmission lines would travel east parallel to one another with the two proposed lines south of the existing line. The estimated magnetic field values at centerlines of the outermost transmission lines would range from 69 to 45 mG for the existing double-circuited 345/138 kV lines, and from 64 to 71 mG for the proposed 345 kV line, under normal load and peak load conditions, respectively. At 50 feet from the outermost centerlines, the estimated levels would drop to between 39 and 25 mG for the existing double-circuited 345/138 kV lines, and to between 28 and 31 mG for the proposed 345 kV line. At 200 feet from the outermost centerlines, the levels would drop to between 3.4 and 2.0 mG for the existing double-circuited 345/138 kV lines and to between

2.0 and 2.1 mG for the proposed 345 kV line. The estimated magnetic field values at the centerlines of each transmission line (n=3) would range from 31 to 71 mG under normal load and peak load conditions.

Route Section N15 would have two proposed new transmission lines running north on delta configured monopoles, co-located with a WEPCO distribution line. The estimated magnetic field values at each centerline would be 35 mG for the 138 kV line, and range from 61 to 70 mG for the 345 kV line, under normal and peak load conditions, respectively. At 50 feet from each centerline, the estimated levels would drop to between 5.3 and 5.2 mG for the 138 kV line, and to between 30 and 35 mG for the 345 kV line. At 200 feet from each centerline, the levels would drop to between 0.5 and 0.6 mG for the 138 kV line and to between 2.6 and 3.1 mG for the 345 kV line.

Route Section N6 would have magnetic levels similar to those described for above for Route Section N13; however, estimated magnetic field values for small portions of Subsections N6-1, N6-2, N6-3, and N6-4 differ slightly from the majority of Route Section N6. Along the north-south portion of Route Subsections N6-1 and N6-3, the proposed transmission lines would be co-located east of the existing double-circuited 345/138 kV lines and a WEPCO distribution line. The estimated magnetic field values at centerlines of the outermost transmission lines would hover between 72 and 51 mG for the existing double-circuited 345/138 kV lines, and between 65 and 73 mG for the proposed 345 kV line under normal and peak load conditions. At 50 feet from the outermost centerlines, the estimated levels would drop to between 44 and 32 mG for the existing double-circuited 345/138 kV lines, and to between 27 and 31 mG for the proposed 345 kV line. At 200 feet from the outermost centerlines, the levels would hover between 3.8 and 2.7 mG for the existing double-circuited 345/138 kV lines and between 1.7 and 2.1 mG for the proposed 345 kV line. The estimated magnetic field values at the centerlines of each transmission line (n=3) would vary between 31 mG and 73 mG under normal and peak load conditions, respectively.

In addition, the estimated magnetic field values along Route Subsection N6-4 would differ slightly from the above values. Estimated values at the centerlines of the outermost transmission lines would be between 68 and 46 mG for the existing double-circuited 345/138 kV lines, and between 65 and 72 mG for the proposed 345 kV line, under normal and peak load conditions. At 50 feet from each centerline, the estimated levels would drop to between 37 and 23 mG for the existing double-circuited 345/138 kV lines, and to between 18 and 22 mG for the proposed 345 kV line. At 200 feet from the centerlines of the outermost transmission lines, the levels would drop to between 3.1 and 1.5 mG for the existing double-circuited 345/138 kV lines, and to between 1.0 and 1.7 mG for the proposed 345 kV line.

Route Sections N14 and N7 travel east on delta configured monopoles, and would have magnetic levels similar to those described above for route section N17.

9.3.4. Aesthetics and visual impacts

Aesthetics and visual impacts are closely related and often used interchangeably. Aesthetics tends to encompass whole sensory experiences including sights, smells, or sounds from the surrounding environment. Visual impact is more directly related to the observer's views, sightlines, and viewsheds. More background discussion on the types and perception of aesthetic impacts can be found in Section 5.5.1. The following discussion of aesthetics is based on the following assumptions:

- Different viewers may have different levels of visual sensitivity.
- The surrounding physical setting can influence the degree of visual impact.
- The viewing conditions can influence the degree of visual impact.

In general, aesthetic and visual impacts are difficult to measure and tend to be perceived as greater in more natural or scenic settings. However, homeowners in partially developed residential settings can also experience significant aesthetic and visual impacts related to transmission lines, especially if no other aboveground utility infrastructure is present in the area beforehand.

All route options in the North Routing Area cross areas where agriculture is the dominant landscape feature. This area is also interspersed with large blocks of woodlands and wetlands among generally flat or gently rolling hills. The proposed configuration of having the two new transmission lines each on their own structures, one at around 120 feet tall and the other about 85 feet tall, rather than double-circuiting the lines, is likely to result in higher visual impacts across the entire area. The impact of the heights of the new facilities would likely be only partially mitigated by the proposed oxidized coating on the structures, meant to blend in better with the northern woodlands.

Common Route Sections (N17, N16)

Route Section N17 is a very short common route section that travels northwest across an active agricultural field and along the existing ANR gas pipeline ROW. This route section is more than 1,000 feet from the nearest residence and road, but the side-by-side structures would be visible as new features on the landscape from some distance.

Route Section N16 is another short common route that travels north through agricultural land along an existing transmission line, resulting in four separate co-located structures entering the Morgan substation supporting six transmission lines. Although this segment is relatively short, the visual impact of going from two sets of structures supporting three high-voltage transmission lines to four sets of structures supporting six and running alongside one another would increase the aesthetic and visual impact of this utility corridor in an otherwise rural farming community. On the other hand, there are several transmission lines that currently terminate at the Morgan Substation, so an increase in the number of transmission structures on this short route section would be relatively minor. Because construction of N16 and the Morgan Substation expansion may occur around the same time if the project is approved, the changes related to construction of N16 might not be identifiable.

Eastern Route Sections (N4, N8)

The primary eastern route section in the North Routing Area, Route Section N4, runs east and then north cross-country through agricultural lands and contiguous blocks of forest. The residences located along N4 are scattered, although more densely populated than along N18. The proposed structures and new ROW would significantly change the landscape and aesthetics along this route, as it bisects agricultural fields and properties and creates or expands ROW clearings through woodlands. As stated in Section 9.3.2, many homeowners would lose their vegetative buffers and portions of their yards for the structures of two new high-voltage transmission lines. Home and property owners could be affected on a daily basis, as the presence of the nearby high-voltage transmission lines would permanently alter their immediate landscape.

Southeast of Kunesh Road North, Route Subsection N4-1 crosses the Mountain-Bay State Trail, which is used for a wide range of recreational activities throughout the year. Patrons of the trail would likely find the new ROW and transmission lines disruptive to the scenic views and experiences they seek when using the State Trail system.

As Route Subsection N4-2 travels north, it parallels the west side of CTH B near a cluster of rural residences. The proposed route crosses many private driveways, and comes less than 200 feet away from a few residences. The proposed transmission lines and cleared ROW would be notable visible changes with potential aesthetic impacts on these residences, as the residents would cross underneath them, often

multiple times a day, to get to and from their homes and farms. In addition, this is one of the few areas that the transmission lines parallel a road instead of bisecting agricultural fields. Visitors and commuters in the area are likely to notice the large imposing utility corridor, as it is currently uncommon in this rural community.

Farther north, the proposed transmission lines on Route Subsection N4-5 would likely be a new dominant feature near multiple residences along Franks Lane. These homeowners are accustomed to a viewshed containing undulating hills with fields and farmsteads in the country. If the tree line between their properties and the proposed ROW are cleared for the new lines, the views from their backyards would be significantly different with the presence of a large utility ROW clearing and electric structures and cables.

Route Subsection N8 begins near CTH E, and travels north through agricultural fields, along forest blocks, and over a quarry. Where the proposed route crosses Morgan Marsh Road, it makes an obtuse angle through an agricultural field. This configuration allows the proposed route to avoid spanning nearby residences; however, its non-linear alignment would require more structures, likely disrupting sight lines from the nearby residences and roads. Further north, the route veers east around a large block of contiguous lowland forest associated with the North Branch of the Pensaukee River (an ASNRI), crossing the waterway along CTH C. The ROW would be cleared of vegetation, permanently altering the aesthetics of this section of the waterway for recreationists on the river, residents nearby, and viewers from the road.

Western Route Sections (N18, N14, N13, N15, N7, N6)

The primary western route section, Route Section N18, would traverse agricultural fields diagonally southeast-to-northwest, generally following the ANR natural gas pipeline. The residences within 300 feet of the proposed transmission centerlines are scattered and often isolated throughout this part of the project area, which is much less densely populated than N4. Where the proposed route is set back into agricultural fields, the open landscape and large distances between roads and residences would mitigate the adverse visual impact to some extent. Nevertheless, a countryside characterized by undulating hills interspersed with dairy farms, fields, remnant forest blocks, and wetlands would now include a large cleared ROW with two tall high-voltage transmission lines. The aesthetic impact of the new lines would likely be felt greatest at road crossings and homesteads in the project area.

Northwest of Deer Drive and Green Valley Road, Route Subsection N18-6 crosses the Mountain-Bay State Trail. This trail is used for a wide range of recreational activities throughout the year. As mentioned earlier, users of the trail would likely find the new ROW and transmission lines disruptive to the scenic views and experiences they seek when using the Wisconsin State Trail system.

Just north of Middle Drive, Route Subsection N18-7 bisects a forested wetland between two residences. In addition, north of Town Line Road Route Subsection N18-9 bisects several large contiguous blocks of forested wetland. The existing natural gas pipeline ROW width would increase from 75 feet to 180 feet, requiring the removal of a significant number of large trees and some vegetation, completely altering the existing habitat and aesthetics of the area.

Route Section N13 is a relatively short section that travels northwest from N18, generally paralleling the ANR pipeline through agricultural fields, and then east along the existing double-circuited transmission line. This route section would have three high-voltage transmission lines running parallel to one another through agricultural fields, increasing the existing ROW from 120 feet to 180 feet. Although the closest residence is approximately 500 feet away, the residents of the nearby homesteads and farming operations would experience a change in the visual landscape and the aesthetic impact of three high-voltage

transmission lines at varying heights, which would be significantly greater than the visual impact of one high-voltage line.

Route Section N14 is another relatively short section, paralleling N13 approximately ½ mile to the south. The proposed route travels east through agricultural fields, generally following property lines. This proposed route crosses only one road, CTH BB, and it would be greater than 300 feet from any residence. Therefore, the visual and aesthetic impacts from this route would be less than other route options. However, the residences along Nauman Road and CTH E could experience a greater aesthetic impact because a new large utility corridor would traverse the back portions of their properties.

The majority of proposed Route Section N15 travels along the west side of Green Valley Road, increasing the existing ROW width from 66 feet to 180 feet. The visual and aesthetic impacts of adding two high-voltage transmission lines alongside a WEPCO distribution line adjacent to a local road would be experienced by visitors and commuters going to and from town in Green Valley. In addition, N15 parallels the Wiouwash State Trail for approximately 0.5 mile. Users of the trail would likely be able to see the transmission lines through breaks in the trees, altering their experience of this part of the trail.

Route Section N6 travels north along Green Valley Road and then east-northeast along the existing double-circuited 345/138 kV transmission line. This route section would have three sets of structures running parallel to one another through agricultural fields and in between existing residences, increasing the existing ROW width from 120 feet to 180 feet. The presence of three high-voltage transmission lines dotting back and forth over a local country road, Green Valley Road, would impact nearby residences and commuters on a daily basis. In addition, this portion of the route section would significantly impact the Wiouwash State Trail. Route Subsections N6-1 and N6-2 are proposed to run parallel (within the ROW) and span the trail for approximately 1,300 feet. The presence of two high-voltage transmission lines spanning the trail would cause significant adverse visual and aesthetic impacts for users of this trail, especially during construction.

Where Route Subsection N6-3 extends to the northeast along the existing double-circuited 345/138 kV transmission line, it passes within 300 feet of multiple residences along Morgan River Road before bisecting agricultural fields and large forest blocks around the Pensaukee River, crossing the river, while on its way to the Morgan Substation. By increasing the width of the ROW and number of lines in the utility corridor from one high-voltage transmission line to three, the aesthetic and visual impacts of these lines on nearby residences, farmsteads, and recreational users of the woods around the Pensaukee River would increase greatly.

Route Section N7 begins northwest of the developed part of Green Valley and continues east along the north side of town and then cross-country through large contiguous wetlands and agricultural fields. Route Subsection N7-1 would cross Wiouwash State Trail, visible to users of the trail, although not to the extent of N6. Crossing the trail here would require the removal of large trees and vegetation, causing significant adverse aesthetic impacts. As this route continues east, paralleling CTH E, it passes through the back portions of many properties. Unlike most other route sections, N7 passes through large contiguous forest and wetland blocks. The new utility corridor would require significant vegetation clearing within the 180 foot ROW, disrupting the scenic views and character of the area.

9.3.5. Public lands and recreation

This section primarily describes the recreational properties and resources that could be directly affected by the construction and presence of the proposed transmission lines between the town of Pittsfield and the Morgan substation. Potential adverse impacts of this project on hunting and passive recreational activities

that include hiking, bird watching, and leisure enjoyment of natural resources are not discussed with respect to individual private properties in this EIS; however, Commission staff acknowledges the numerous comments received from owners of rural, undeveloped properties supporting woodlands, meadows, waterways, and wetlands. Some of the impacts to nearby public lands and recreation in the north routing area could be mitigated by locating lines along property edges, using pole designs that blend into the background and reduce aesthetic impacts, and/or designing recreation facilities to take advantage of cleared ROWs.

Route Subsections N4-1 and N18-6 cross the Mountain-Bay State Trail in Brown County and Shawano County. The Mountain-Bay State Trail is one of the longest rail-trails in Wisconsin, which travels 83 miles between Green Bay (Brown County) and Rib Mountain (Marathon County). This multi-use recreational trail is used by hikers, bicyclists, dog walkers, horseback riders, snowmobilers, and cross-country skiers, among others. The proposed ROW would impact 0.53 acres along Route Subsection N4-1, and 0.11 acres along Route Subsection N18-6. Removal of large trees and vegetation would be required at both locations, significantly impacting the aesthetics and natural character of the trail in these locations. No structures would be placed at either location where the proposed routes cross the Mountain-Bay State Trail. Trail use would be significantly impacted during construction activities. Furthermore, if this part of the project is ordered, DNR requests that construction activities be limited to off-peak use times (during the week versus the weekend). Refer to Appendix H of the application for DNR correspondence regarding trail crossings.

Proposed Route Subsections N6-1, N6-2, and N7-1 cross the Wiouwash State Trail in Shawano County. This recreational trail consists of two separate segments; the northern segment (nearest to the proposed project ROW) travels 19 miles between Birnamwood and Split Rock in Shawano County, connecting with the Mountain-Bay State Trail in Eland. The multi-use recreational trail is used for activities similar to those mentioned above. The proposed ROW would impact approximately 1.3 acres along Route Subsection N7-1, and 2.11 acres along Route Subsections N6-1 and N6-2. Removal of large trees and vegetation would be required at both locations, significantly impacting the aesthetics and natural character of the trail in these locations; especially along Section N6 where the proposed route would run parallel and span the trail for approximately one-fourth of a mile.

In proposed Route Subsection N4-5, the town of Chase in Oconto County owns a 40-acre former landfill that is being developed into a town park for residents. Hiking and skiing trails as well as a picnic area will be constructed. The proposed transmission line would run north-south along the western boundary of this park, impacting approximately 3.0 acres of the proposed park. If ordered, the proposed route would significantly impact the development and future plans of this park. Refer to Section 9.3.2.2 for more details.

The Oconto County Sportsmen's Alliance (Alliance) owns a 440 acres of upland and wetland forests in the town of Morgan. Proposed Route Section N7 crosses portions of three separate 40-acre parcels owned by the Alliance, impacting approximately 8.6 acres of upland and lowland forest that would need to be cleared for transmission line construction and maintenance. Use of these areas would be significantly impacted during construction activities. While the Alliance itself has not commented at this time, local landowners have.[152] The aesthetics, wild character, and ecological integrity of these areas would be significantly impacted by two high-voltage transmission lines bisecting these large blocks of undeveloped natural land.

[152] Letter from Paul Ignatowski, landowner, to Ken Rineer of Commission staff. September 3, 2014.

In addition, hunting activities would also be impacted by clearing existing forest and wetland habitats for the ROW.

Based on 2013-2014 maps of Oconto, Shawano, and Brown Counties, route options in the North Routing Area cross local and statewide snowmobile and ATV trails. Communicating with trail managers prior to construction and adequate signage during construction, if needed, would minimize the potential for any accidents.

9.3.6. Airports and airstrips

Carter Airport, a privately-owned airport, is located approximately 1.16 miles from proposed Route Section N4 and 1.24 miles from proposed Route Section N18. The runway is approximately 2,550 feet long and is oriented in a northwest-southeast direction. Upon the submission of structure heights to FAA, 18 structures (three structures in N4 and 15 structures in N18) were found to require FAA notice due to height restrictions in the area. If ordered, the applicant has stated that it would file the required notices with FAA including 2C certified survey and temporary equipment elevations where cranes may be used during construction. In addition, the applicant has stated that it would coordinate with local officials, the WisDOT Bureau of Aeronautics, and the airport operator to mitigate any conflicts.

The Community Memorial Hospital Heliport, a privately owned heliport in Oconto Falls, is located approximately 3.66 miles from proposed Route Section N16. It appears that the presence of the proposed 138/345 kV transmission lines would not adversely affect flights landing and taking off from this helipad.

9.3.7. Communication towers

The applicant had an initial assessment of the potential impact to communication facilities conducted to determine whether a viable risk to communication operations was present. As discussed in Section 5.5.12 in Chapter 5, the primary types of potential interference with communication structures include AM broadcast antenna reradiation, transferred voltages to communication facility grounding systems, and microwave line-of-sight signal degradation. Data presented below, as well as additional information regarding the impacts of the North Appleton-Morgan project on communication facilities, can be found in Appendix K of the utility's application.[153]

There are no AM broadcast facilities within 10 km (6.2 miles) of the proposed routes in the North Routing Area. Therefore, AM reradiation analysis would not be required during the Phase 2 investigation.

Two FM broadcast facilities are located within 10 km of N4 (WQLH - 98.5 MHz, FM Station) and N18 (WOWN - 99.3 MHz, FM Station). The WOWN facility is required to have a Phase 2 analysis because microwaves would cross the path of the transmission line.

No TV broadcast facilities were located within 10 km of route options within the north routing area.

ATC provided a list of FCC-licensed structures found within 10 km of proposed routes in the North Routing Area. Tables 9.3-6 and 9.3-7 show the number of cell, microwave, radio, and shared towers along specified route sections and route alternatives in the north routing area. The total number of microwave structures detailed below does not reflect the actual number of microwave antennas in the entire area, but

[153] CPCN Application, Appendix K. North Appleton to Morgan Project: Communication Facility Impact Study, Phase I, Technical Report, Revision B. PSC REF#: 203879.

rather the number of microwave structures. No additional antennas would be located within 10 km of route sections N17, N8, N13, N15, or N7.

Table 9.3-6 Number of antennas located within 10km of proposed route sections in the North Routing Area

Proposed Route Section	Cell Towers	Microwave Towers	Radio Towers	Shared Cell and Microwave Towers	Shared Microwave and Radio Towers	Shared Cell, Microwave and Radio Towers	Total
N4	5	0	1	3	1	0	10
N16	2	0	1	0	2*	0	5
N18	3	2*	0	4*	0	1*	10
N14	1	0	0	0	0	0	1
N6	1	1*	0	0	0	0	2

* These structures would be located less than 500 feet from proposed transmission lines. Phase 2 grounding analysis is required for one or more structures in these categories along these route sections.

Table 9.3-7 Number of communication structures within 10 km of the proposed route alternatives in the North Routing Area

Route Alternatives	Route Sections	Total
A, E, I, M (West)	N17, N18, N13, N6, N16	17
B, F, J, N (West)	N17, N18, N14, N15, N6, N16	18
C, G, K, O (West)	N17, N18, N14, N7, N8, N16	16
D, H, L, P (East)	N17, N4, N8, N16	16

9.3.8. Electric distribution lines

Along proposed routes in the North Routing Section, there are distribution lines owned by WEPCO, WPSC, and Oconto Electric Cooperative (OEC) that would require relocation if the proposed project was approved along one of these routes. These existing distribution lines might be in areas that would pose physical conflicts with either proposed route, or their proximity to one of the transmission lines might result in concerns about stray voltage resulting from NEV situations. Refer to Section 5.5.15 in the EIS for more detail on this phenomenon.

Because of concerns about stray voltage and its potential effect on confined animals (such as dairy cows), all routes have been analyzed for areas where distribution lines might be located too close to the proposed transmission lines. There is a general consensus that distribution lines located less than 150 feet from a transmission line and running parallel to a transmission line for a continuous distance greater than 1,000 feet can cause impacts to nearby farms with confined animals.

All distribution modifications required as a result of the ordering of this project would be made by the distribution owners, including distribution line design, relocation, burial, and any associated permitting. Due to the ambiguity of where and how each distribution line listed below would be relocated, associated potential impacts cannot be determined at this time. Proposed distribution line modifications are listed in Tables 9.3-8 and 9.3-9 and discussed in the subsections that follow.

Table 9.3-8 Distribution lines by route section that would be relocated in the North Routing Area

Proposed Route Section	Number of Locations	Total Length (feet)
N4	8	5,505
N6	2	1,700
N8	1	2,225
N15	2	905
N18	1	410
N13	1	630

Relocation of distribution lines are not anticipated in Route Sections N17, N14, N7, or N16.

Table 9.3-9 Distribution lines by proposed route alternatives that would be relocated in the North Routing Area

Route Alternatives	Route Sections	Number of Locations	Total Length (feet)
A, E, I, M (West)	N17, N18, N13, N6, N16	4	2,740
B, F, J, N (West)	N17, N18, N14, N15, N6, N16	5	3,015
C, G, K, O (West)	N17, N18, N14, N7, N8, N16	2	2,635
D, H, L, P (East)	N17, N4, N8, N16	9	7,730

9.3.8.1. Common route sections

Relocation of distribution lines are not anticipated in Route Sections N16 and N17.

9.3.8.2. Eastern route sections

Route Section N4 follows local existing roads more than Route Section N18, so more distribution lines would be impacted by the proposed transmission lines. Where there would be conflict between the height of the existing distribution lines and the clearance needed by the proposed new transmission lines, the distribution lines would be relocated or, more likely, buried. Longer segments of distribution lines such as WPS overhead lines along the south side of CTH B from N4-3 to N4-5 and along the east side of CTH C in N8-2 would be relocated underground. In addition, approximately 4,450 feet of WPS overhead line along the east side of CTH B would be relocated underground on the west side of CTH B.[154] Table 9.3-10 below lists the subsections and areas where distribution would be relocated if an eastern route alternative was ordered.

Table 9.3-10 Eastern distribution lines owned by WEPCO and WPSC in the north routing area that would be relocated

Subsection	Location	Length (feet)
N4-1	Along the north side of Norway Drive	125
N4-1	Along the east side of Kunesh Road North	590
N4-2	Crosses east to west of CTH B	100
N4-2	Along the east side of CTH B	4,450
N4-3 to N4-5	Along the south side of CTH B	2,100
N4-5	Along the north side of Brown County Line Road	660
N4-5	Along the south side of South Chase Road	650
N4-9	Near/in quarry	800
N4-9	Along the south side of CTH E	480
N8-2	Along the east side of CTH C	2,225

[154] Details regarding relocation of this distribution line was determined through staff communication. September 10, 2014.

9.3.8.3. Western route sections

Route Section N18 is common to all West route alternatives and would not run along roads where there are existing distribution lines, but rather would cross these features at various angles. Where there would be a conflict between the height of the existing distribution lines and the clearance needed for the proposed new transmission lines, the distribution lines would be relocated or, more likely, buried. Table 9.3-11 below lists the subsections and areas where distribution would be relocated if a western route alternative was ordered.

Table 9.3-11 Western distribution lines owned by WEPCO and OEC in the north routing area that would be relocated

Subsection	Location	Length (feet)
N18-2	Along the east side of Saint Augustine Road	360
N18-3	Along the south side of CTH E	600
N18-9	Along the southeast side of CTH E	410
N15-2 to N15-3	Crosses west to east of Green Valley Road	275
N15-3/N13-3	Along the west side of Green Valley Road	630
N6-2	Crosses west to east of Green Valley Road	250
N6-2	Along north side of Carlson Lane, along east side of Green Valley Road	1,450

CHAPTER

10

10. Summaries and Comparisons of Route Alternatives

This chapter provides a summary and comparison of the various route alternatives for consideration by the Commission. It includes details on the composition of each route alternative plus summaries and comparisons of the potential natural resource and local community resources impacted by each alternative and their costs.

10.1. SUMMARY OF ROUTE ALTERNATIVES

Under WEPA, an EIS must consider alternatives to the proposed action (Wis. Stat. § 1.11(2)(c)3.), and an EIS must clearly describe the alternatives being considered (Wis. Admin. Code § PSC 4.30(2)(c)). System alternatives for the proposed project are discussed in Chapter 3. Alternative route options to be utilized if the project need is verified, and the potential impacts in each routing area, are discussed in Chapters 7 through 9.

Under Wis. Stat. § 196.025(2m)(c), the PSC and DNR have the following obligation regarding transmission project alternatives:

> …for a project identified in an application for a certificate under s. 196.491(3), the Commission and the department are required to consider only the location, site, or route for the project identified in the application and one alternative location, site, or route.

ATC states that two high voltage transmission lines are necessary between the existing North Appleton and Morgan Substations. It made an effort to ensure that it had two viable alternative routes; basically, a western route and an eastern route (see Section 2.4 in Chapter 2), with some variations possible in particularly constrained or environmentally sensitive areas. ATC also found it appropriate to identify three distinct routing areas between its two chosen endpoints: a South Routing Area, a Central Routing Area, and a North Routing Area. This combination allows for crossover route segments at the routing area junctions that create 16 route alternatives. While numerous, the Commission accepted this proposal in order to ensure at least two viable route options between the two substations and maintain the flexibility to address the complexity of the natural resource, local community, and individual landowner issues that exist in the project area. The 16 route alternatives are illustrated in Figure Vol. 2-5.01 through 5.04.

10.1.1. Potential Route Alternatives A through P

Different route options within each of the three identified routing areas have been combined, resulting in 16 route alternatives for the Commission to consider. The 16 alternatives, identified as Route Alternatives A through P, are illustrated in Figure Vol.2-5.01 through 2-5.04, Maps A through P.

These 16 route alternatives use the following route "options" in each routing area (south, central, and north). See Figure Vol. 2-4 for the routing areas and the route sections that would make up each option. The route sections are also identified in the detailed route maps in Figure Vol. 2-1.01 through 1.10.

- South Routing Area:
  - South Option West – Route Section S1 connecting to Route Section C3 of the Central Routing Area
  - South Option East – Route Section S2 connecting to Route Section C4 of the Central Routing Area
  - South Option West with S3 Eastbound – Route Section S1 using Section S3 Eastbound to Section C4 of the Central Routing Area
  - South Option East with S3 Westbound – Route Section S2 using Section S3 Westbound to Section C3 of the Central Routing Area.
- Central Routing Area:
  - Central Option West – Route Section C3
  - Central Option East – Route Section C4
- North Routing Area:
  - North Option West with N13 – Route Sections N17, N18, N13, N6, and N16
  - North Option West with N15 – Route Sections N17, N18, N14, N15, N6, and N16
  - North Option West with N7 – Route Sections N17, N18, N14, N7, N8, and N16
  - North Option East – Route Sections N17, N4, N8, and N16

ATC's 16 route alternatives are summarized in Table 10.1-1. Asterisks (*) are inserted to show route sections that include possible local modifications to accommodate concerns on various properties. The potential modifications are discussed and illustrated in Sections 8.3.3 and 9.3.3 in Chapters 8 and 9 and tabulated in Table 10.1-2.

Table 10.1-1 Sixteen route alternatives comprised of different route options, and route sections, in the South, Central, and North Routing Areas

Route Alternative	South Area Option	Central Area Option	North Area Option	Route Sections
A	West	West	West with N13	S1, C3*, N17, N18, N13, N6, N16
B	West	West	West with N15	S1, C3*, N17, N18, N14, N15, N6, N16
C	West	West	West with N7	S1, C3*, N17, N18, N14, N7, N8, N16
D	West	West	East	S1, C3*, N17, N4*, N8, N16
E	West with S3 eastbound	East	West with N13	S1, S3 Eastbound, C4*, N17, N18, N13, N6, N16
F	West with S3 eastbound	East	West with N15	S1, S3 Eastbound, C4*, N17, N18, N14, N15, N6, N16
G	West with S3 eastbound	East	West with N7	S1, S3 Eastbound, C4*, N17, N18, N14, N7, N8, N16
H	West with S3 eastbound	East	East	S1, S3 Eastbound, C4*, N17, N4*, N8, N16
I	East with S3 westbound	West	West with N13	S2, S3 Westbound, C3*, N17, N18, N13, N6, N16
J	East with S3 westbound	West	West with N15	S2, S3 Westbound, C3*, N17, N18, N14, N15, N6, N16
K	East with S3 westbound	West	West with N7	S2, S3 Westbound, C3*, N17, N18, N14, N7, N8, N16
L	East with S3 westbound	West	East	S2, S3 Westbound, C3*, N17, N4*, N8, N16
M	East	East	West with N13	S2, C4*, N17, N18, N13, N6, N16
N	East	East	West with N15	S2, C4*, N17, N18, N14, N15, N6, N16
O	East	East	West with N7	S2, C4*, N17, N18, N14, N7, N8, N16
P	East	East	East	S2, C4*, N17, N4*, N8, N16

Table 10.1-2 Possible local route modifications with references to the EIS discussion and figures in the EIS

Route Section	Route Subsection	Modification Option	Figure	EIS Discussion
C3	C3-12	03.01a	8.3-4	Section 8.3.3.1
C3	C3-12	03.01b	8.3-5	Section 8.3.3.1
C3	C3-13	02.01	8.3-6	Section 8.3.3.1
C3	C3-7	06.02	8.3-2	Section 8.3.3.1
C3	C3-7	06.03	8.3-3	Section 8.3.3.1
C4	C4-7	03.02a	8.3-7 and 8	Section 8.3.3.2
C4	C4-7	03.02b	8.3-7 and 8	Section 8.3.3.2
C4	C4-9	02.02	8.3-9	Section 8.3.3.2
C4	C4-9	06.04	8.3-10	Section 8.3.3.2
N4	N4-5	02.06a	9.3-4	Section 9.3.3.1 Route Section N4
N4	N4-5	02.06b	9.3-4	Section 9.3.3.1 Route Section N4
N4	N4-5	02.06c	9.3-4	Section 9.3.3.1 Route Section N4

All options and route alternatives have been analyzed, discussed and considered equally and objectively in this EIS in preparation for the independent decisions that must be made by the Commission.

10.1.2. ROW length and corridor sharing

In considering, comparing, and contrasting potential impacts of the routes, one consideration is the amount and percentage of new ROW. Each route section in each routing area includes some variety of structure combinations and configurations. The structure combinations and configurations are illustrated in the figures in Appendix A. The route lengths and amounts of new ROW required for each route alternative are tabulated in Table 10.1-3.

Table 10.1-3 Route lengths and ROW required for Alternatives A through P

Route	Length (miles)	Total ROW Required (acres)	Existing ROW Shared (acres)	New ROW (acres)	Percentage of Shared ROW
A	45.1	1029.5	241.7	787.8	23.5
B	44.7	1020.8	235.8	784.8	23.1
C	46.4	1034.3	196.3	837.8	19.0
D	43.0	959.1	186.7	772.3	19.5
E	42.5	956.0	168.5	787.0	17.6
F	42.2	947.3	162.6	784.1	17.2
G	43.8	960.8	123.1	837.1	12.8
H	40.4	885.6	113.5	771.6	12.8
I	46.5	1056.3	185.2	871.0	17.5
J	46.6	1047.6	179.3	868.1	17.1
K	47.8	1061.0	139.9	921.0	13.2
L	44.4	985.8	130.3	855.5	13.2
M	42.4	955.7	107.4	847.8	11.2
N	42.0	947.0	101.5	844.8	10.7
O	43.7	960.4	62.0	897.8	6.5
P	40.3	885.2	52.4	832.3	5.9

- Route Alternatives O and P, which use the same eastern route options in the South and Central Routing Areas and Route Section N8 in the North Routing Area, have the least amount of ROW shared with other transmission lines, natural gas lines, or roads.
- Route Alternatives A and B have the most shared ROW. These route alternatives take slightly different paths in the North Routing Area (N13 vs N14) but are otherwise identical.

- Route Alternatives A and B, in contrast, differ from Route Alternative P in almost every aspect, as A and B follow the most westerly route options and P follows the most easterly route options.

10.1.3. ROW lengths at substation locations

All of the new ROW for construction of transmission structures associated with the project's substation enhancements is within existing substation property boundaries and owned by ATC. However, new ROW would be required at the existing Morgan, Pioneer, and North Appleton Substations and for both of the new Benson Lake Substation configurations. Existing shared ROW would be used at the Stiles Substation property.

The table below shows what the ROW requirements are at each of the substations described above. The potential impacts quantified in Table 10.1-4 would be the same regardless of which transmission route alternative (A through P) was selected. Substation locations can be seen in Figure Vol. 2-3.

Table 10.1-4 ROW requirements at project substations

Substation	Length (feet)	Total ROW Required (acres)	Existing ROW Shared (acres)	New ROW (acres)	Percentage of Shared ROW
Morgan	3,504.1	17.2	9.7	7.5	56.4
Pioneer	980.0	2.5	2.1	0.4	84.0
Stiles	456.8	1.2	1.2	0.0	100.0
North Appleton	7,941.0	17.3	8.6	8.6	49.7
Benson Lake – North	1,241.7	1.8	0.7	1.1	38.9
Benson Lake – South	1,687.2	2.4	0.3	2.1	12.5

- The North Appleton and Morgan Substations would require the greatest amount of ROW and new ROW.
- The Stiles and Pioneer Substations would require the least amount of ROW and new ROW. In addition, the Stiles Substation would be within 100 percent of shared ROW.

10.2. COMPARISON OF NATURAL RESOURCE IMPACTS

In Sections 7.2, 8.2, and 9.2 of the EIS, the potential natural resource impacts for route sections within each routing area are described. Expected permanent natural resource impacts for any of the route alternatives include, but are not limited to:

- loss or degradation of natural communities and rare species habitat,
- upland forest clearing,
- loss of wooded wetlands and conversion to open wetland types,
- loss of wetland acreage due to structure placements,
- aesthetic effects due to the physical presence of the line and tree clearing associated with the ROW.

Each route crosses multiple landscapes and different natural communities. To compare potential habitat impacts for each route briefly but effectively, it is important to consider more than the total number of habitat types crossed. Additional factors must include the length of the ROW that crosses the habitat, the areal extent of the habitat, the habitat quality, the distance from or contiguity with adjacent natural habitat, as well as the surrounding land use.

Similarly, when comparing potential impacts to rare species, the numbers of occurrences recorded in the NHI database, or the results of habitat assessments and the incidental observations recorded during those assessments, are generally skewed towards routes that are readily accessible and/or on public lands. Few surveys have been done and little information is recorded for most private properties. Therefore, comments from landowners during comment periods and public hearings are invaluable.

In Chapters 7, 8, and 9 of the EIS, the route sections within each routing area were examined for potential natural resource impacts. Comparisons were made to aid in the Commission's decisions about which route sections to select. In this chapter, the 16 full-length route alternatives are compared. But again, the discussion begins with an overview of the contrasts between route sections as it may shed light on the differences between the route alternatives and be helpful in comparing them in more detail.

10.2.1. Natural resource impacts by routing area

Comparisons are made to aid the Commission's decisions about specific impacts by route section. All 16 route alternatives are compared in Section 10.2.2. The routing areas and their component route sections can be identified in the maps in Figure Vol. 2-4 and in more detail in Figure Vol. 2-1. The route sections and subsections that comprise each of the 16 route alternatives are tabulated in Section 10.1.1 and Table 10.1-1.

10.2.1.1. South Routing Area

The South Routing Area is discussed in detail in Chapter 7.

In the South Routing Area, the two main choices are between the western Route Section S1 and the eastern Route Section S2. They are comparable in terms of rare species and archaeological resources. S1 includes more forest lands than S2, but nearly half of the forest lands on S2 are wooded wetlands. Likewise, more acres of wetlands are affected on S1 than S2, but a slightly higher percentage of the wetlands along S2 are wooded wetlands that would be cleared. The two alternatives cross a similar number of waterways; all of the S2 waterway crossings require TCSBs while just over half of them do on S1.

Overall, Route Section S1 generally appears to have less impact on wooded wetlands and waterways than Route Section S2.

10.2.1.2. Central Routing Area

The Central Routing Area is discussed in detail in Chapter 8.

In the Central Routing Area, the route section choices are clear—either C3 (the western route) or C4 (the eastern route). They are comparable in terms of rare species and archaeological resources. In terms of woodlands, Route Section C3 and C4 are similar, but 67 percent of the woodlands along C3 are forested wetlands compared to 50 percent along C4. Overall, C3 has more ROW through wetlands, with about one quarter of the wetlands being wooded. C4 affects less wetland acreage, and about 5 percent of the wetlands are wooded. The two options are similar in the number of waterways crossed and in the total number of TCSBs required.

Overall, Route Section C4 generally appears to affect less wooded wetland than C3.

10.2.1.3. North Routing Area

The North Routing Area is discussed in detail in Chapter 9.

In the North Routing Area, routing options comparisons are less clear. The main east-versus-west comparisons are between Route Sections N4 and N18. The options for getting from these sections,

primarily from Route Section N18, to the Morgan Substation involve a variety of possibilities. These are discussed in detail in Section 9.2 in Chapter 9.

In comparing natural resource impacts among the route sections, N4 affects over twice as much woodland and wetland as N18 and almost twice as much forested wetland. Both N4 and N18 cross the Little Suamico River and a similar number of its tributaries, requiring a similar number of TCSBs. Using N4 also includes probable encounters with rare turtle habitat and possibly rare turtles. Using N4 requires the use of N8, which would affect additional woodlands, wetlands, and forested wetlands, as well as additional possible encounters with rare turtles. Quantitatively, the North Option East appears to have more impact on natural resources than any of the North Option West alternatives.

As discussed in Section 10.1.1, if Route Section N18 is part of an approved route, three additional route options are available to reach the Morgan Substation: one using N13 and N6 (North Option West with N13), one using N14, N15, and N6 (North Option West with N15), and one using N14, N7, and N8 (North Option West with N7). The important comparisons in this portion of the North Routing Area are between N13 and N14, and between N6 and N7 plus N8.

- N13 versus N14
  - In terms of forest land, Route Section N14 affects about 0.1 percent of the woodlands of N13, and about 0.2 percent of the wooded wetlands of N13. Only one wetland is crossed on Route Section N14.
  - N14 does not cross any waterways. Adding N15, which would be required if N6 is used, would affect one large wooded wetland of about 1.5 acres and three waterway crossings, all tributaries to the Pensaukee River, with one requiring a TCSB.
  - N6, which is common to both the N13 and N15 options, affects about 10 acres of wooded wetland, 13 acres of non-wooded wetland, 17 acres of upland forest, and 16 waterway crossings, nine with TCSBs, all related to the Pensaukee River.
  - Overall, N14 has less impact on woodlands, wetlands, wooded wetlands, and waterways than N13. Thus, North Option West with N15 (and N14) likely has fewer natural resource impact than North Option West with N13.
- N6 versus N7 plus N8
  - In terms of forest land, Route Section N6 affects almost the same total forest acreage as Route Section N7.
  - Almost all of the N7 forest is wooded wetland. N7 also impacts about 6.0 acres more of non-wooded wetland than N6.
  - N7 crosses various waterways six times and would require three TCSBs, as opposed to 16 waterways crossed by N6 with nine required TCSBs.
  - Both route sections include possible impacts to rare turtle habitat or possible encounters with rare turtles.
  - Using N7, also requires N8 to get to the Morgan Substation. N8 adds about 5.0 acres of forest impact including about two acres of wooded wetland. It also adds three waterway crossings (no TCSBs required).
  - Thus, N6 involves notably less wetland or wooded wetland impact, although it involves more waterway crossings. North Option West with N13 and North Option West with N15 (both with N6) have less woodland, wetland, and wooded wetland impact than the West Option with N7.

In terms of potential impacts to natural resources, then, the largest differences in the North Routing Area are in the potential impacts to forest lands, wetlands, wooded wetlands, and waterways.

- North Option East affects about 46 acres of wooded wetlands, about 33 acres of upland forest, about 24.7 acres of non-forested wetlands, and requires about 41 structures in wetlands and about 28 TCSBs.
- North Option West with N13 affects about 38 acres of wooded wetlands, about 23 acres of upland forest, about 21 acres of non-forested wetlands, and requires about 47 structures in wetlands and about 45 TCSBs.
- North Option West with N15 affects about 35 acres of wooded wetlands, about 25.9 acres of upland forest, about 18.7 acres of non-forested wetlands, and requires about 40 structures in wetlands and about 42 TCSBs.
- North Option West with N7 affects about 47 acres of wooded wetlands, about 15 acres of upland forest, about 32 acres of non-forested wetlands, and requires about 58 structures in wetlands and about 35 TCSBs.

In the North Routing Area, the North Option West with N7 has the greatest potential impact on wetlands and wooded wetlands, with the North Option East a close second. The North Option East has the greatest potential impact on upland forest. North Option West with N15 has the least potential wetland impact and a lower potential to impact upland forest.

10.2.2. General resource comparisons among Routes A through P

Table 10.2-1 shows a general comparison of the habitat types along the route alternatives to provide a basis for considering natural resource impacts likely to occur as a result of constructing and operating the side-by-side proposed 138 kV and 345 kV transmission lines. Crop lands, pasture lands, and tree farms are not included, although they can provide resources for animals, including rare species, as well as buffer habitat from urban, exurban, and residential disturbances. For the forested lands categories in the tables below, the acreages in the table reflect both new ROW and existing (*i.e.* shared) ROW that would also require tree clearing.

All numbers shown in Table 10.2-1 include ROW impacts that would occur on affected substation properties as well, with the exception of the Benson Lake Substation. There are two proposed designs for the Benson Lake Substation—a northern and a southern layout. No prairie, grassland, or shrubland habitat would be impacted by either of the layouts for the Benson Lake Substation. The southern layout of the Benson Lake Substation would have greater natural resource impacts than the northern layout, except for non-wooded wetlands (northern 0.29 acres vs. southern 0.02 acres):

Benson Lake Substation – Northern Layout

- Approximately 0.41 acres of upland forest would be impacted.
- No forested wetlands would be impacted.
- Approximately 0.29 acres of non-forested wetlands would be impacted.

Benson Lake Substation – Southern Layout

- Approximately 1.12 acres of upland forest would be impacted.
- Approximately 0.52 acres of forested wetlands would be impacted.
- Approximately 0.02 acres of non-forested wetlands would be impacted.

Table 10.2-1 Summary of habitat types potentially affected by routes A through P

Route	Prairie/Grassland/Shrubland (acres)	Upland Forest (acres)	Wooded Wetland (acres)	Non-forested Wetland (acres)
A	0.0	33.8	53.0	33.7
B	0.0	37.2	50.1	31.4
C	1.8	26.3	62.3	44.8
D	0.0	44.9	60.5	37.4
E	0.0	36.6	49.5	31.5
F	0.0	40.0	46.6	29.3
G	1.8	29.1	58.8	42.6
H	0.0	47.7	56.9	35.3
I	0.0	32.0	53.6	31.6
J	0.0	35.4	50.8	29.3
K	1.8	24.4	63.0	42.7
L	0.0	43.0	61.2	35.4
M	0.0	34.8	50.1	29.5
N	0.0	38.1	47.3	27.2
O	1.8	27.2	59.5	40.5
P	0.0	45.9	57.6	33.3

The potential natural resource impacts of the route alternatives shown in Table 10.2-1 are described in more detail below.

- Route C, which is made up of the western options in the South and Central Routing Areas and utilizes Route Section N7 in the North, affects the most wetland acreage.
- Route H, made up of the west option in the South Routing Area and the east option in the Central and North Routing Areas, requires the greatest amount of upland forest to be cleared.
- Route K, made up of the east option in the South Routing Area and west options in the Central and North Routing Areas, requires the least amount of upland forest to be cleared but the most wooded wetland clearing. Its west option in the North Routing Area involves Route Section N7.
- Route F affects the least amount of wooded wetland. It includes the west option in the South Routing Area, the east option in the Central (the opposite of Route K) and the west option in the North with Route Sections N15 and N6.

10.2.3. Potential forest impacts

Table 10.2-2 compares the amounts and type of woodland affected by new ROW among the route alternatives. As with table 10.2-1, the acreages in the table below reflect all of the substation properties, with the exception of the Benson Lake Substation. While upland forest clearing is always a concern, DNR has expressed strong concerns about the high quality of local forested wetlands that would be crossed and impacted by project construction on different project routes. Clearing forested wetlands permanently alters wetland hydrology, biology, and function.

Table 10.2-2 Comparison of potential upland forest and wooded wetland impacts for Routes A through P

Route	Route Length (miles)	New Upland Forest Affected (acres)	New Wetland Forest Affected (acres)	Total Forest Area Cleared (acres)
A	47.5	30.8	48.2	79.0
B	47.1	34.2	45.8	80.0
C	48.8	24.4	58.5	82.9
D	45.4	43.4	58.0	101.4
E	44.9	34.0	46.3	80.3
F	44.6	37.3	43.9	81.2
G	46.2	27.6	56.6	84.2
H	42.8	46.6	56.0	102.6
I	48.9	29.7	49.1	78.8
J	49.0	33.1	46.7	79.8
K	50.2	23.3	59.4	82.7
L	46.8	42.3	58.9	101.2
M	44.8	32.9	47.2	80.1
N	44.4	36.2	44.8	81.0
O	46.1	26.5	57.5	84.0
P	42.7	45.5	56.9	102.4

Some of the route impacts shown in Table 10.2-2 can be described in more detail:

- Route Alternatives D, H, L, and P require the clearing of over 100 acres of new ROW through forested lands. They each involve the east option in the North Routing Area. The primary reason routes D, H, L, and P contain overall greater forested impacts than the other routes is because of their relatively large impact on upland forests, although they also affect a greater amount of wooded wetland compared to some other routes.
- The remainder of the possible routes are similar in terms of their potential new ROW impact on forested lands, which ranges from approximately 79 to 84 acres.
- Routes C, D, G, H, K, L, O, and P all require nearly 60 acres of new ROW in wooded wetlands. These eight routes all involve either the east option or the west option with N7 in the North Routing Area.

10.2.4. Potential wetland impacts

The numbers of structures in wetlands and the wetland acreages that would be impacted by the various route alternatives are shown in Table 10.2-3 below. Similar to Table 10.2-1, all of the substation properties where wetlands would be impacted are included in the table, with the exception of the Benson Lake Substation, which has a northern and southern layout option. No structures would be placed in wetlands at any of the substation sites, with the exception of the Benson Lake Substation.

In terms of wetland impacts at the Benson Lake Substation sites:

Benson Lake Substation – Northern Layout

- No forested wetlands would be impacted.
- Approximately 0.29 acres of non-forested wetlands would be impacted
- One structure would be placed within a wetland.

Benson Lake Substation – Southern Layout

- Approximately 0.52 acres of forested wetlands would be affected.
- Approximately 0.02 acres of non-forested wetlands would be affected.
- Two structures would be placed within a wetland.

Table 10.2-3 Comparison of potential wetland effects for each route

Route	Wetland Area Affected (acres)	Percent of ROW Area in Wetland	Number of Structures in Wetlands	New Wooded Wetland Affected (acres)	Existing ROW Wooded Wetland (acres)	New Non-Wooded Wetland Affected (acres)	Existing ROW Non-Wooded Wetland (acres)
A	86.6	8.4	75	48.2	4.7	17.3	16.3
B	81.5	8.0	68	45.8	4.3	16.3	15.1
C	107.1	10.4	86	58.5	3.8	36.4	8.4
D	97.9	10.2	69	58.0	2.5	29.3	8.1
E	81.0	8.5	67	46.3	3.1	15.8	15.7
F	75.8	8.0	60	43.9	2.7	14.8	14.5
G	101.4	10.6	78	56.6	2.2	34.9	7.7
H	92.2	10.4	61	56.0	0.9	27.8	7.5
I	85.2	8.1	70	49.1	4.5	20.0	11.6
J	80.1	7.6	63	46.7	4.1	19.0	10.3
K	105.7	10.0	81	59.4	3.6	39.1	3.6
L	96.6	9.8	64	58.9	2.3	32.0	3.4
M	79.6	8.3	62	47.2	2.9	18.5	11.0
N	74.5	7.9	55	44.8	2.5	17.5	9.7
O	100.0	10.4	73	57.5	2.0	37.5	3.0
P	90.9	10.3	56	56.9	0.7	30.5	2.8

Certain route impacts shown in Table 10.2-3 can be described in more detail:

- Routes C, G, K, and O all impact at least 100 acres of wetlands while the other routes range from as low as 74.5 acres of impact (Route N) to 97.9 acres (Route D). All four of these routes include the west option in the North Routing Area with Route Section N7.
- The percentage of the ROW that would contain wetlands ranges from 7.6 percent (Route J) to 10.6 percent (Route G).
- New ROW in wooded wetlands ranges from 56.0 acres (Route H) to 59.4 acres (Route K), among routes C, D, G, H, K, L, O, and P. These eight route alternatives include either the west option with N7 or the east option in the North Routing Area and have greater potential impact on wooded wetlands than the other eight route alternatives.
- Routes A, B, E, F, I, J, M and N would impact less wooded wetland, ranging from 43.9 acres (Route F) to 49.1 acres (Route I). These routes all include the west options with N13 or N15 in the North Routing Area, regardless of the options in the South and Central Routing Areas.
- New ROW impact on non-wooded wetlands is variable among route alternatives. Route F has the least amount of impact at 14.8 acres, while route K affects the most at about 39.1 acres.
- Transmission structures to be placed in wetlands require special care and would have more intensive direct impact on the wetlands in which they are placed. Structure placement is generally needed if the wetlands are large enough that they cannot be spanned. Route C requires about 86 transmission structures to be installed in wetlands, and Routes G, K, and O each require over

70. All of these routes involve Route Section N7. Route A would need 75 structures installed in wetlands, and Route I would need 70. Both routes include Section N13.

10.2.5. Potential waterway impacts

Differences between the various routes in relation to potential waterway impacts is influenced by the number of streams that would be crossed, the quality of the streams, where the stream crossings would occur within the watershed (*e.g.* at the mouth, upstream, or at a feeder stream), and the type of impact (*e.g.* TCSB or permanent structures within the waterway.)

Table 10.2-4 compares each route with respect to the numbers of rivers and streams that are crossed. See also Figure Vol. 2-10. Some streams are identified as ASNRI, Priority Navigable Waterways, ORW, ERW, or trout waters by DNR. These designations are given to waterways that have special characteristics or features that generally require additional environmental protections. According to the map in Figure Vol. 2-10, no route sections cross any ORWs or ERWs. All waterways that are bisected by the ROW would be impacted by long-term vegetation management and maintenance of the utility line. The numbers and types of bridge structures that would be required are also enumerated in Table 10.2-4. Proposed work at the North Appleton Substation would require three waterway crossings.

Table 10.2-4 Route comparisons reflecting number of permitted structures for each route alternative, and associated waterway designations

Route	Waterway Crossings along ROW	ROW Crossings of ASNRI Streams	Proposed TCSBs	Number of Structures Placed in Wetland
A	91	4	74	75
B	90	3	71	68
C	80	2	64	86
D	81	2	57	69
E	90	4	79	67
F	89	3	76	60
G	79	2	69	78
H	80	2	62	61
I	97	4	79	70
J	96	3	76	63
K	86	2	69	81
L	87	2	62	64
M	94	4	82	62
N	93	3	79	55
O	83	2	72	73
P	84	2	65	56

There are many waterway crossings regardless of route. Some of the waterway impacts on the route alternatives shown in Table 10.2-4 can be described in more detail:

- Routes I and M have the most waterway crossings with 97 and 94, respectively. Both routes include the South Option East with Route Section S2 and the North Option West with Route Sections N13 and Route Section N6.
- Route G has the fewest number of waterway crossings at 79, and Routes C and H each require 80 waterway crossings. These three route alternatives have only the South Option West with Route Section S1 in common.

- Route M requires 82 TCSBs across waterways which is the most of any route, while Routes I and E require 79, almost as many. These three routes share only the North Option West with N13 and N6.
- Routes D, H, and L require the fewest TCSBs, at around 60 each. These three routes share the North Option East in common. Route P also shares this option and requires 64 TCSBs.
- No trout streams would be impacted by any of the routes. As Table 10.2-4 indicates, the number of ASNRI waterways that are crossed by the routes is limited for all routes, ranging from two to four.

10.2.6. Potential rare species impacts

All of the routes include some potential habitat or known locations of rare bird, herptile, or plant species. Known locations of rare species are confidential; however, the following species and/or their potential habitat occur within two miles of the project area:

- A Migratory Bird Concentration Site
- Wafer-ash (*Ptelea trifoliata*) – Special Concern
- Wood Turtle (*Glyptemis insculpta*) – State Threatened
- Blanding's Turtle (*Emydoidea blandingii*) – Special Concern
- Slippershell Mussell (*Alasmidonta viridis*) – State Threatened

Additional species, not indicated above, might also be present within the project area. However, these occurrences are not inventoried in the NHI database. Additional information provided by routing area can be found in Sections 7.2.5, 8.2.5, and 9.2.5.

The Commission or DNR could require one or more methods to avoid impacts to rare species, including but not limited to specifying the timing of construction, use of construction barriers, or changes in the design of the transmission line at specific locations. Additionally, the Commission could order an expert to be present during construction to monitor for potential impacts. If the DNR determines that construction activities could result in the harm of "take" of a threatened or endangered species, ATC could apply for the Incidental Take Permit from the DNR. Based in part on the conservation plan included in the application, the DNR would determine whether the criteria for issuing an Incidental Take Permit could be met according to Wis. Stat. § 29.604.

10.3. COMPARISON OF COMMUNITY IMPACTS

Since the proposed ROWs run cross-country along natural gas lines and existing transmission lines, as opposed to roads, the rural nature of the project area and the community impacts would be largely residential and/or agricultural. Individual residence concerns and impacts are discussed in Sections 7.3, 8.3, and 9.3, and will hopefully be addressed by local landowners during the comment period on the draft EIS and through testimony at the public hearings.

10.3.1. Community impacts by routing area

For the discussions in this section, the routing areas and their component route sections are identified in the maps in Figure Vol. 2-4 and in more detail in Figure Vol. 2-1. Descriptions of route alternatives for each routing area can be found in Section 10.1.1 and Table 10.1-1.

10.3.1.1. South Routing Area

In the South Routing Area, the two choices are between the western Route Section S1 and the eastern Route Section S2. An additional route section, S3, is necessary if the approved route switches between the east and west options as it shifts between the South and Central Routing Areas.

The two route sections differ in the amount of potential impact to agricultural land, particularly cropland. About 85 percent of the total ROW area of Route Section S2 crosses agricultural land, compared with about 77 percent of S1. In addition, the eastern and longer of the two South Routing Area options (S2), involves about 75 new acres of ROW on cropland, while S1 involves only about 20 acres. If the connection to the C3, the western option in the Central Routing Area, is made from Section S2, about 17.1 acres of additional potential agricultural impact, along Route Section S3, would occur, 21.3 acres including existing ROW.

The western route section, S1, travels within 300 feet of about 30 residences, a substantially greater number than along S2, which is within 300 feet of about 12 residences.

10.3.1.2. Central Routing Area

In the Central Routing Area, the potential community impacts are similar for either the western (C3) or the eastern (C4) route option.

Regardless of the option chosen, the Central Routing Area ROWs would impact approximately 91 percent agricultural land. The actual amounts of new ROW in cropland and pasture land within both route options affected are nearly equal as well.

Route Section C3 runs within 300 feet of 11 residences, while the eastern option, C4, is within 300 feet of about 19 residences. Both route sections have additional route adjustments that have been provided in response to staff requests about residences that appear to be unusually close. Refer to Section 8.3.3 in Chapter 8 for more detail.

In addition, both options have similar impacts on public lands such as trails, airstrips, and communication towers.

10.3.1.3. North Routing Area

In the North Routing Area, routing options comparisons are less clear. The main east-versus-west comparisons are between Route Sections N4 and N18, but the options for getting primarily from N18 in the west options to the Morgan Substation involve a variety of other possibilities. These are discussed in detail in Section 9.2 in Chapter 9.

Overall, less ROW within the North Routing Area traverses agricultural land compared to ROW in the Central or South Routing Areas. Approximately 72 percent of the North Routing Area ROW is agricultural land, which is dominated by row crops (similar to the other routing areas). Comparing the East and West Options' longest route sections, N18 crosses agricultural land over 86 percent of its length. N4 crosses agricultural land over 65 percent of its length. Looking at the North Options utilizing these two route sections, the potential agricultural land impacts involve:

- approximately 235 acres of new ROW on cropland for the North Option East
- approximately 300 acres of new ROW on cropland for the North Option West with N13, as well as for the North Option West with N15 (and N14)

- approximately 330 acres of new ROW on cropland for the North Option West with N7 (and N14 and N8)

The North Option East is a shorter route option, crossing 61,129 feet (11.6. miles) of crop land. The North Option West with N13 crosses 81,093 feet (15.4 miles) of cropland, about one-third more than the North Option East. The North Option West with N15 crosses 81,244 feet (15.4 miles) of cropland. The North Option West with N7 crosses the most agricultural land at 86,481 feet (16.4 miles). Thus, it appears that the North Option East affects notably less farmland, particularly cropland, than any of the West options.

Based on Table 9.3-2 and the tables that follow it, differences emerge among the North Options in terms of the number of residences within 300 feet of either centerline. North Option East would impact the highest number of residences (29) within 300 feet of either centerline. However, three residences are farther away from either centerline if the routing alternatives requested by Commission staff (see Section 9.3.3) are selected. North Option West with N13 has 16 residences within 300 feet of a centerline. North Option West with N15 has 18 residences, and North Option West with N7 impacts the least (14).

Therefore, in terms of potential agricultural and residential impact, the North Option East affects the most residences and least agricultural land, while the North Option West with N7 affects the most agricultural land and fewest residences.

10.3.1. Agriculture impacts by route alternative

As discussed in Sections 7.3.1, 8.3.1, and 9.3.1, the current land use in the project area is largely agricultural. Table 10.3-1 illustrates the differences among the 16 route alternatives in the amount of agricultural land that would be affected by the proposed lines and associated ROW.

Table 10.3-1 Comparison of total agricultural land along each route ROW

Route	Total Agricultural Land in ROW (acres)	Existing ROW in Agricultural Land (acres)	New ROW in Agricultural Land (acres)	Percent of New ROW in Agricultural Land
A	889.1	214.1	675.0	75.9
B	881.8	208.2	673.7	76.4
C	887.7	184.4	703.3	79.2
D	787.1	174.3	612.8	77.9
E	823.7	146.9	676.8	82.2
F	816.4	141.0	675.5	82.7
G	822.4	117.3	705.1	85.7
H	721.7	107.1	614.6	85.2
I	920.8	169.9	750.9	81.5
J	913.6	163.9	749.7	82.1
K	919.4	140.2	779.2	84.8
L	818.7	130.0	688.7	84.1
M	829.8	98.8	731.0	88.1
N	822.6	92.9	729.7	88.7
O	828.5	69.2	759.3	91.6
P	727.9	59.0	668.9	91.9

Some of the route impacts shown in Table 10.3-1 can be described in more detail:

- Route Alternative I contains the highest amount of agricultural land within the ROW (920.8 acres).
- Route Alternative H has the least (721.7 acres).

- Route Alternatives I, K, J, A, C, and B, all of which include the West Option (C3) in the Central Routing Area and the West Options in the North Routing Area, have an above average (838.2 acres) amount of agricultural land with the ROW.
- The largest amount of new ROW on agricultural land occurs on Route Alternative K (779.2 acres), which includes Route Sections S2 and N7.
- The least amount of new ROW on agricultural land occurs on Route Alternative D (612.8 acres), which includes Route Sections S1 and N4.

10.3.2. Numbers of residences by route alternative

As discussed in Sections 7.3.3, 8.3.3, and 9.3.3, the number of residences within the project area differs by route alternative. The number of residences within 300 feet of the outside centerlines have been tabulated and summarized for the 16 route alternatives in Table 10.3-2.

Table 10.3-2 Comparison of numbers of residences within different distances from the outside centerlines

Route	Distance from Proposed Centerline				
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	Total
A	0	3	19	39	61
B	0	3	20	40	63
C	0	5	19	35	59
D	0	8	25	41	74
E	0	2	17	53	72
F	0	2	18	54	74
G	0	4	17	49	70
H	0	7	23	55	85
I	1	7	6	32	46
J	1	7	7	33	48
K	1	9	6	28	44
L	1	12	12	34	59
M	1	6	4	40	51
N	1	6	5	41	53
O	1	8	4	36	49
P	1	11	10	42	64

Some of the residential impacts of the route alternatives shown in Table 10.3-2 can be described in more detail:

- Route Alternative H, which includes Route Section S1 and the North Option East, comes within 300 feet of the highest number of residences (85).
- Route Alternative K, which includes Route Section S2 and the North Option West with N7, comes within 300 feet of the fewest residences (44).
- Route Alternatives H, F, D, E, G, P, B, and A are above average (61 residences) when it comes to the total number of residences within 300 feet of the centerlines.
- Route Alternative L, which includes the North Option East, is within 100 feet of the highest number of residences (13).
- Route Alternatives E and F, which include Route Sections S1 and C4 plus North Option West with N13 and N15, are within 100 feet of the fewest residenc1s (2).

10.4. SELECTED ENVIRONMENTAL IMPACT COMPARISONS AMONG ROUTE ALTERNATIVES

Upon examination of each route alternative, the associated ROWs, and the natural resource and community impacts, one can get an overall picture of each route alternative proposed. Table 10.4-1 shows the impact each route alternative would have on a number of important general characteristics. The Routes A through P are illustrated in the maps in Figure Vol. 2-5.01 through 5.04. Instead of total acres of wetland crossed, the table includes the numbers of structures that would be constructed in wetlands. Structures placed in wetlands have very direct and significant impacts that require specific permitting from DNR. The total acres of wooded wetland crossed is included as a characteristic because the ROW would be cleared of trees, which would significantly alter both the hydrological and biological nature of these ecological communities.

Table 10.4-1 Comparison of impacts by Route Alternative

Route	Length (miles)	New ROW (acres)	Percent of ROW Length Shared	Agricultural Land Impacted (acres)	Number of Stream Crossings	Number of TCSBs Placed in Waterways	Number of Structures Placed in Wetland	Total Wooded Wetland Impacted (acres)	Total Wetland Impacted (acres)	Total Upland Forest Area Impacted (acres)	Number of Residences within 300 Feet of the Centerlines
A	45.1	787.8	23.5	889.1	91	74	75	52.9	53	33.8	61
B	44.7	784.8	23.1	881.8	90	71	68	50.1	50.1	37.2	63
C	46.4	837.8	19.0	887.7	80	65	86	62.3	62.3	26.3	59
D	43.0	772.3	19.5	787.1	81	56	69	60.5	60.5	44.9	74
E	42.5	787.0	17.6	823.7	90	79	67	49.4	49.5	36.6	72
F	42.2	784.1	17.2	816.4	89	76	60	46.6	46.6	40	74
G	43.8	837.1	12.8	822.4	79	69	78	58.8	58.8	29.1	70
H	40.4	771.6	12.8	721.7	80	61	61	56.9	56.9	47.7	85
I	46.5	871.0	17.5	920.8	97	79	70	53.6	53.6	32	46
J	46.6	868.1	17.1	913.6	96	76	63	50.8	50.8	35.4	48
K	47.8	921.0	13.2	919.4	86	69	81	63	63	24.4	44
L	44.4	855.5	13.2	818.7	87	61	64	61.2	61.2	43	59
M	42.4	847.8	11.2	829.8	97	82	62	50.1	50.1	34.8	51
N	42.0	844.8	10.7	822.6	93	79	55	47.3	47.3	38.1	53
O	43.7	897.8	6.5	828.5	83	72	73	59.5	59.5	27.2	49
P	40.3	832.3	5.9	727.9	84	64	56	57.6	57.6	45.9	64

Certain route alternatives have readily identifiable impacts on agricultural land, waterways, wetlands, forests, and residences, as enumerated above in Table 10.4-1.

- Route I impacts the most amount of agricultural land (920.8 acres) and Route H the least (721.7 acres). Route I follows the western route option in Central and North Routing Areas and eastern option in the South Routing Area, whereas Route H follows the eastern route option in the Central and North Routing Areas and the western option in the South Routing Area.
- Routes I and M impact the highest number of waterways, as well as require the highest number of TCSBs, whereas Routes C, G, D, and H impact the fewest waterways. Routes M and I have a commonality, in that both utilize northern Route Sections N13 and N6, which have significantly more waterway crossings and TCSBs than their counterparts (N14 and N7).
- Routes K and C have the greatest impact on wooded wetlands and require the highest number of structures to be constructed within wetlands. Routes N and P impact the least amount of wooded wetlands and require the fewest number of wetland structures. The routes with the greatest impact

(K and C) share Route Sections N7, whereas the route alternatives with the lowest impact (N and F) share Route Sections N13 and N6.

- Route H impacts the most amount of upland forest (47.7 acres) and has the highest number of residences within 300 feet of either centerline (85 homes). Route K impacts the least amount of upland forest (24.4 acres) and has the fewest number of residences (44) within 300 feet of a centerline.

10.5. ROUTE ALTERNATIVE COSTS

Table 10.5-1 summarizes project costs for the 16 potential route alternatives based on the route sections proposed by ATC in the three routing areas. For a more thorough review and delineation of costs, refer to Section 2.5 in Chapter 2.

Table 10.5-1 Cost summary and comparisons for Routes A through P

Route	Total Line and Substation Costs	Precertification and EIF Costs	Total Costs
A	$300,850,000	$25,758,960	$326,608,960
B	$299,130,000	$25,697,360	$324,827,360
C	$298,610,000	$25,639,120	$324,249,120
D	$291,520,000	$25,373,680	$316,893,680
E	$297,570,000	$25,687,840	$323,257,840
F	$295,840,000	$25,626,240	$321,466,240
G	$295,320,000	$25,568,000	$320,888,000
H	$288,230,000	$25,302,560	$313,532,560
I	$300,060,000	$25,904,560	$325,964,560
J	$298,330,000	$25,842,960	$324,172,960
K	$297,810,000	$25,784,160	$323,594,160
L	$290,720,000	$25,519,280	$316,239,280
M	$291,440,000	$25,631,280	$317,071,280
N	$289,710,000	$25,570,240	$315,280,240
O	$289,200,000	$25,511,440	$314,711,440
P	$282,110,000	$25,246,560	$307,356,560

Table 10.5-1 illustrates cost comparisons and ranges in cost for the project route alternatives. The range in total costs of the project depends on the costs of the transmission lines and the payments necessary for the Environmental Impact Fees.

- Total costs range from about $307 million to about $327 million.
- Route Alternative A has the highest cost at $ 326,608,960. Route Alternative A is an all-western route that includes the West South Option, West Central Option, and West North Option with N13, and is shown in Figure Vol. 2-5.01 A.
- Route Alternative P would cost the least at $ 307,356,560. Route Alternative P is the all-eastern route that includes the East South Option, East Central Option, and East North Option, and is shown in Figure Vol. 2-5.04 P.

10.6. ENVIRONMENTAL AND AGRICULTURAL MONITORS

While construction conditions specified in the Commission's order and DNR's permit can avoid, minimize, and mitigate the potential adverse impacts of an approved project, it is sometimes useful to

employ an independent environmental monitor (IEM) and/or an agricultural monitor that reports directly to the state agencies. A monitor can assist the agencies in ensuring compliance with regulatory requirements. Additionally, a monitor's presence during construction of the project may proactively prevent impacts from occurring through close observation of construction personnel. In Section 5.2.5 of Chapter 5, there is a brief discussion of how an IEM or agricultural monitor may function for projects that have a potential to impact high-quality natural resources or special or fragile farmlands.

There could conceivably be a need for both types of monitors during construction of the North Appleton-Morgan project if it is approved. All three routing areas consist primarily of agricultural lands. In addition, route sections within the North Routing Area would impact many wetlands, forested and non-forested alike, that are associated with sensitive areas along the Pensaukee or Suamico Rivers.

10.6.1. Independent environmental monitor

IEMs have been required by the Commission in five transmission construction projects. The projects include the Arrowhead-Weston (docket 05-CE-113), Gardner Park-Central Wisconsin and Morgan-Werner West also known as GCMW (dockets 137-CE-122 and 137-CE-123), Rockdale-West Middleton (docket 137-CE-147), and CapX2020 Alma-La Crosse (docket 5-CE-136). The Commission determined in each of these dockets that one or more IEMs should be utilized because of the scope of the projects, the diversity of landscapes through which the transmission would pass, and the presence of sensitive natural resources. As third-party independent monitors, IEMs have reported directly to PSC staff, rather than to the applicants or construction subcontractors. IEMs have been charged with reporting incidents and stopping work, if appropriate, when construction practices violated any applicable permit, approval, order, or agreement issued by regulatory agencies or were likely to cause non-approved impacts to the environment or private properties.

Construction activities that have been subject to monitoring and reporting by the IEMs included activities that might impact wetlands and bodies of water, habitats and occurrences of protected species, archeological sites, agricultural fields or facilities, state and federal properties, and private property with detailed construction agreements or specific issues such as organic farming practices or trees valued by the landowner. In these dockets, PSC, DNR, and DATCP staff submitted testimony that an independent environmental monitoring was critical in obtaining a clear and current record of construction activities and environmental protection measures that were implemented. The utilities were required to pay the salaries and expenses of the IEMs, as reviewed and approved by PSC staff. The Commission-approved IEM scopes of work for these transmission projects varied from complete coverage of all utility construction activities to specific areas or specific construction activities.

As a method to identify sensitive resources along the approved route and appropriate environmental mitigation measures, a PSC-approved plan was required prior to the start of construction of project segments. Consultation with other regulatory agencies ensured that sensitive sites were identified and would be properly protected. The PSC-approved plans became a useful communication and training tool for the contractors, construction crews, IEM(s), PSC staff, and other regulatory agencies. The PSC-approved plans included current contact information, general construction and mitigation practices, specific construction and mitigation measures needed at sensitive resource locations, and maps identifying all pertinent structures and resources.

10.6.2. Agricultural monitor

An agricultural monitor has been found useful for the most recent high-voltage transmission projects, Rockdale to West Middleton (PSC docket 137-CE-147) and CapX2020 Alma-La Crosse (PSC docket

5-CE-136), for construction activities that would impact agricultural lands. Prior to that, utilities have hired agricultural monitors on an as-needed basis or to step in only after a problem in the field has occurred. Similar to IEMs, the leading benefits of an agricultural monitor are for regulators to obtain a current record of construction activities and agricultural protection measures and to proactively prevent or minimize potential impacts.

If this project is approved, the qualifications and responsibilities of an agricultural monitor could be included in an agricultural impact mitigation plan. This plan would not apply to public or railroad ROWs or private land that is not agricultural, unless they were crossed by agricultural tiles. The agricultural monitor would be funded by the applicant but would report directly to the DATCP and could act as a liaison between landowners and DATCP, if necessary.

Acronyms

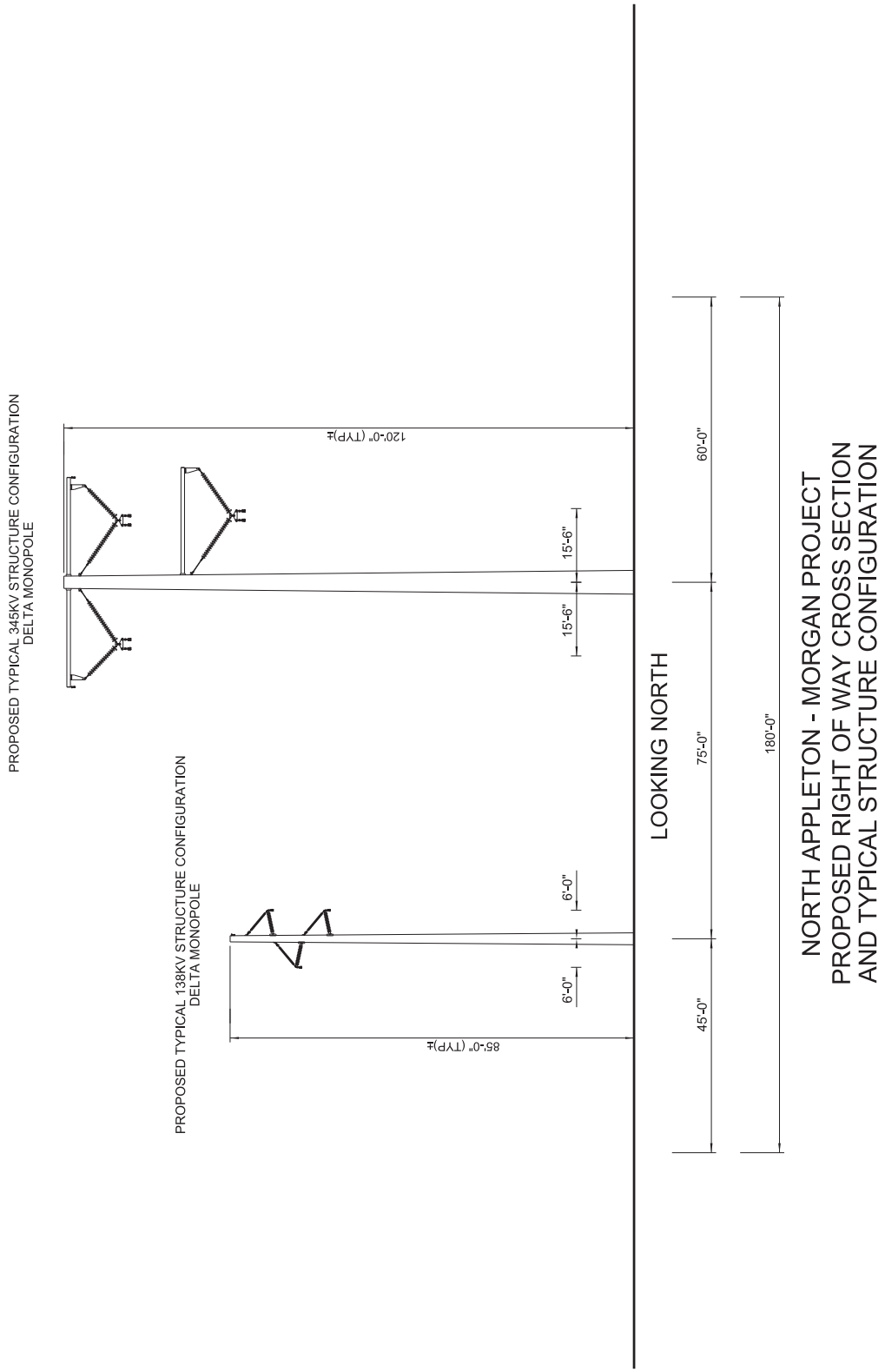
Abbreviation or Acronym	Definition
%	Percent
§	Section
AC	Alternating current
ACSR	Aluminum conductor steel reinforced
ACSS	Aluminum conductor steel supported
AFUDC	Allowance for funds used during construction
AIS	Agricultural Impact Statement
Alliance	Oconto County Sportsmen's Alliance
AMSL	Above mean sea level
ANR	ANR Pipeline Company
ASNRI	Areas of Special Natural Resource Interest
ATC	American Transmission Company LLC
ATV	All-terrain vehicle
BAU	Business as usual
BFD	Bird flight diverters
BIA	Bureau of Indian Affairs
BMP	Best management practices
CAFO	Confined animal feeding operation
CCRG	Commonwealth Cultural Resources Group, Inc.
ch.	Chapter
Commission or PSC	Public Service Commission of Wisconsin
CPCN	Certificate of Public Convenience and Necessity
CREP	Conservation Reserve Enhancement Program
CRP	Conservation
CTH	County Trunk Highway
CWA	Clean Water Act
dbh	Diameter at breast height
DC	Direct current
DATCP	Department of Agriculture, Trade and Consumer Protection
DNR	Department of Natural Resources
DOA	Department of Administration
DSM	Demand-side management
DPC	Dairyland Power Cooperative
EAB	Emerald ash borer
ECWRPC	East Central Wisconsin Regional Planning Commission
e.g.	*exempli gratia,* for example
EHV	Extra high-voltage
EIF	Environmental impact fee
EIS	Environmental impact statement
EMF	Electric and magnetic fields
EMI	Electromagnetic interference
END	Endangered species
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
ERW	Exceptional Resource Waters
ESA	Environmentally Sensitive Area
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FCL	Forest Crop Law

Abbreviation or Acronym	Definition
FERC	Federal Energy Regulatory Commission
FPP	Farmland Preservation Program
FSA	Farm Service Agency
FTR	Financial transmission rights
G	Gauss
GIS	Geographic Information System
HPFF	High-pressure fluid-filled
HV	High-voltage
ICD	Implantable cardioverter defibrillators
i.e.	*id est,* that is
IEM	Independent third-party environmental monitors
Kcmil	Kilo circular mils
km	Kilometer
kV	Kilovolt – 1,000 volts
kW	Kilowatt
kWh	Kilowatt-hour
LMP	Locational marginal pricing
LSE	Load-serving entities
MARELI	Multi-Area Reliability
MBTA	Migratory Bird Treaty Act
MFL	Managed Forest Law
mG	Milligauss
MHz	Megahertz
MISO	Midcontinent Independent System Operator, Inc.
MTEP	MISO Transmission Expansion Plan
MVA	Megavolt-ampere
MVAC	Mississippi Valley Archeological Center
MVAR	Megavolt-amperes reactive
MW	Megawatt
MWh	Megawatt hour
N/A	Not available or not applicable
NEC	National Electrical Code
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Council
NESC	National Electrical Safety Code
NEV	Neutral-to-earth voltage
NHI	Natural Heritage Inventory
NHPA	National Historic Preservation Act
NRC	National Research Council
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NRPB	National Radiological Protection Board (England)
NSPW	Northern States Power Company-Wisconsin
OEC	Oconto Electric Cooperative
OHWM	Ordinary high water mark
OMS	Organization of MISO States
OPGW	Optical ground wire
ORW	Outstanding Resource Waters
OSHA	Occupational Health and Safety Administration
PAC	Planning Advisory Committee
POM/OPM	Ventyx Physical and Operational Margins-Optimal Mitigation Measures
PSA	Planning Study Area
PSC or Commission	Public Service Commission of Wisconsin
PSS®E	Power System Simulator for Engineering

Abbreviation or Acronym	Definition
PTI	Siemens Power Technologies, Inc.
RECB	Regional Expansion Criteria and Benefits
REPS	Wisconsin Rural Electric Power Services
RFI	Radio-frequency interference
ROW	Right-of-way
RPC	Regional Planning Commission
RTO	Regional transmission operator
RUS	Rural Utilities Service
SBRM	Study Based Rating Methodology
SHPO	Wisconsin State Historic Preservation Officer
sp.	Species (singular)
spp.	Species (plural)
SSR	System Support Resource
STH	State Trunk Highway
SVC	Static VAR compensator
TCSB	Temporary clear-span bridges
TP	Twisted pair
TTL	Transient thermal limits
UP	Upper Peninsula of Michigan
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USH	U.S. Highway
VA	Volt-amperes
VAR	Volt-amperes reactive
VSAT	PowerTech Labs' Voltage Security Assessment Tool
WEPA	Wisconsin Environmental Policy Act
WEPCO	Wisconsin Electric Power Company
WHS	Wisconsin Historical Society
WHPD	Wisconsin Historic Preservation Database
Wis. Admin. Code	Wisconsin Administrative Code
WisDOT	Department of Transportation
Wis. Stat.	Wisconsin Statutes
WPSC	Wisconsin Public Service Corporation
WRP	Wetlands Reserve Program

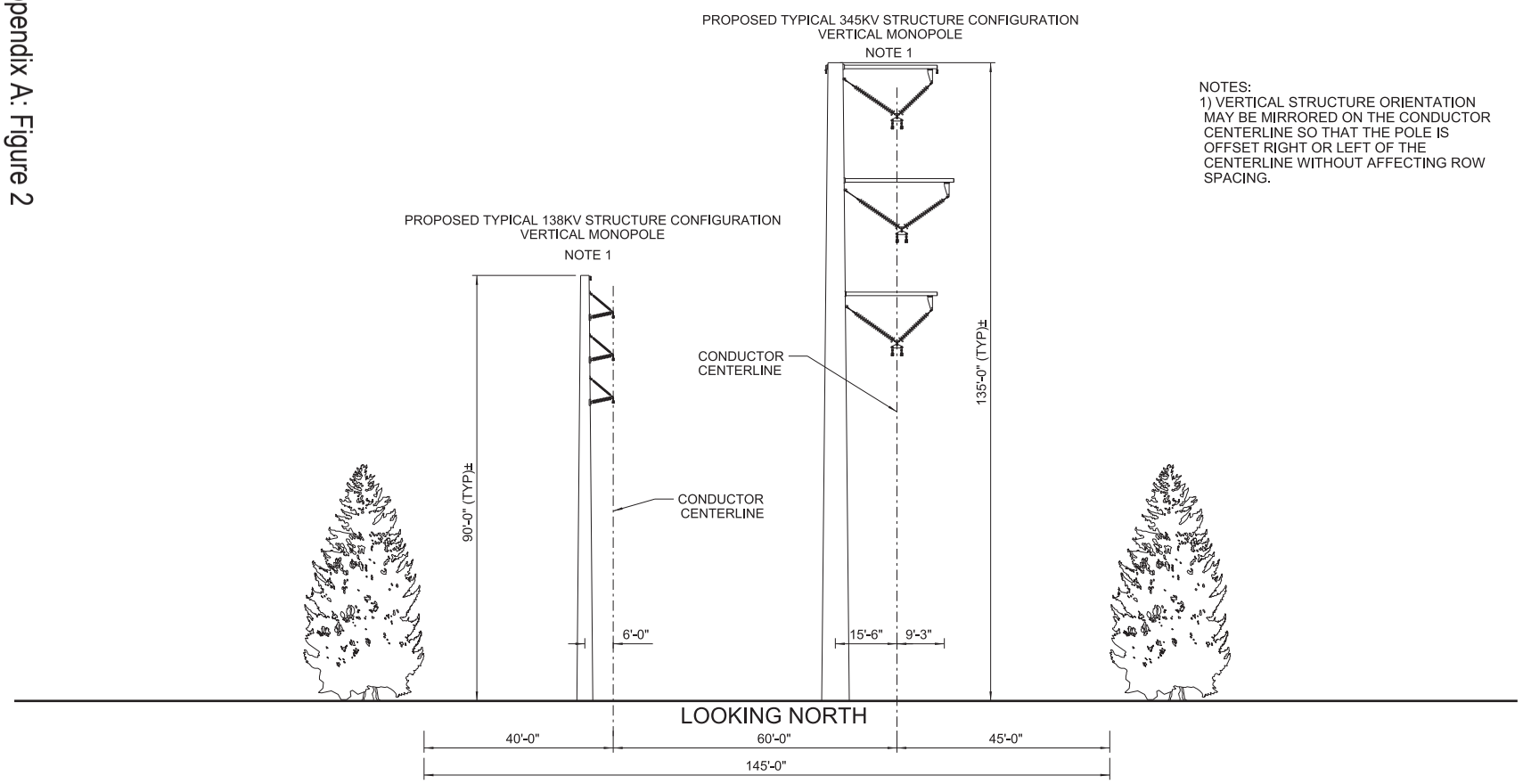
Appendix A – Common Structure Configuration Diagrams

This appendix includes diagrams of the major structural types proposed for the transmission line by the applicants.



Appendix A: Figure 1

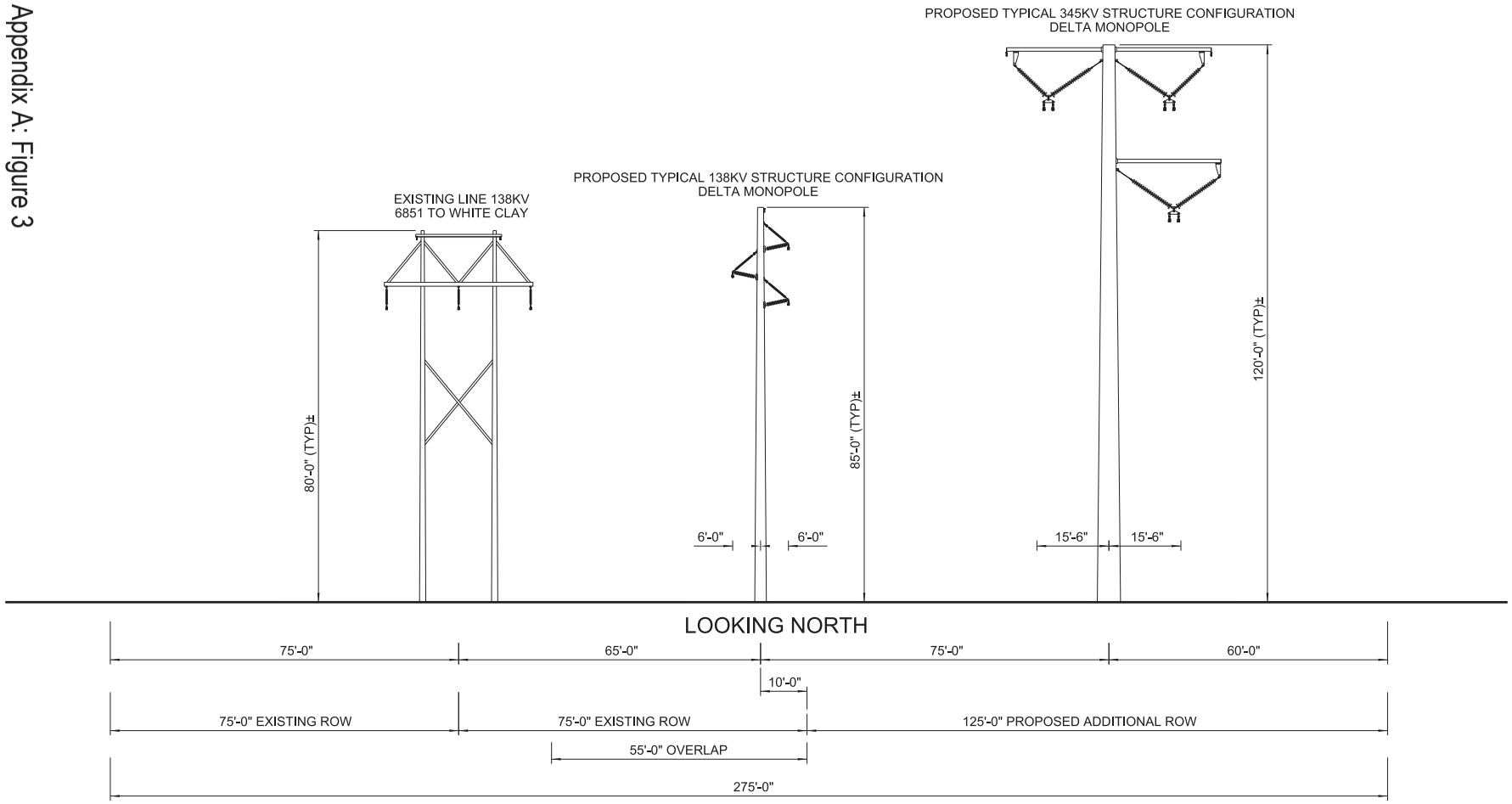
Appendix A: Figure 2



NOTES:
1) VERTICAL STRUCTURE ORIENTATION MAY BE MIRRORED ON THE CONDUCTOR CENTERLINE SO THAT THE POLE IS OFFSET RIGHT OR LEFT OF THE CENTERLINE WITHOUT AFFECTING ROW SPACING.

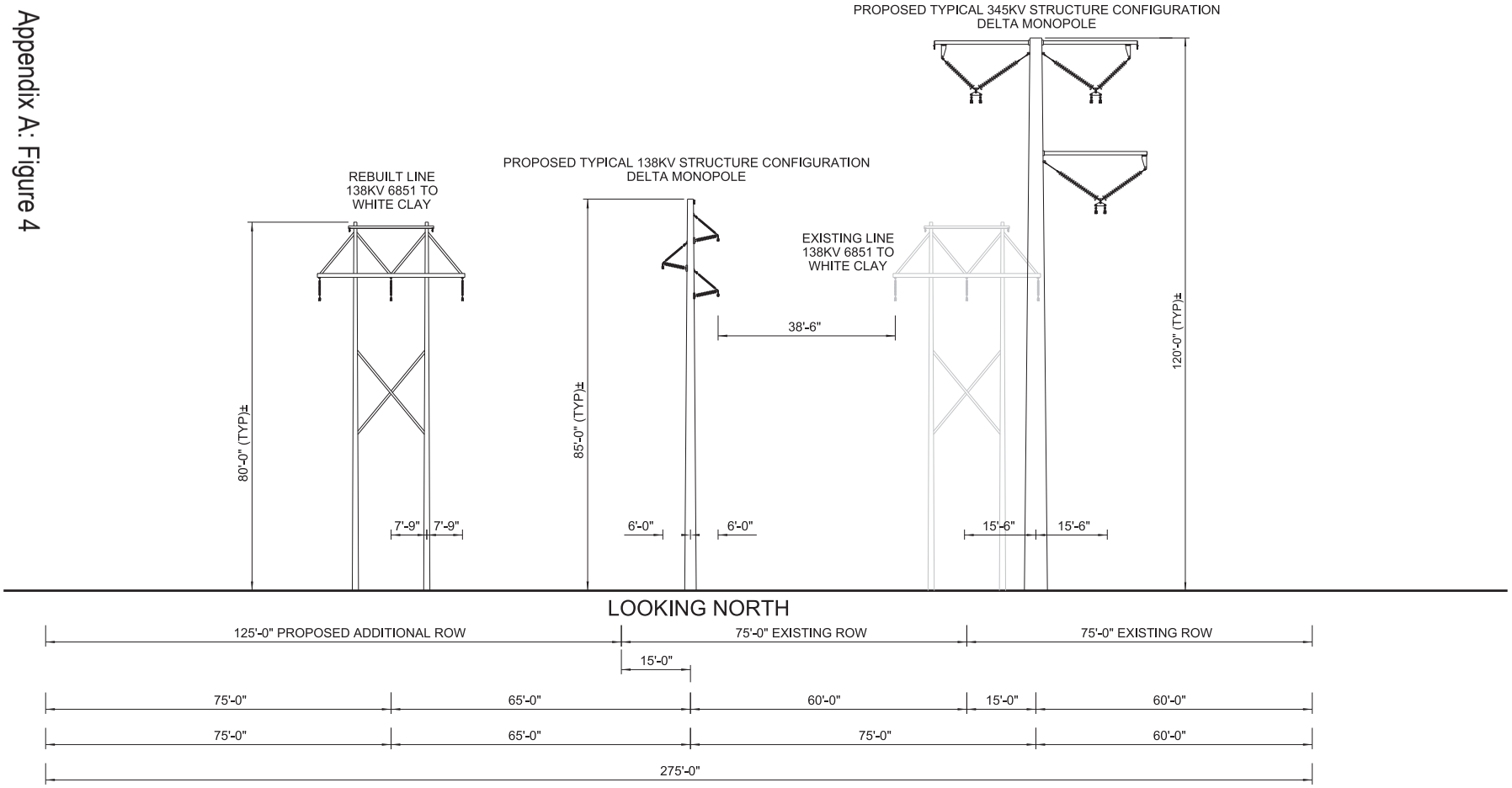
NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

Appendix A: Figure 3



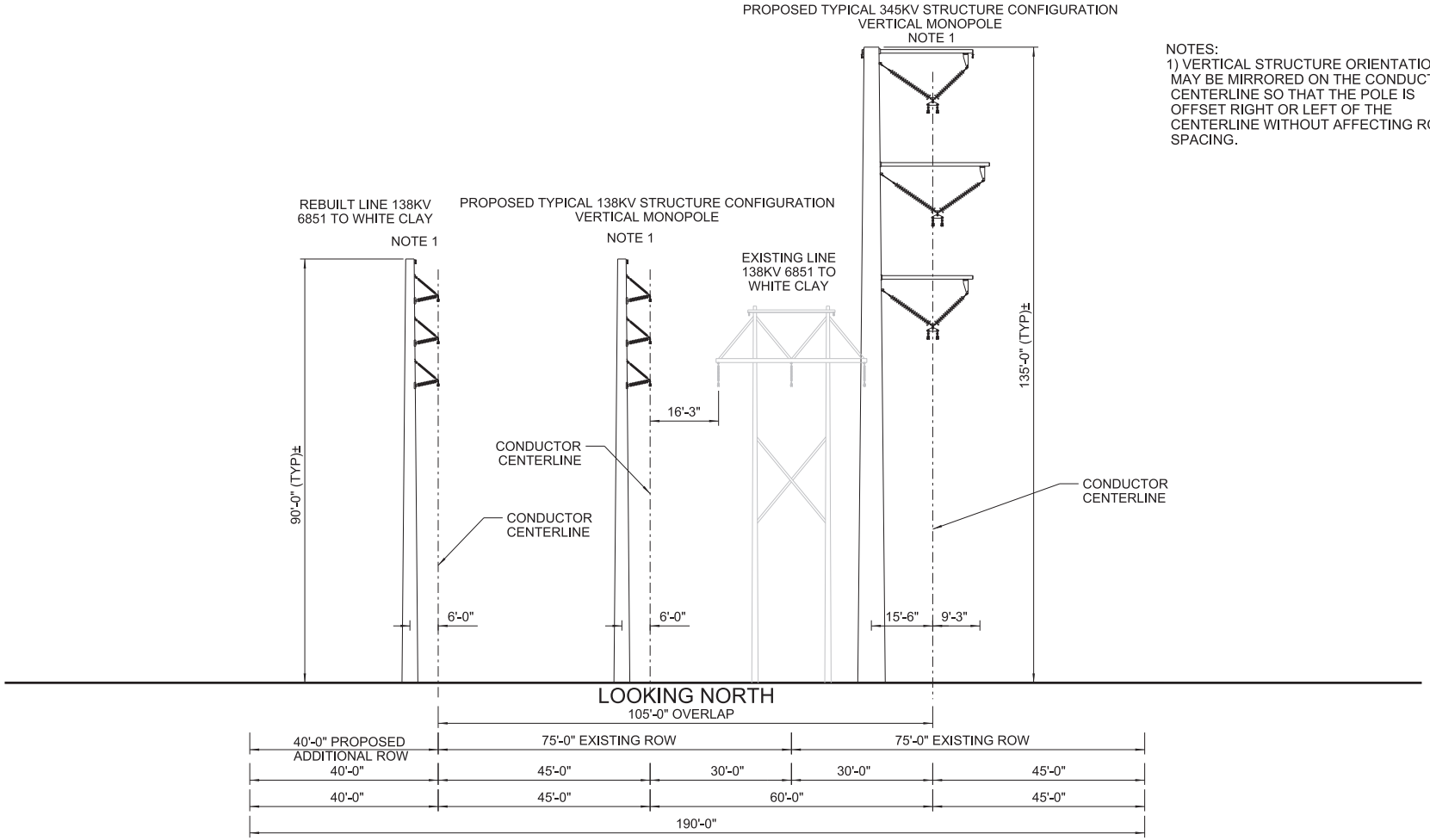
NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

Appendix A: Figure 4



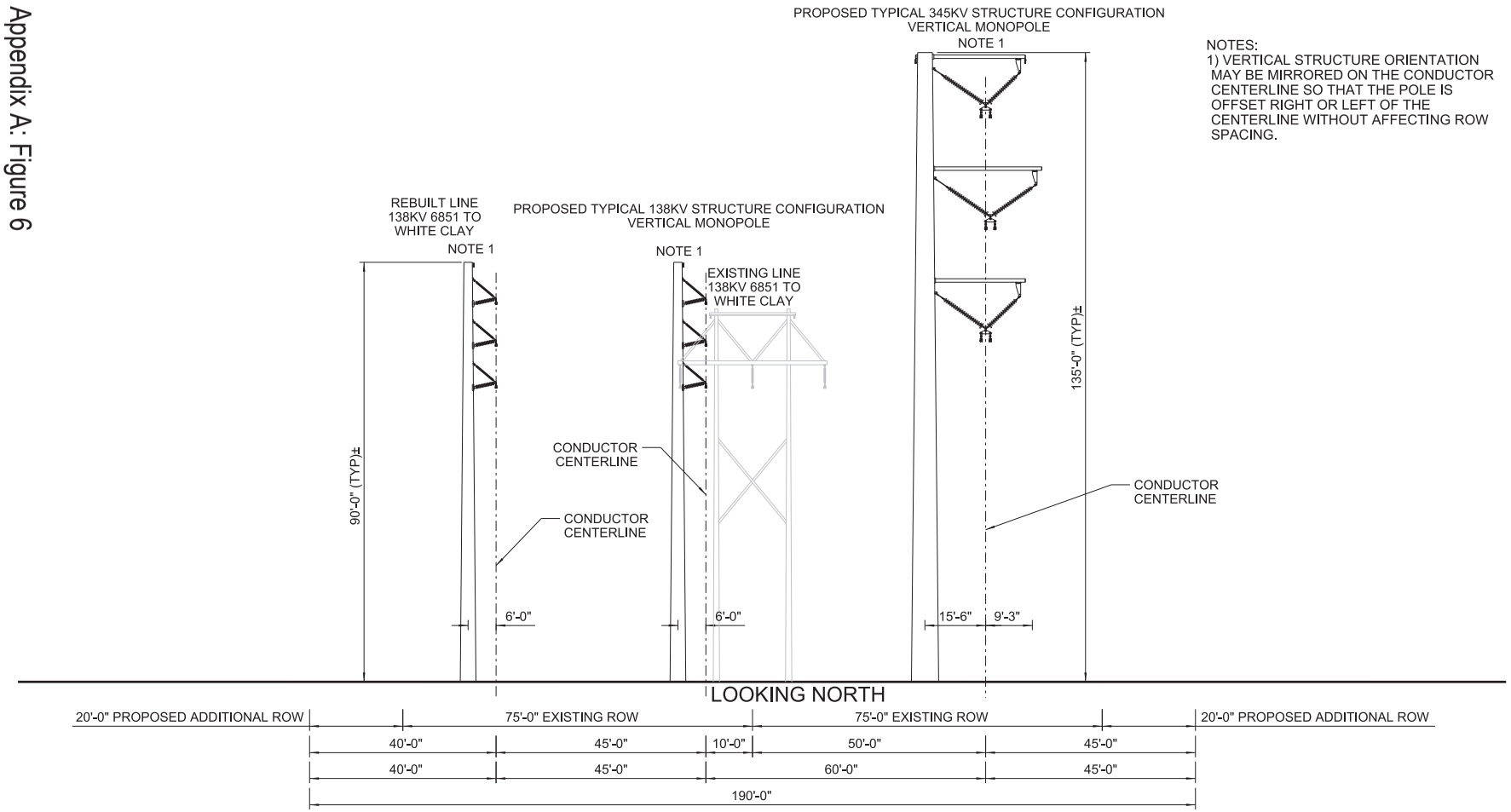
NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

Appendix A: Figure 5



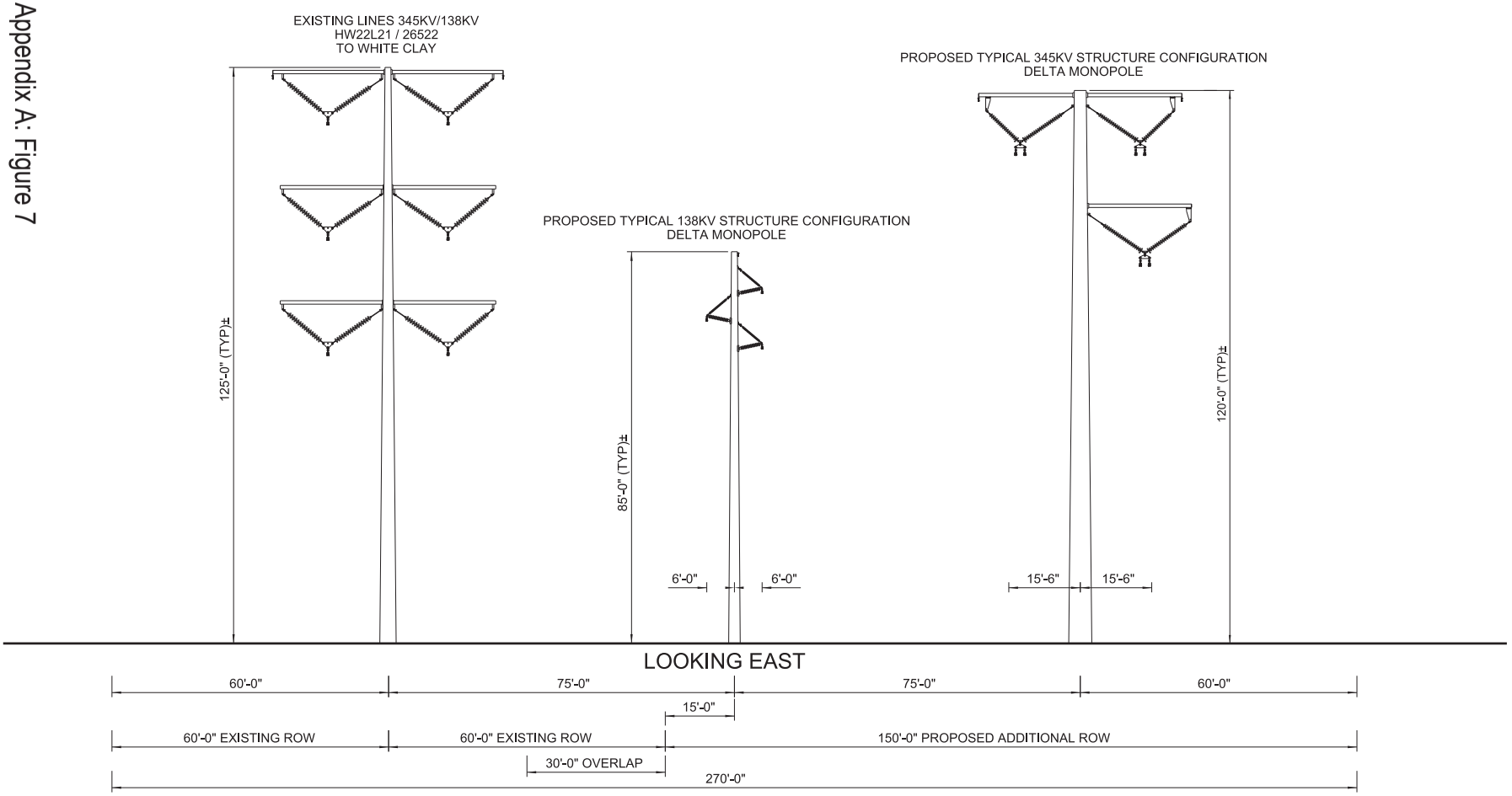
NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

Appendix A: Figure 6



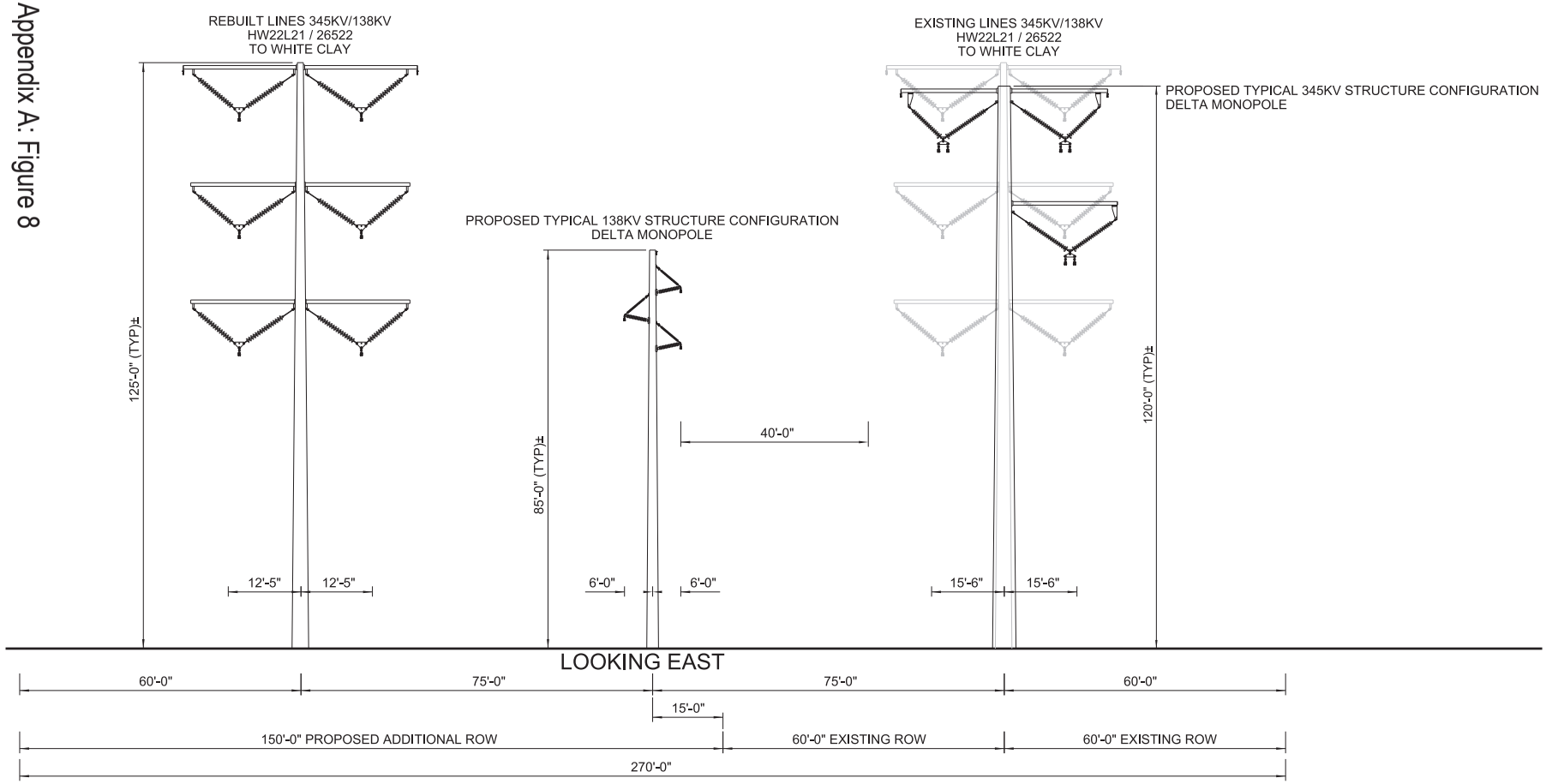
NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

Appendix A: Figure 7



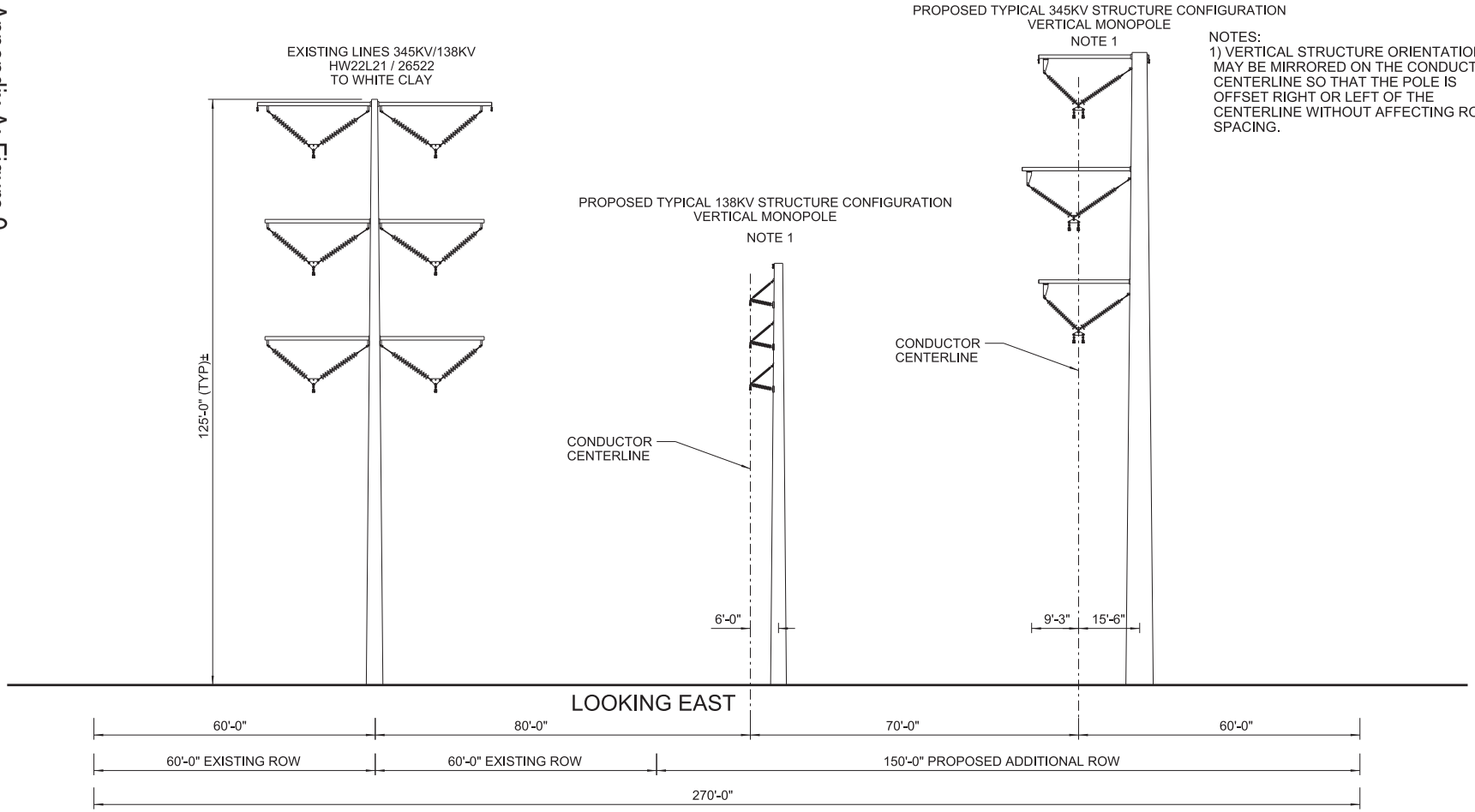
NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

Appendix A: Figure 8



NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

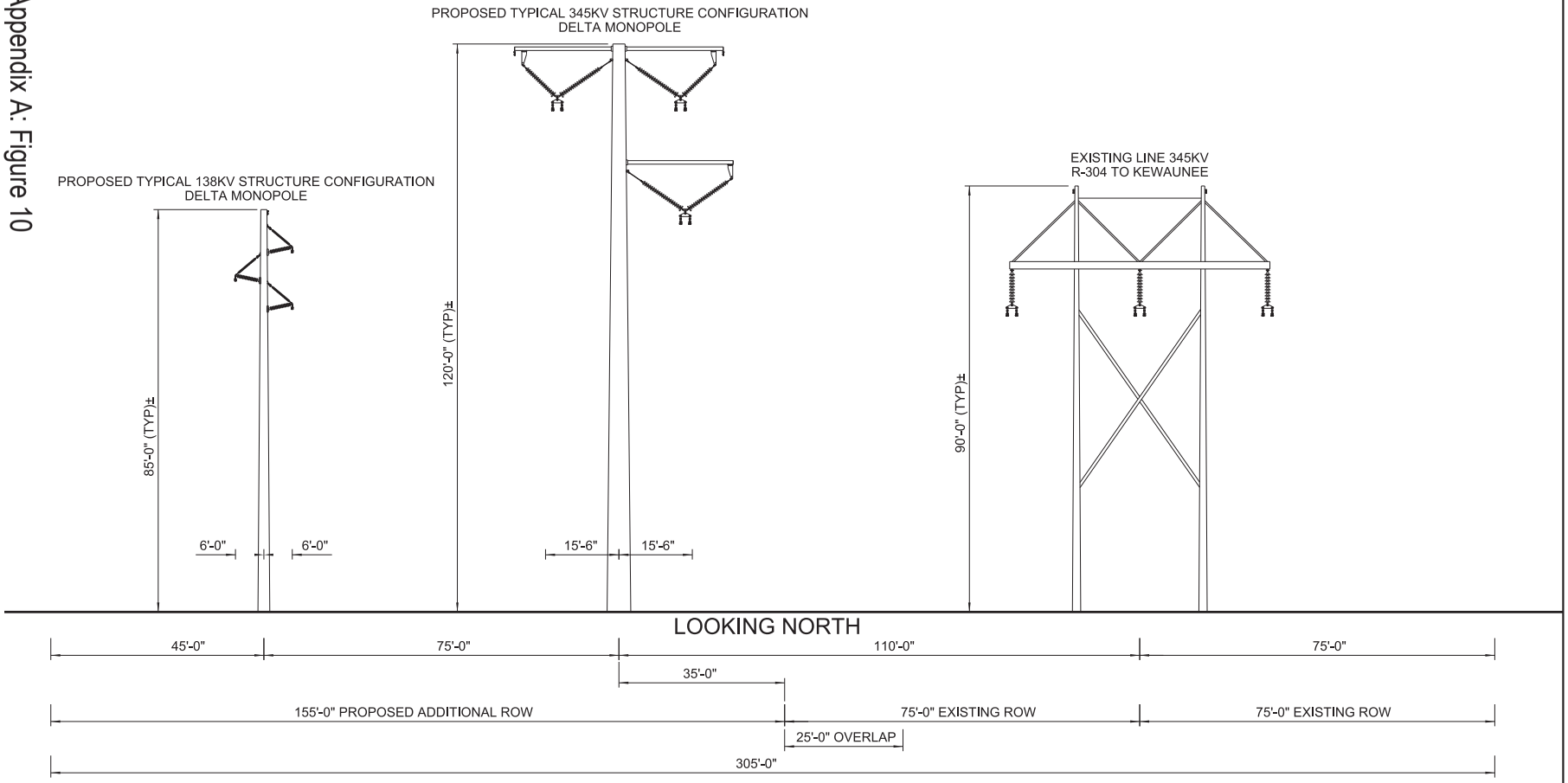
Appendix A: Figure 9



NOTES:
1) VERTICAL STRUCTURE ORIENTATION MAY BE MIRRORED ON THE CONDUCTOR CENTERLINE SO THAT THE POLE IS OFFSET RIGHT OR LEFT OF THE CENTERLINE WITHOUT AFFECTING ROW SPACING.

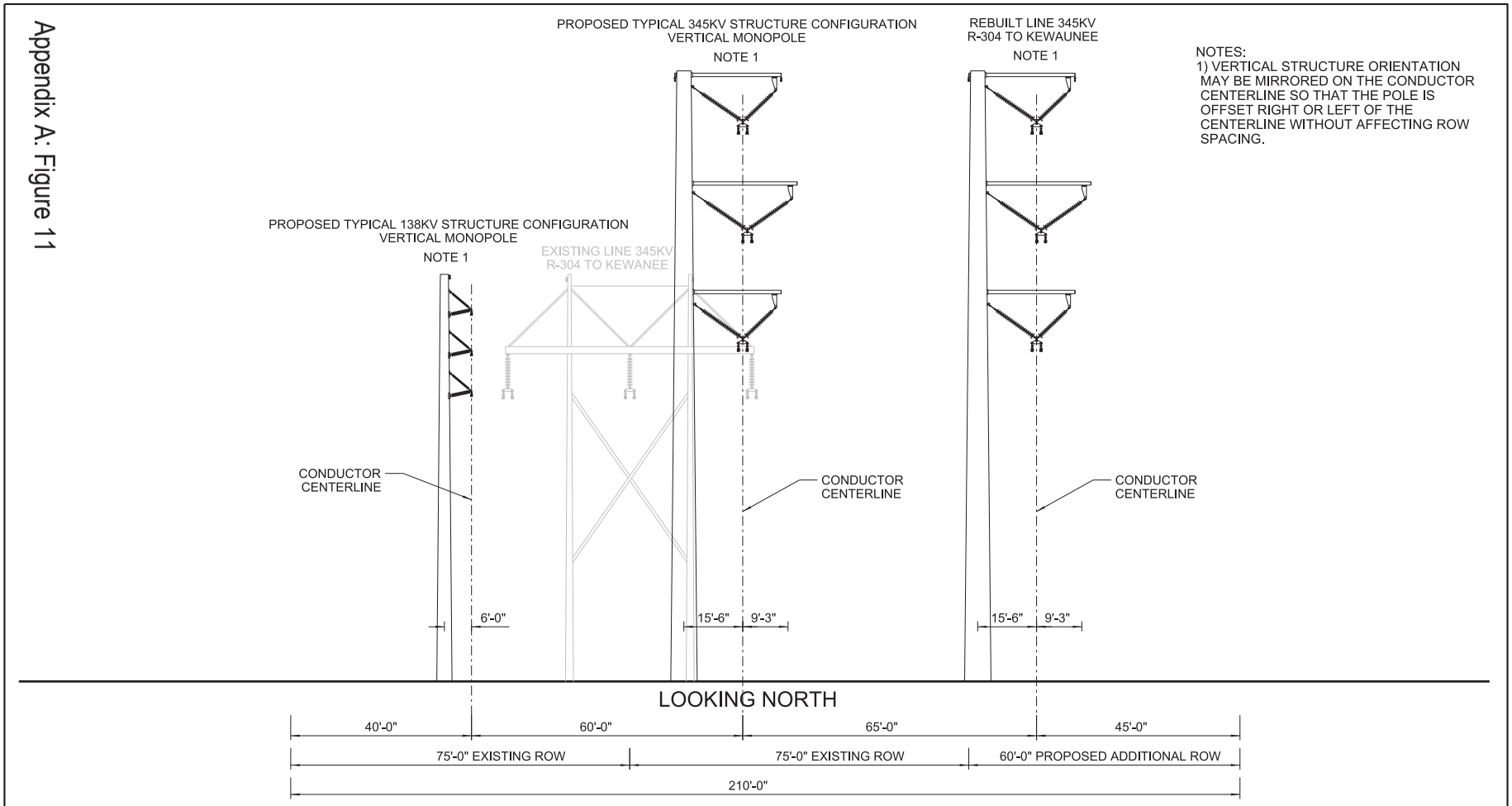
NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

Appendix A: Figure 10



NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

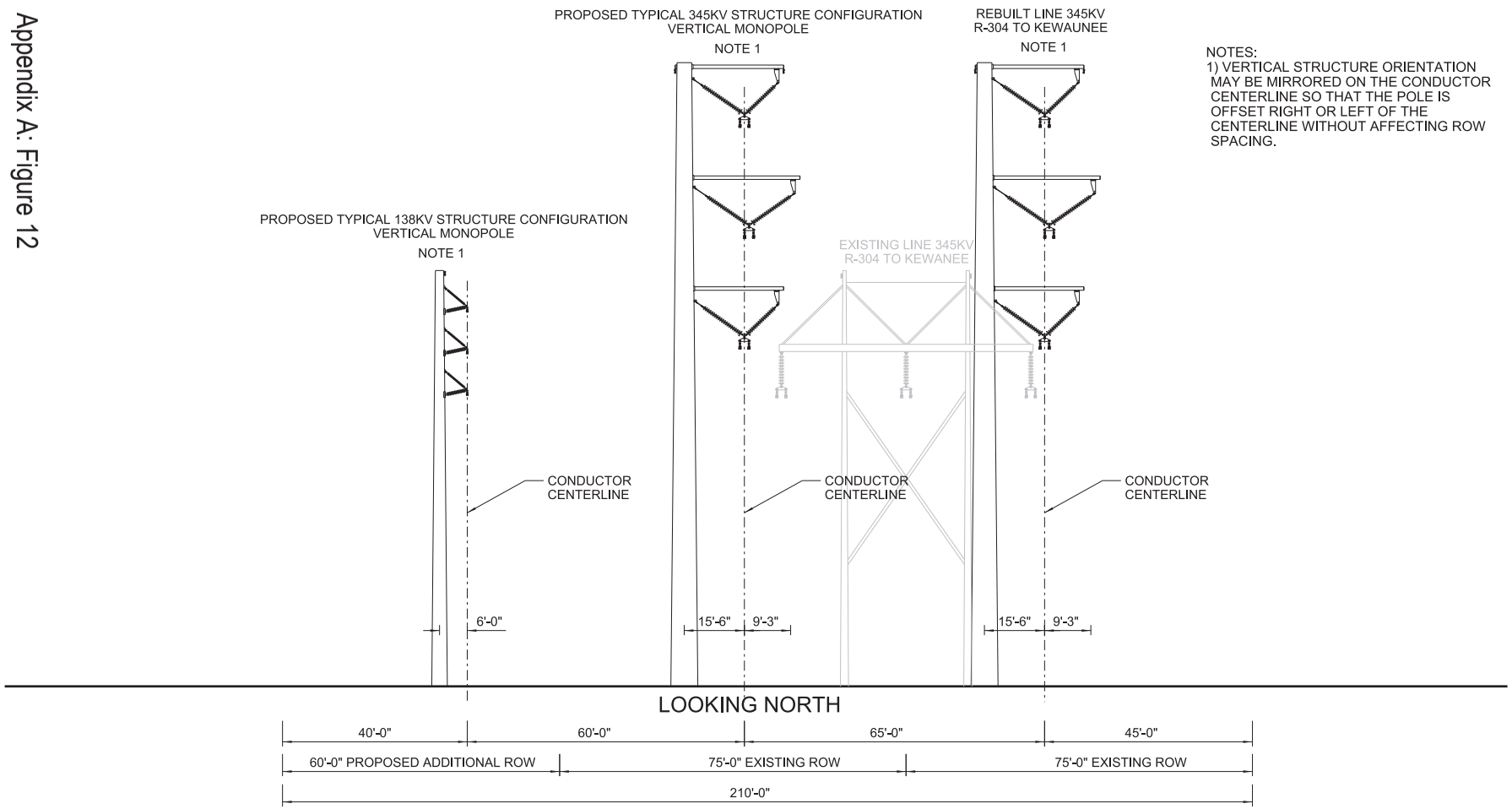
Appendix A: Figure 11



NOTES:
1) VERTICAL STRUCTURE ORIENTATION MAY BE MIRRORED ON THE CONDUCTOR CENTERLINE SO THAT THE POLE IS OFFSET RIGHT OR LEFT OF THE CENTERLINE WITHOUT AFFECTING ROW SPACING.

NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

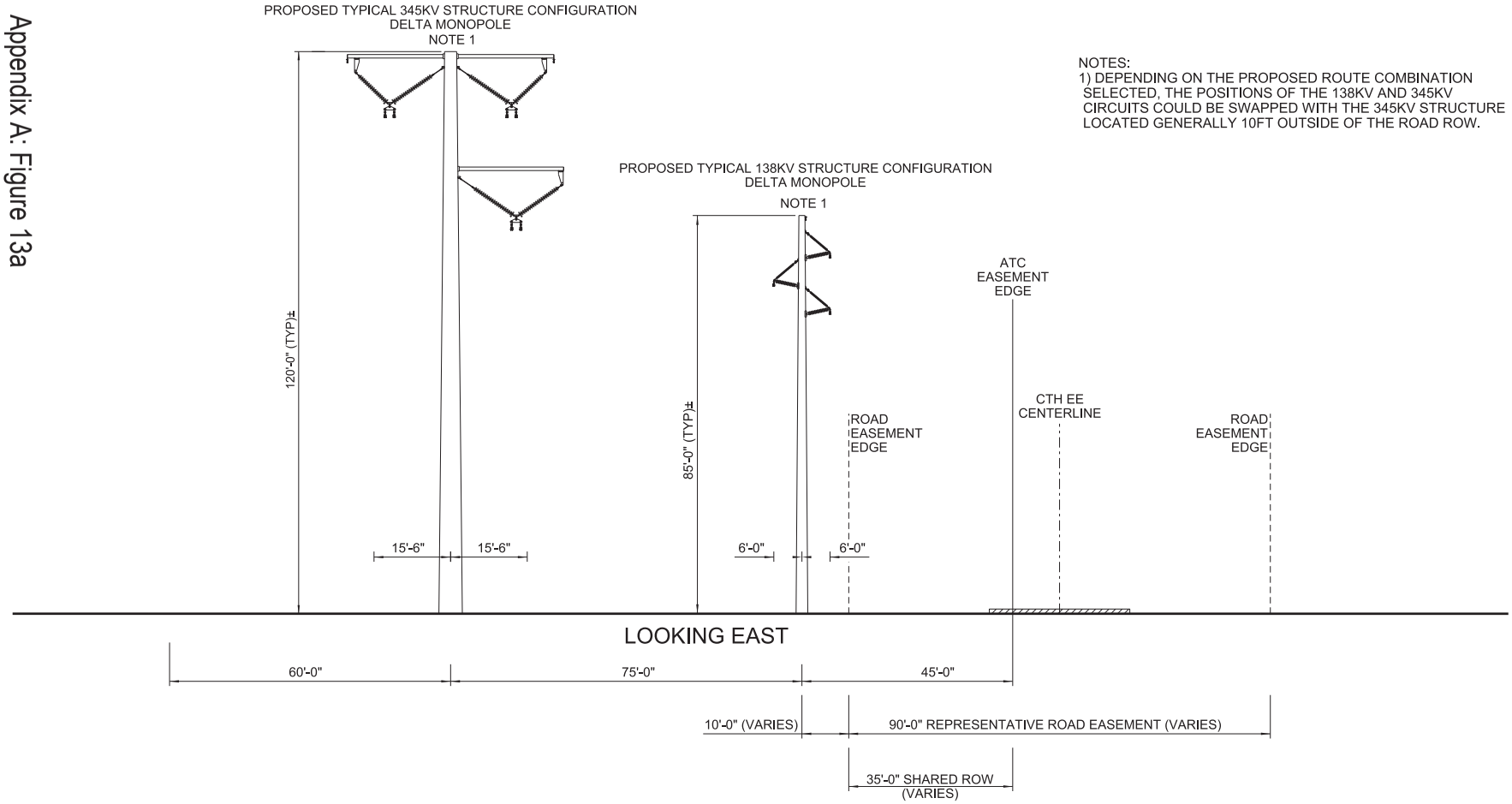
Appendix A: Figure 12



NOTES:
1) VERTICAL STRUCTURE ORIENTATION MAY BE MIRRORED ON THE CONDUCTOR CENTERLINE SO THAT THE POLE IS OFFSET RIGHT OR LEFT OF THE CENTERLINE WITHOUT AFFECTING ROW SPACING.

NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

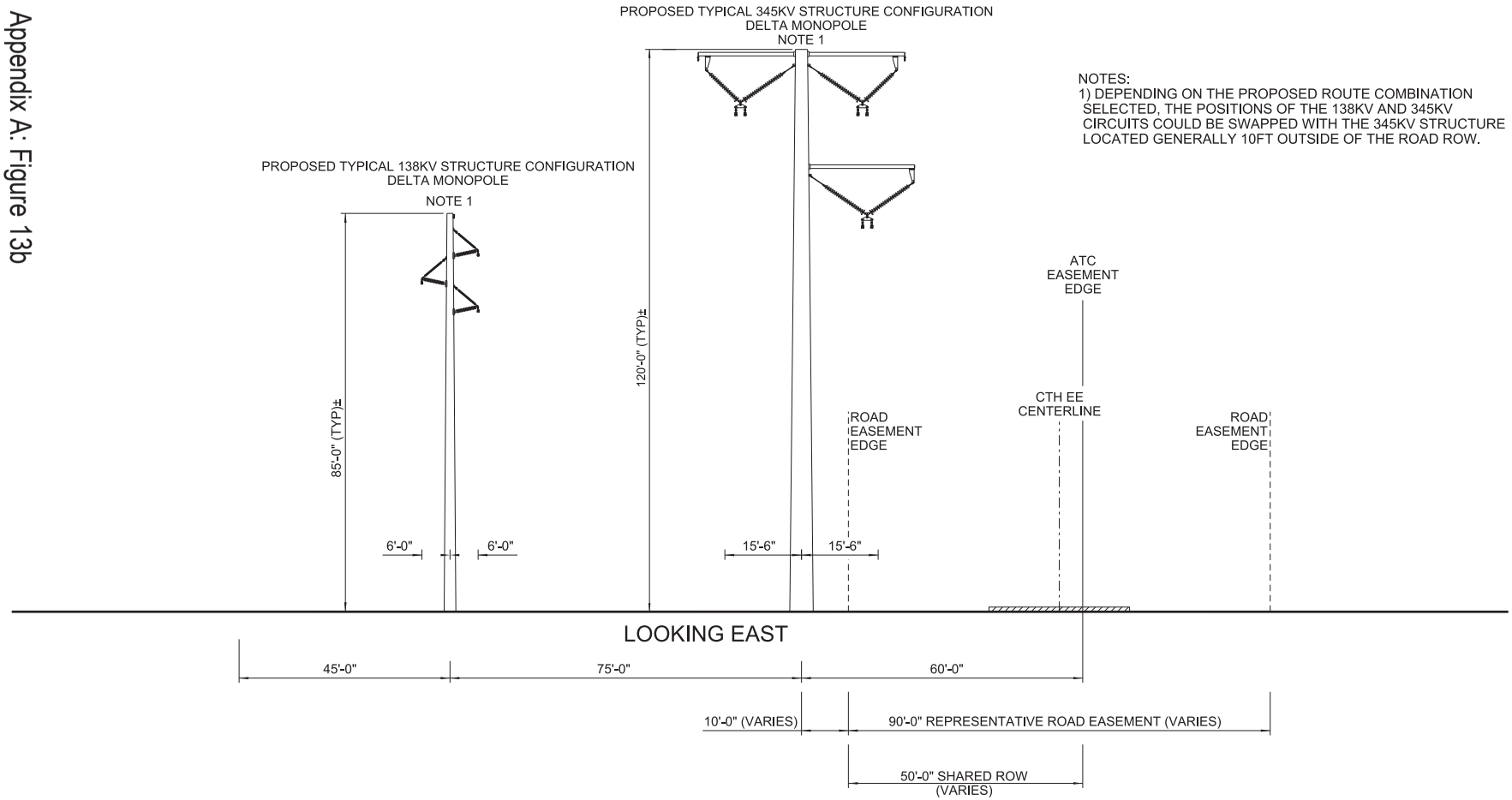
Appendix A: Figure 13a



NOTES:
1) DEPENDING ON THE PROPOSED ROUTE COMBINATION SELECTED, THE POSITIONS OF THE 138KV AND 345KV CIRCUITS COULD BE SWAPPED WITH THE 345KV STRUCTURE LOCATED GENERALLY 10FT OUTSIDE OF THE ROAD ROW.

NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION
OSBORN / OUTAGAMIE COUNTY

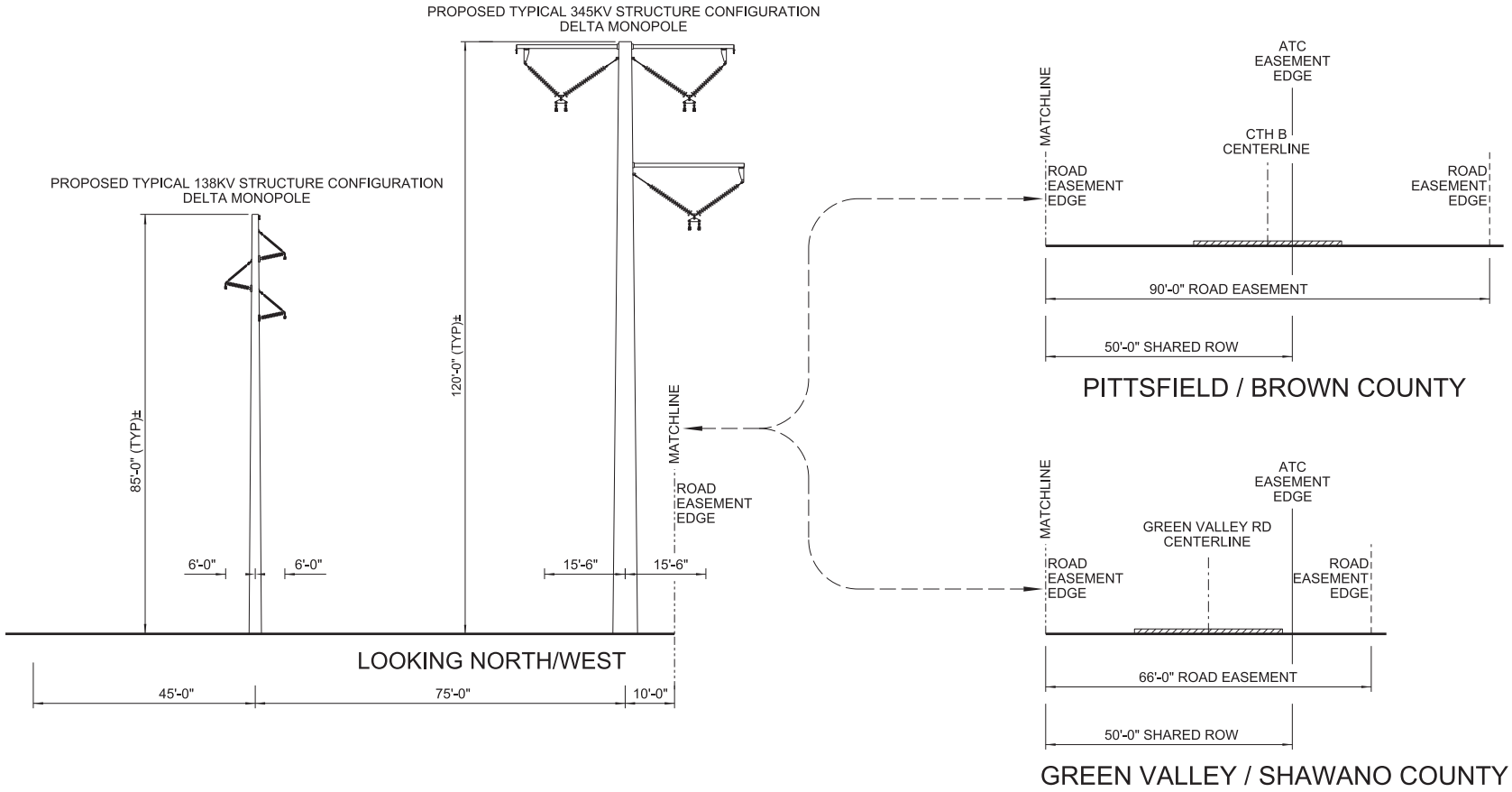
Appendix A: Figure 13b



NOTES:
1) DEPENDING ON THE PROPOSED ROUTE COMBINATION SELECTED, THE POSITIONS OF THE 138KV AND 345KV CIRCUITS COULD BE SWAPPED WITH THE 345KV STRUCTURE LOCATED GENERALLY 10FT OUTSIDE OF THE ROAD ROW.

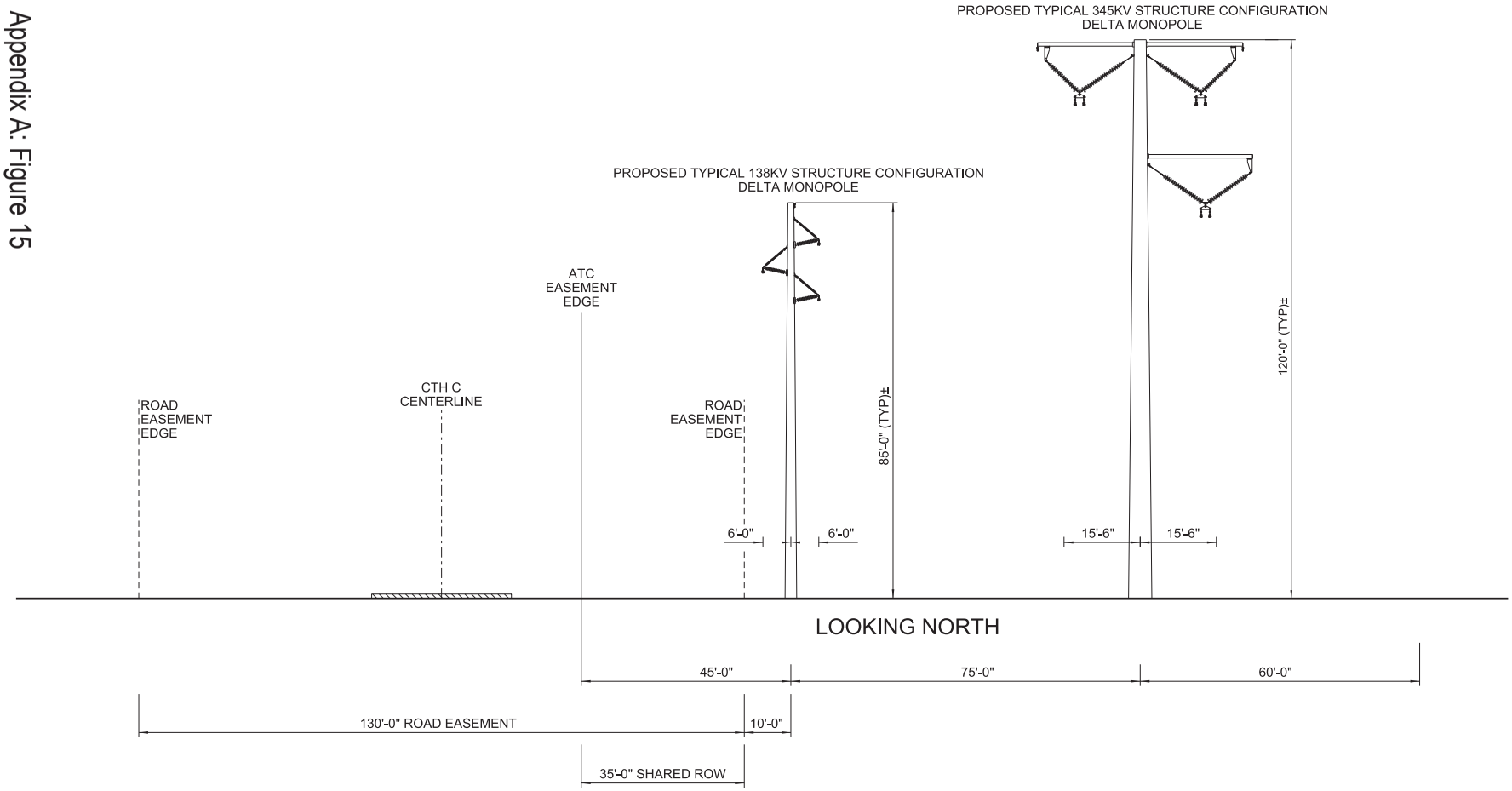
NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION
OSBORN / OUTAGAMIE COUNTY

Appendix A: Figure 14



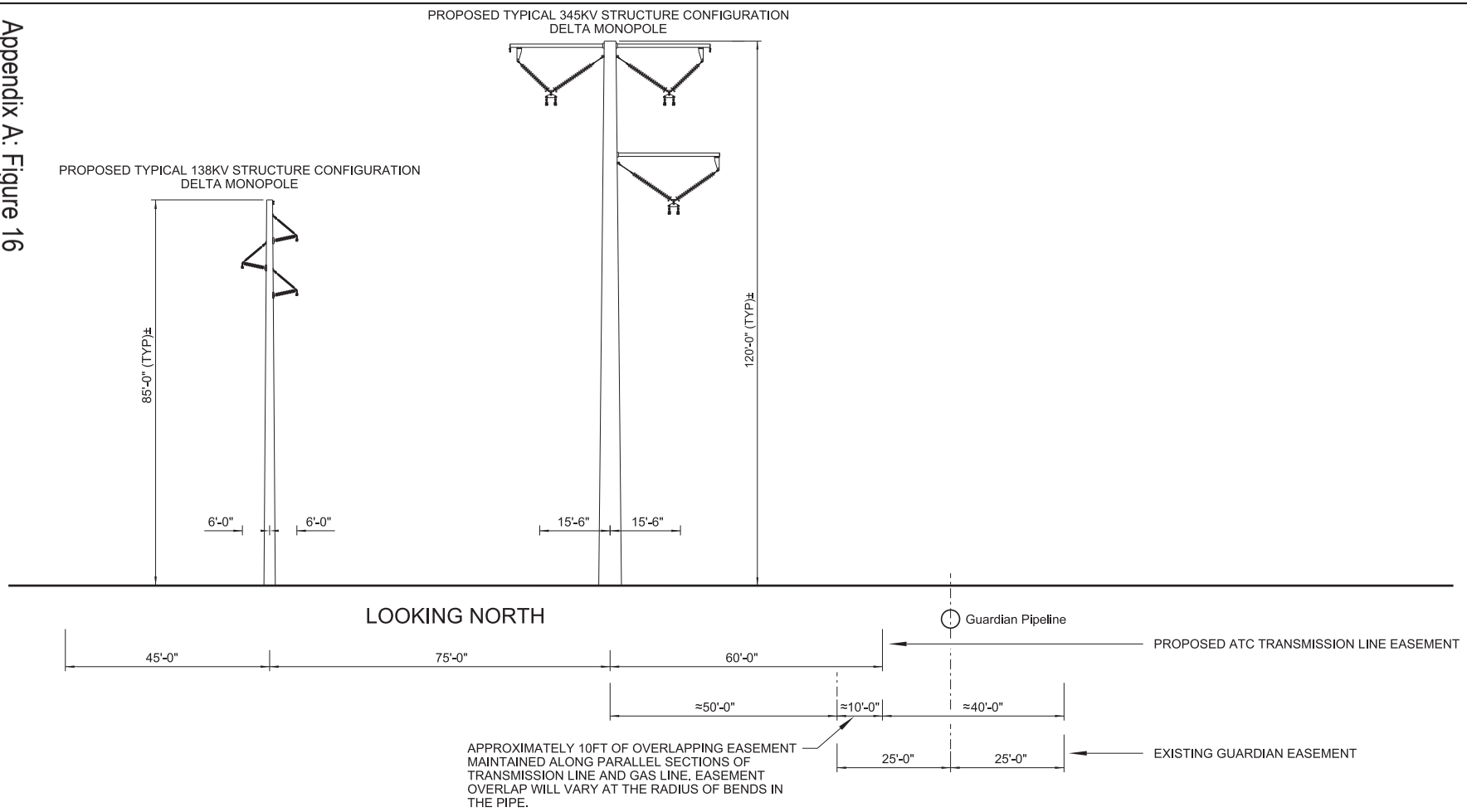
NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

Appendix A: Figure 15



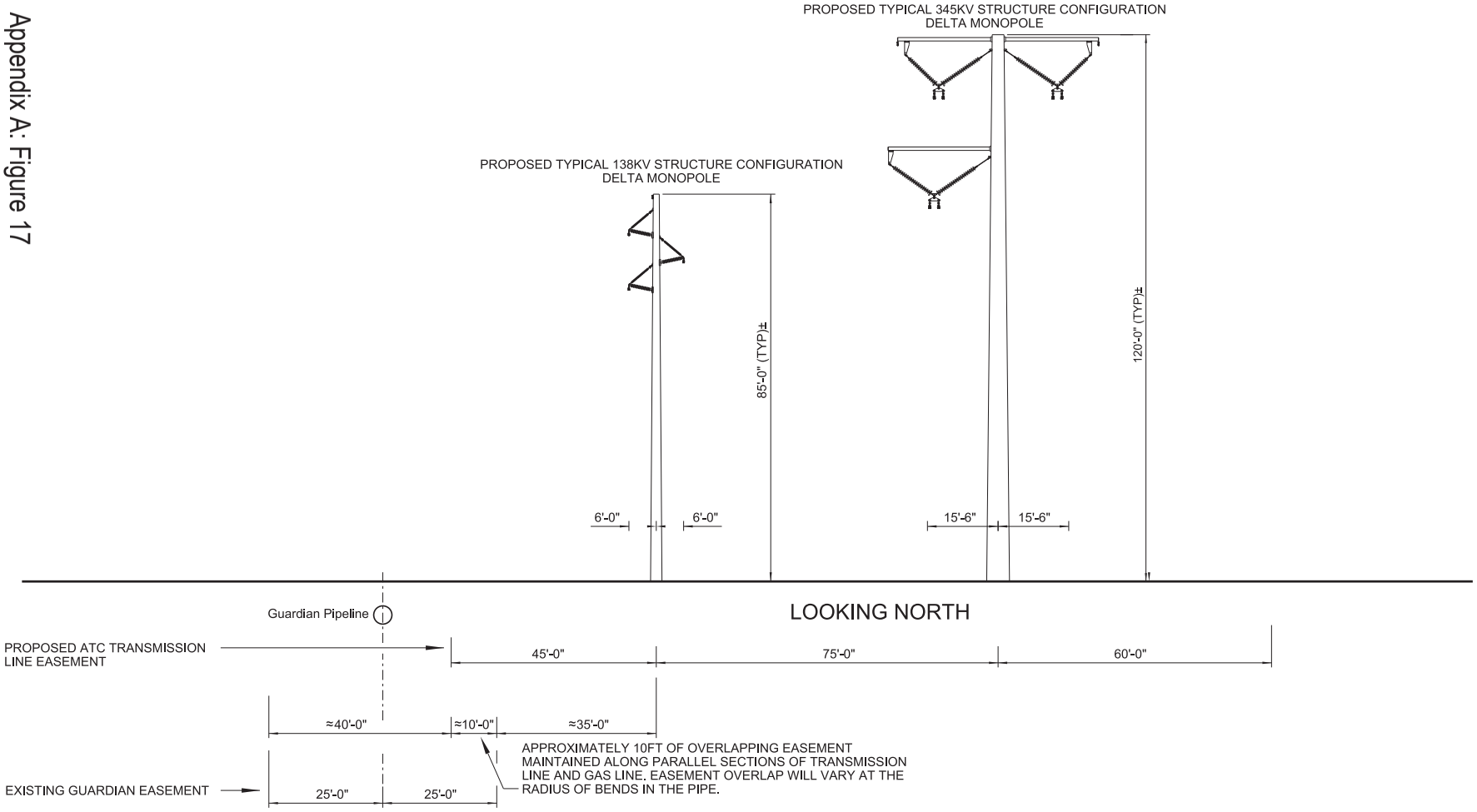
NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION
MORGAN / OCONTO COUNTY

Appendix A: Figure 16



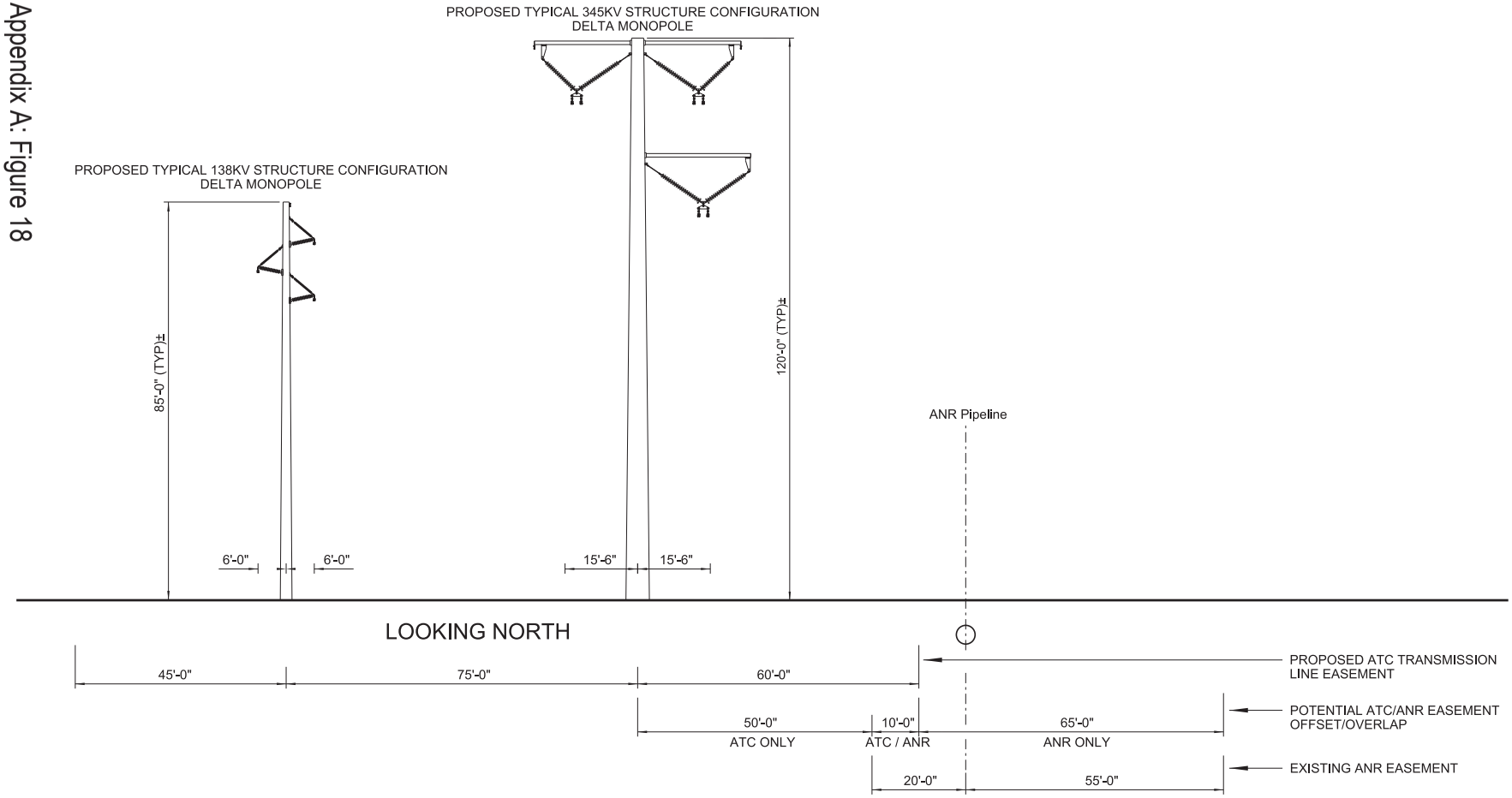
NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

Appendix A: Figure 17



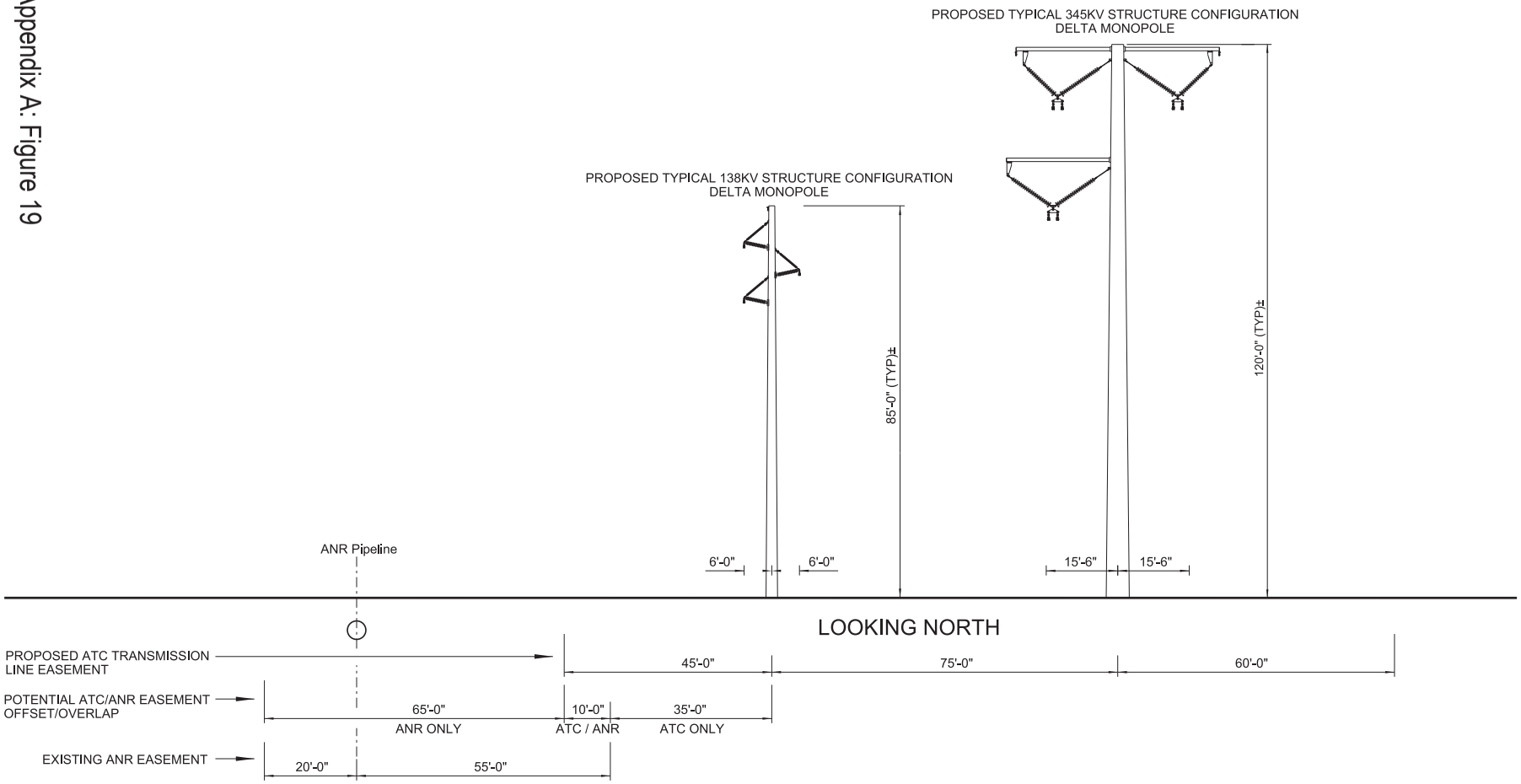
NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

Appendix A: Figure 18



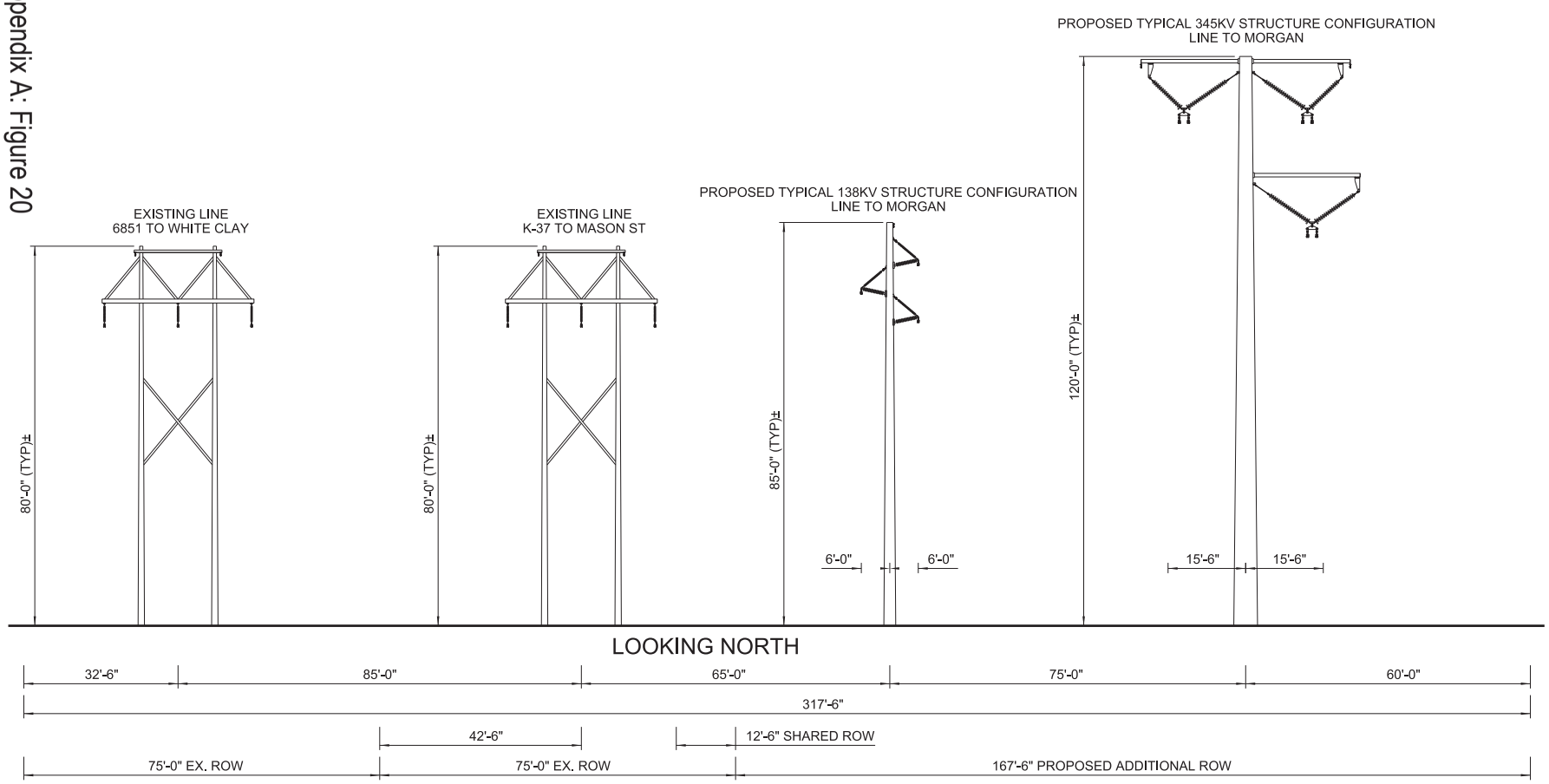
NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

Appendix A: Figure 19



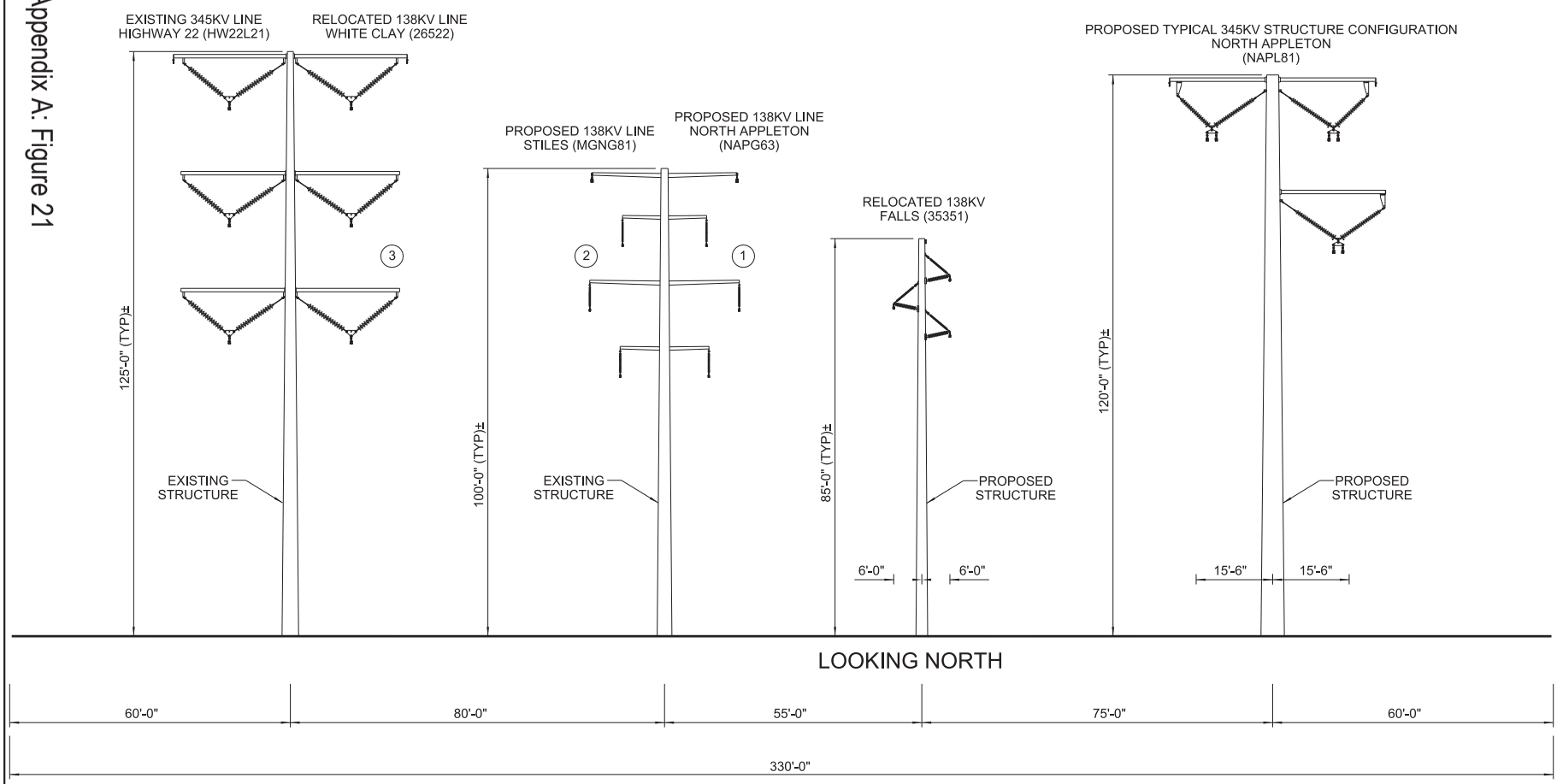
NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

Appendix A: Figure 20



NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

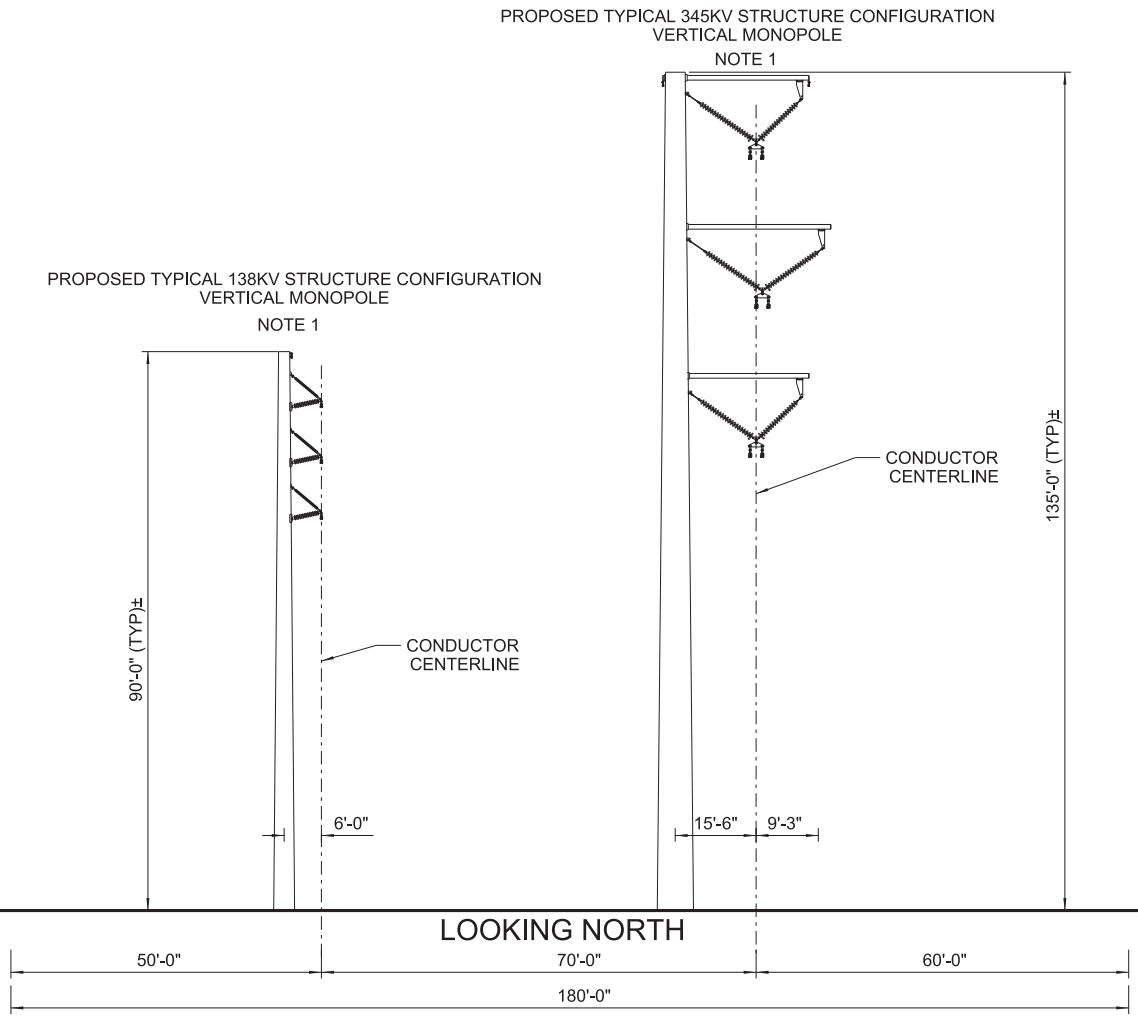
Appendix A: Figure 21



NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION
MORGAN SUBSTATION

NOTES:
1) POSITION OF 138KV FALLS (35351) BEFORE WIRE RELOCATION
2) POSITION OF 138KV WHITE CLAY (26522) BEFORE WIRE RELOCATION
3) UNUSED BEFORE WIRE RELOCATION

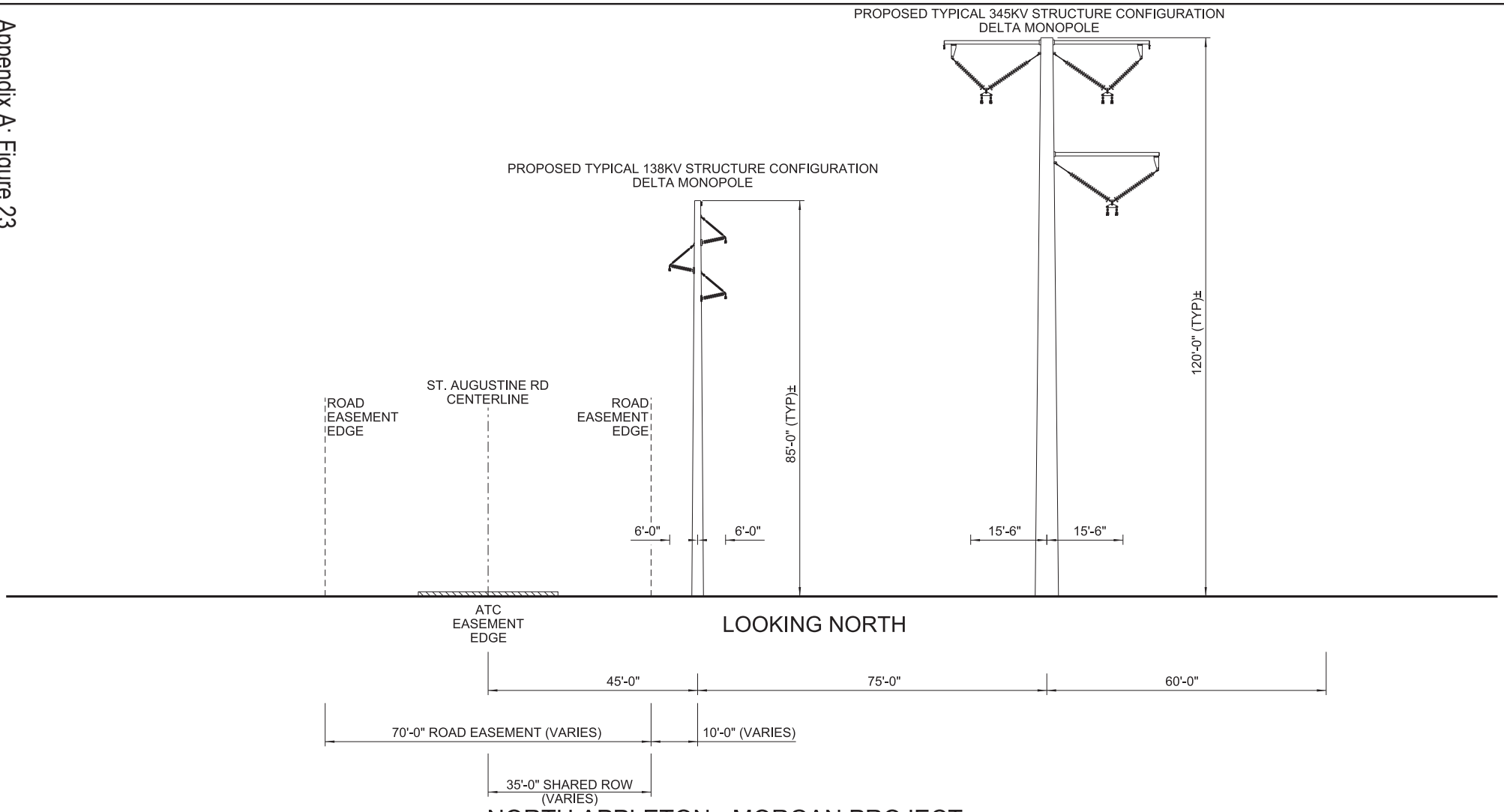
Appendix A: Figure 22



NOTES:
1) VERTICAL STRUCTURE ORIENTATION MAY BE MIRRORED ON THE CONDUCTOR CENTERLINE SO THAT THE POLE IS OFFSET RIGHT OR LEFT OF THE CENTERLINE WITHOUT AFFECTING ROW SPACING.

NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION

Appendix A: Figure 23



NORTH APPLETON - MORGAN PROJECT
PROPOSED RIGHT OF WAY CROSS SECTION
AND TYPICAL STRUCTURE CONFIGURATION
PULASKI COUNTY

Appendix B – Electric and Magnetic Fields Overview

Appendix B consists of a reproduction of the PSC's informational material about EMF. This material can also be found on the PSC website at http://psc.wi.gov/thelibrary/publications.htm#electric.

EMF
Electric & Magnetic Fields

The Electromagnetic Spectrum

Electricity produces two types of fields, electric and magnetic. These fields are often combined and referred to as electromagnetic fields or EMF. However, the two types of fields are quite different.

Recent scientific studies typically concentrate on the effects of magnetic fields and any potential association with health issues. "EMF" has become the popular short-hand term for magnetic fields.

Electric Fields

Wherever there is electricity, there are electric fields. While magnetic fields are created only when there is a current, electric fields are associated with any device or wire that is connected to a source of electricity, even when current is not flowing or the devise is not turned on.

Electric fields produced by high-voltage electric transmission lines have very little ability to penetrate buildings, or even skin. They are easily shielded by common objects such as trees, fences, and walls. Scientific studies have found no association between exposure to electric fields and human disease.

Magnetic Fields

Magnetic fields are created only when there is an electric current, the motion of electric charges (electrons) in a conductor, such as a wire. The magnitude of a magnetic field is proportional to the current flow through an electric line, not the voltage. As the current increases, so does the magnetic field.

There is no relationship between magnetic field strength and voltage. In the world of electric transmission lines, it is not uncommon for a 69 kilovolt (kV) electric line to have a higher magnetic field than a 115 kV line. High voltage 345 kV lines can carry large currents and as a result may produce relatively high magnetic fields, but primary distribution lines with voltages less than 69 kV can produce fields similar to those measured around a transmission line if they are carrying enough current.

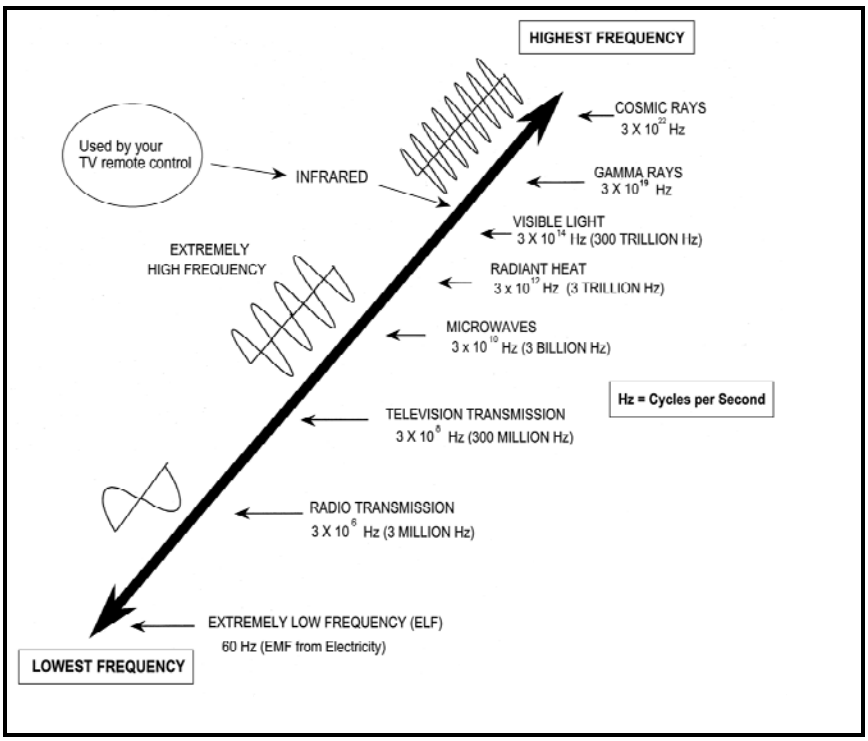
Magnetic fields become weaker rapidly with distance from the source. However, they do pass through most non-metallic materials and are therefore more difficult to shield.

In the literature, magnetic field data are presented in either units of Gauss (G) or Tesla (T). A milligauss (mG) is equal to one-thousandth of a Gauss (G). One Tesla is equal to 10,000 Gauss. A microtesla (μT) is equal to one-millionth of a Tesla or 10 mG.

Types of Radiation

Magnetic fields are part of the electromagnetic spectrum which includes cosmic rays, gamma rays, sunlight, microwaves, radio waves, and heat as illustrated in Figure 1.

Figure 1 Electromagnetic Spectrum



The electromagnetic spectrum is a name given to the range of different types of radiation from low to high frequencies. Radiation is energy that travels and spreads out as it moves away from a source. Visible light that comes from a lamp and radio waves that come from a radio station are two types of electromagnetic radiation. Only the highest frequency electromagnetic radiation, like gamma rays, can break apart DNA and lead to cancer. Low frequency radiations such as microwaves do not have enough energy to break molecular bonds, but can heat food items.

Magnetic fields generated by electric lines are in the extremely-low-frequency (ELF) range of the electromagnetic spectrum. The energy from these magnetic fields is very small. Magnetic fields from appliances and transmission lines cannot break molecular bonds.

Common Levels of Magnetic Fields

Any device that uses electric current creates a magnetic field. Electric appliances such as computers and refrigerators and the wiring that runs through walls and ceilings in homes produce magnetic fields when current is flowing. Table 1 lists sample ranges of magnetic fields for various appliances and tools. For comparison, Table 2 shows typical magnetic fields generated by different types of electric lines. Typical background environmental or ambient magnetic field levels are most often around 1 to 3 mG. Table 3 shows magnetic fields generated by different types of underground transmission lines.

Table 1 Common Sources of Magnetic Fields (mG)[1]

Sources*	Distance From Source	
	6 inches (mG)	24 inches (mG)
Microwave Ovens	100 - 300	1 - 30
Dishwashers	10 - 100	2 - 7
Refrigerators	Ambient - 40	Ambient - 10
Fluorescent Lights	20 - 100	Ambient - 8
Copy Machines	4 - 200	1 - 13
Drills	100 - 200	3 - 6
Power Saws	50 – 1,000	1 - 40

* Different makes and models of appliances, tools, or fixtures will produce different levels of magnetic fields. These are generally-accepted ranges.

Table 2 Typical US Magnetic Field Levels Associated with Overhead Transmission Lines[2]

Overhead Transmission Line Voltages	Usage	Typical Magnetic Field Measurements (mG)				
		Maximum in ROW	Approximate Distance From Centerline (Feet)			
			50	100	200	300
115 kV	Average	30	7	2	0.4	0.2
	Peak	63	14	4	0.9	0.4
230 kV	Average	58	20	7	1.8	0.8
	Peak	118	40	15	3.6	1.6
500 kV	Average	87	29	13	3.2	1.4
	Peak	183	62	27	6.7	3.0

NOTE: These values are for general information and not for a specific line.

[1] National Institute of Environmental Health Sciences (NIEHS) and National Institutes of Health, *EMF: Electric and Magnetic Fields Associated with the Use of Electric Power*, June 2002, pp.33-35, <http://www.niehs.nih.gov/health/topics/agents/emf/>, accessed on April 10, 2013.

[2] World Health Organization (WHO), *Extremely Low Frequency Fields, Environmental Health Criteria Monograph No. 238,* Geneva, World Health Organization, 2007, modified from Table 6, p. 33.

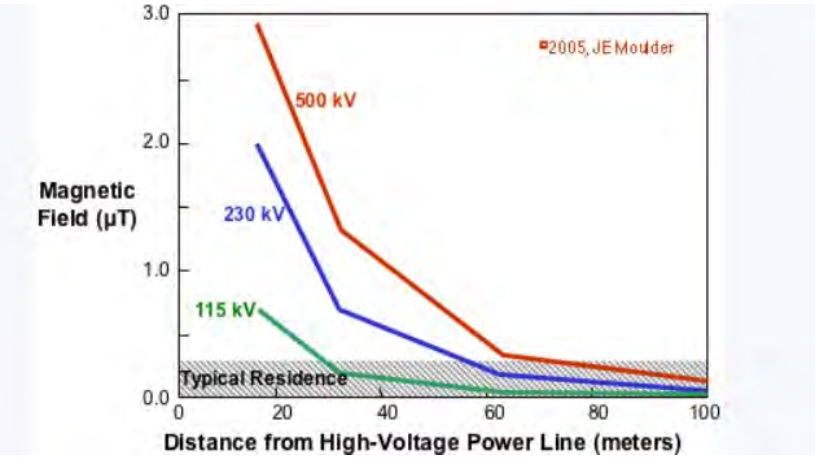
Table 3 Typical Magnetic Field Levels Associated with Underground Transmission Lines in the UK[3]

Underground Transmission Line Voltages	Details	Load	Typical Magnetic Field Measurements (mG) Approximate Distance From Centerline (Feet)			
			0	16	33	66
132 kV	Single cable at a depth of 1 m	Typical	50	17.8	9.4	4.7
275 kV	Direct buried with 0.5 m spacing and at 0.9 m depth	Maximum	962	131	36	9.2
		Typical	241	33	9.0	2.3

NOTE: While the standard voltages of lines in the UK differ from those used in Wisconsin, the information may be used as general background information and as a comparison with overhead transmission lines.

Since magnetic field levels in the vicinity of transmission lines are dependent on the flow of electric current through them, they fluctuate throughout the day as electrical demand increases and decreases. For overhead transmission lines, the magnetic fields typically range from about 5 to 150 mG, depending on current load, separation of the conductors, and distance from the lines. In general, at a distance of about 300 feet from a transmission line, measured magnetic fields are similar to typical ambient background levels found in most homes[4]. Figure 2 shows a generalized graphic view of how magnetic fields quickly diminish with distance.

Figure 2 Magnetic Field Strength and Distances from Overhead Transmission Lines[5]



[3] WHO, 2007, modified from Table 7 on p.34.
[4] NIEHS, 2002., p. 35.
[5] Medical College of Wisconsin website by John Moulder, *Power Lines and Cancer FAQs,* <http://www.mcw.edu/radiationoncology/ourdepartment/radiationbiology/Power-Lines-and-Cancer-FAQs.htm>, accessed on April 10, 2013.

Health Concerns

After more than three decades of research, there are still concerns among members of the public regarding exposure to elevated magnetic fields and an increased risk of childhood cancers. The concern about power lines and cancer comes largely from studies of people living near power lines and people working in the electrical occupations. Some of these studies appear to show a weak association between exposure and power-frequency magnetic fields and the incidence of some cancers.

Types of Studies

Medical research is of several different types, including epidemiological studies, laboratory studies, and clinical studies.

Epidemiological studies collect data in the real world and draw inferences from the information collected. For medical research, epidemiological studies observe and compare groups of people who have had or have not had certain diseases or exposures to see if the risks to the groups differ. Usually when epidemiological studies show a consistent and strong association to a risk factor, scientists will develop a plausible theory for how such an exposure might cause the disease. This is called a biological mechanism.

Epidemiological studies alone are not sufficient to verify a theory of cause and effect because the results are statistical associations and not direct evidence. To get beyond epidemiological studies and evaluate whether exposure to magnetic fields actually causes health effects, laboratory studies of cells and animals and clinical studies with human volunteers are necessary.

Controlled laboratory studies are conducted at the cellular level and on lab animals to test the hypothesis. In medical laboratory studies, the researchers take total control over study conditions to try to determine the actual biological mechanisms of how potential agents like magnetic fields can cause disease.

Clinical studies make use of the theories of biological mechanisms, and perhaps the laboratory testing results, to try to quantify effects on persons. In clinical studies, human volunteers are tested with different treatments to measure the actual effects on them accurately. For studies of EMF effects, medical researchers use controlled exposure rates on volunteers to look for measurable changes such as brain activity and hormonal levels.

Epidemiological Studies

In 1979, an epidemiology study by Wertheimer and Leeper[6] reported a statistical association between "wire codes" and childhood cancers in certain neighborhoods of Denver, Colorado. The term, "wire code" referred to the physical size of the power line which was assumed to be related to current flow of the line and thus a good surrogate measurement for the magnetic field. No magnetic field measurements were ever conducted for this study. Because the size of a line is not related to the magnetic field, subsequent studies have been tried to determine if there is any validity to the relationship stated in the Wertheimer/Leeper study. A multitude of increasingly sophisticated laboratory and correlative studies have investigated the potential association for more than 30 years.

[6] N.W. Wertheimer and Leeper, E., "Electric Wiring Configurations and Childhood Cancer", *Am. J. Epidem.*, Vol. 109, 1979, pp. 273-284.

Epidemiological studies are field studies. Unlike laboratory research where investigators have total control over study conditions, epidemiologists observe the world as it is. They draw inferences from information observed or collected about a study population's life, habits, and exposure to environmental factors. Because of this limitation, epidemiological studies suffer from a number of inherent weaknesses which may include issues associated with sample size, sample biases, and confounding factors. It is not uncommon for published studies to be criticized for weaknesses in study design or faulty conclusions. Additionally, particularly in regard to the study of EMF impacts, there is a problem with the lack of unexposed populations (control group) that can be compared to exposed populations. Everyone is exposed to some level of magnetic fields from household appliances and existing electric lines.

Most public and scientific attention has focused on childhood leukemia with lesser attention given to adult leukemia, childhood and adult brain cancer, lymphoma, and overall childhood cancer. Some epidemiological studies used a combination of the type of wiring and the distance to a residence as means of quantifying exposure, as the Wertheimer/Leeper study did, to see if level of exposure varied with the occurrence of cancer. Other studies used distance from transmission lines or substations as measures of exposure, and some studies have used contemporary measured fields or calculated fields. In general, the different methods of exposure assessment do not agree with each other, and there is no one method of exposure assessment common to all the major studies.

One set of epidemiological studies has involved research of potential links between the occurrence of adult cancers and EMF exposure in electrical workers. The assumption is that electrical workers present a larger population than children with leukemia and they may be routinely exposed to higher levels of magnetic fields for longer periods of time. However in some of these studies, there were no consistent dose-response relationships. They were studies based on job titles and not on measured exposures.

Laboratory Studies

Laboratory studies have been conducted to look at the possibility of genetic mutations from magnetic fields because genetic mutations are at the root of the development of cancers like leukemia.

Cellular genotoxicity studies look at the properties of an agent that might damage the genetic information within a cell and cause mutations, which may lead to cancer. There have been many published cellular studies, examining many types of cells from plasmids and bacteria to human cells. A wide range of exposure conditions and field intensities have been assessed looking for a plausible biological mechanism to explain how EMF might cause disease in the human body.

Whole-animal laboratory studies are used to determine whether or not exposure does indeed lead to disease. Animals can be exposed to elevated levels of an agent under strictly controlled conditions for long periods of time and then carefully examined for an increase in tumors, pre-cancerous effects, and cancer. The usefulness of laboratory animal work for assessing toxicity depends on how well the work is done, what care is given to the animals, and whether the results are reproducible.

Clinical Studies

Clinical studies with human individuals rely on volunteers in a last step toward determining the degree of an agent's ability to cause disease. Clinical studies have varying degrees of rigor and can depend in part of how the volunteer study participants cooperate with the researchers as well as the researchers' control over the volunteer participants.

Participating Organizations

More than 25,000 scientific epidemiological, occupational safety, laboratory animal and cellular studies have been published. In addition there have been numerous reviews of the available research from various respected national and international organizations. A short list of the countries and organizations that have participated include:

American Cancer Society (ACS)
American Industrial Hygiene Association (AHA)
American Medical Association (AMA)
British Columbia Center for Disease Control
European Union
Health Canada
Institute of Electrical and Electronics Engineers (IEEE)
International Agency for Research on Cancer (IARC)
International Commission on Non Ionizing Radiation Protection (ICNIRP)
National Cancer Institute (NCI)
National Institute of Environmental Health Sciences (NIEHS)
Netherlands Health Council (NHC)
World Health Organization (WHO)

A list of all EMF studies to-date would be too numerous for our purposes, but a list of useful links to studies and organizations can be found at the end of this publication. There is also a summary of the findings from scientific organizations on EMF and its potential health effects.

The Results

Childhood leukemia is a relatively rare disease and its causes are not well understood despite decades of research. On average, 1 to 2 children develop the disease each year for every 10,000 children in the United States.[7] Overall though, it is still the most common type of childhood cancer, amounting to 30 percent of all cancers diagnosed in children younger than 15 years. Because the disease is very serious, researchers continue to study a wide range of subjects looking for causes and for the most effective treatments.

In order to have confidence that an exposure agent is actually linked to human disease, scientists look for strong and consistent associations from epidemiological research. In the cases of electric and magnetic fields, the studies have found only weak association, or no association, between exposure and the incidence of some cancers. In addition, study outcomes are not consistent. A large number of studies show no association between transmission lines and cancers. In contrast, the vast majority of epidemiological studies on cigarette smoking have showed a strong positive association between cigarette smoking and lung, neck, and throat cancer.

Science cannot prove a negative, so magnetic fields cannot be proven to have no effect and be safe. However, so far, science has not been able to prove the positive either, that magnetic fields do have an effect -- no published power-frequency exposure study has shown a statistically-significant dose-response relationship between measured magnetic fields and cancer rates, or between distances from transmission lines and cancer rates.

[7] National Cancer Institute at the National Institutes of Health, National Cancer Institute Factsheet, Childhood Cancers, <http://www.cancer.gov/cancertopics/factsheet/Sites-Types/childhood>, accessed April 10, 2013.

Overall, most scientists are convinced that the evidence that power line fields cause or contribute to cancer is weak to nonexistent. The biological studies conducted to-date has not been able to establish a cause-and-effect relationship between exposure to magnetic fields and human disease. Scientists have been unable to identify any plausible biological mechanism by which EMF exposure might cause human disease. There is a general consensus within the scientific community that exposure to EMF is not responsible for human disease. In summary:

- There is no documented cancer linked to EMF exposure.[8]
- There is little evidence that magnetic fields cause childhood leukemia, and there is inadequate evidence that magnetic fields cause other cancers in children.[9]
- Studies of adults' magnetic field exposure from power lines show little evidence of an association with leukemia, brain tumors, or breast cancer.[10]
- Whole animal exposure studies have not shown evidence that long-term exposure to EMF causes cancer, and no link has been found to leukemia, brain cancer, and breast cancer.[11]
- For power line magnetic fields below 500 mG, no plausible mechanisms have been identified by which biological effects can be caused in living systems. [12]

Regulation of Magnetic Fields

Public Service Commission of Wisconsin

The Public Service Commission of Wisconsin (PSCW or Commission) actively monitors research on EMF and its potential for causing human health effects. Consideration of magnetic field exposures is a regular part of the review process for electric utility construction cases. Transmission and substation construction applications must contain several types of information that relate to magnetic fields.

A utility must provide estimates of magnetic fields that would be generated by a proposed transmission line. The estimates are specific to the proposed voltage, line configuration and peak power flows during the first year of operation and after ten years of operation. In its application, a utility must report the number and type of buildings within 300 feet of a proposed centerline, including schools, hospitals, and daycare centers.

Commission staff checks and verifies the utility's calculations of the estimated magnetic fields. This information is then available to the public and considered by the Commission in its route selection decisions.

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[8] Michael P. Halpin, P.E., Florida Department of Environmental Protection, *Transmission Lines – Electric and Magnetic Fields (EMF)*, presentation, <http://www.dep.state.fl.us/siting/files/application/ppsa/turkey_pt/emf_presentation.pdf>, website accessed April, 10, 2013.

[9] National Cancer Institute Factsheet, <http://www.cancer.gov/cancertopics/factsheet/Risk/magnetic-fields>, accessed April, 10, 2013.

[10] Ibid.

[11] Medical College of Wisconsin, 2006.

[12] Robert K. Adair, "Constraints on Biological Effects of Weak Extremely-Low-Frequency Electromagnetic Fields," *Phys Rev A*, January 1991, Vol. 43, Issue 2, pp. 1039-1048.

Other Regulations and Guidelines

Limits established by national and international professional organizations are well beyond the range of magnetic fields typically generated by transmission lines. In 2002, the Institute of Electrical and Electronics Engineers (IEEE), a professional group, published a public exposure guideline of 9,040 mG.[13] In 2010, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) revised its reference levels for public exposure for magnetic fields in the 60 Hz range, and recommended that magnetic fields to not exceed 2,000 mG[14]. In the US, there are no federal standards at all limiting occupational or residential exposure to power line EMF.

Some other states, particularly Florida and New York, have standards or guidance documents related to magnetic fields produced by transmission power lines. Florida limits magnetic fields at the edge of the ROW to 150 mG for transmission lines with voltages of 69 kV through 230 kV. For lines greater than 250 kV, the limit is 200 mG. Double-circuited 500 kV lines and lines greater than 500 kV may not exceed 250 mG, also at the edge of the ROW.[15] New York has a policy that requires transmission lines to be designed, constructed and operated so that magnetic fields at the edges of the ROW will not exceed 200 mG.[16]

The California Public Utility Commission requires utilities to apply no- or low-cost EMF reduction techniques to new or upgraded transmission facilities.[17]

Mitigation of Magnetic Fields

One method to lower the public's exposure to the magnetic fields generated by transmission lines is to increase the distance of the conductors from the public. The fields decrease drastically with distance. The magnetic field level at 300 feet or more from a transmission line centerline should be similar to local ambient, or background, levels. Increasing the height of any transmission structure thus lowers any resulting exposure levels.

Another common method to reduce magnetic field exposure to the public is to bring the lines (conductors) closer together. The magnetic fields interfere with one another, producing a lower overall magnetic field level. The conductors can be brought closer together by using different types of structures or double-circuiting two lines on the same structures (see Figure 3). However, there are electrical safety limits to how close together conductors can be placed. Conductors must be far enough apart so that arcing cannot occur and so that utility employees can safely work around them. Additionally, the closer conductors are to one another, the closer together poles must be constructed. Increasing the number of poles per mile increases private property land impacts and costs.

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[13] Institute of Electrical and Electronics Engineers (IEEE), *C95.6-2002 IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields 0 to 3 kHz*,. New York, IEEE, 2002 <http://standards.ieee.org/findstds/standard/C95.6-2002.html>, accessed on April 10, 2013.

[14] International Commission on Non-Ionizing Radiation Protection (ICNIRP), *Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz - 100 kHz)*. Health Physics, Vol. 99, No. 6, November 2010, p. 3, <http://www.icnirp.de/documents/FactSheetLF.pdf>, accessed on April 10, 2013.

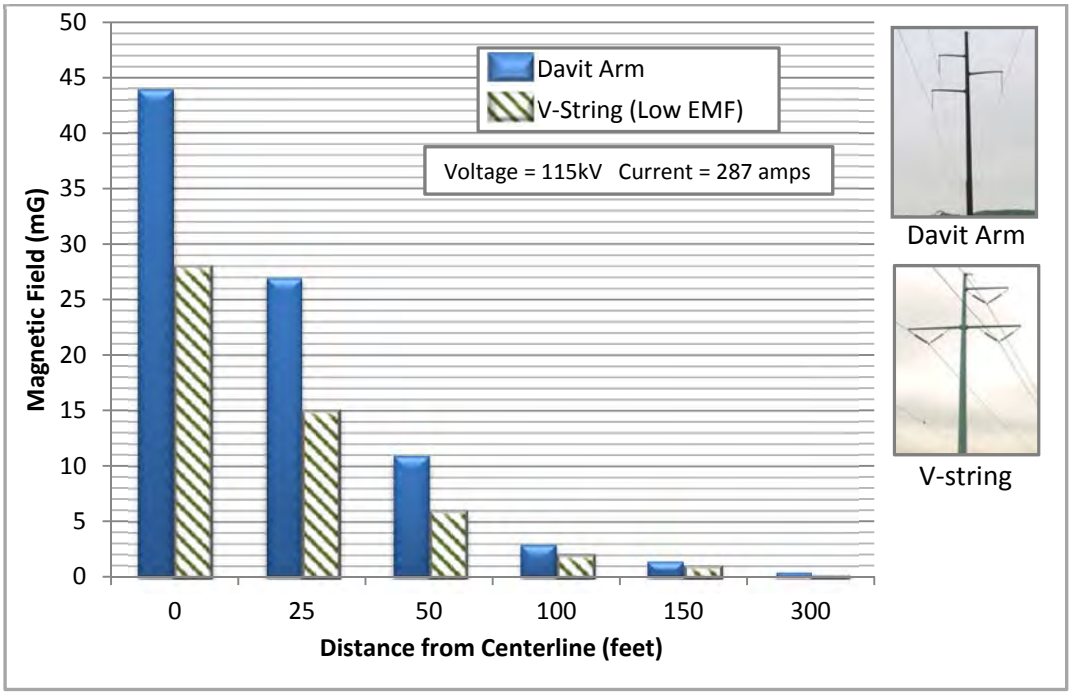
[15] Florida Administrative Code 62-814.450.

[16] State of New York Public Service Commission, *Statement of Interim Policy on Magnetic Fields of Major Electric Transmission Facilities, Cases 26529 and 26559*, Issued and Effective September 11, 1990.

[17] California Public Utility Commission, CPUC Decision D.93-11-013.

Burying transmission lines can also reduce magnetic fields because the underground lines can be installed closer together than overhead lines. Overhead lines need to be further apart because air is used as an insulator, but underground cables be insulated with rubber, plastic, or oil. Underground transmission lines are typically three to five feet below ground. While magnetic fields can be quite high directly over the line, magnetic fields on either side of an underground line decrease more drastically with increased distance than magnetic fields from an overhead line.

Figure 3 Sample EMF for Two Types of Transmission Structures



Sources of Information

The following organizations and websites contain detailed information about EMF and transmission lines along with links to published research.

International Commission on Non Ionizing Radiation Protection
http://www.icnirp.de/PubEMF.htm

Medical College of Wisconsin
http://www.mcw.edu/radiationoncology/ourdepartment/radiationbiology/Power-Lines-and-Cancer-FAQs.htm

National Cancer Institute (NCI)
http://www.cancer.gov/cancertopics/factsheet/Risk/magnetic-fields

National Institute of Environmental Health Sciences (NIEHS)
http://www.niehs.nih.gov/health/topics/agents/emf/

US EPA
http://www.epa.gov/radtown/power-lines.html

World Health Organization (WHO)
http://www.who.int/peh-emf/en/

Summaries of Scientific Consensus Group Assessments of EMF and Health Effects[18]

Scientific Group	Endpoints Considered	Overall Conclusions	Level of Concern
American Cancer Society (ACS)	cancer	[EMF] not proven to cause cancer	low
American Conference of Governmental Industrial Hygienists (ACGIH)	health	insufficient information on human responses and possible health effects of magnetic fields in the frequency range of 1 Hz to 30 kHz to permit the establishment of a threshold limit value for time-weighted exposures	low
American Industrial Hygiene Association (AIHA)	health	insufficient evidence of human health risk at EMF levels below ICNIRP guidelines	low
American Medical Association (AMA)	cancer/health	no scientifically documented health risk associated with the usually occurring levels of electromagnetic fields	low
American Physical Society (APS)	cancer/health	conjecture relating cancer to power line fields has not been scientifically substantiated	low
Australian Radiation Protection and Nuclear Safety Agency (ARPNSA)	health	no evidence that prolonged exposures to weak EMF result in adverse health effects	low
British Columbia Center for Disease Control (BCCDC)	health	no evidence yet to support the assumption that adverse health effects from exposure to current residential and occupational levels pose a risk to human health	low
British National Radiation Protection Board (NRPB), now health Protection Agency (HPA)	health	recommend ICNIRP EMF limits; apparent increased incidence of childhood leukemia at >4 mG, but weak evidence does not justify causality; no evidence of other health effects	low
Committee on Man and Radiation	health	balance of evidence is against the fields encountered by the public being a cause of cancer or any other disease	low
European Union (EU)	cancer/health	overall evidence for EMF to produce childhood leukemia is limited; no suggestions of any other cancer effects	low
Health Canada (HC)	health	no conclusive evidence of any harm caused by exposures at levels normally found in residential and work environments	low
Institution of Electrical Engineers (IEE)	health	not enough scientific evidence to indicate that harmful effects occur in humans due to low-level electromagnetic field exposure	low
Institute of Electrical and Electronics Engineers (IEEE)	health	the low-frequency standard IEEE C95.6 is leading standard worldwide on protection against ELF exposure to human beings; basic restrictions based on current biological knowledge; IEEE standards also adopted by the International Committee on Electromagnetic Safety (ICES)	low
International Agency for Research on Cancer (IARC)	cancer	limited convincing evidence in humans for childhood leukemia; inadequate evidence in humans for all cancers	low / med
International Commission on Non Ionizing Radiation Protection (ICNIRP)	health	no convincing evidence for carcinogenic effects of EMF; data cannot be used to set guidelines; ICNIRP guidelines are not based on cancer risks	low
Medical College of Wisconsin (MCW)	health	evidence that power line fields cause or contribute to cancer seen by most scientists as weak to nonexistent	low
National Academy of Sciences / National Research Council (NRC)	cancer/health	body of evidence has not demonstrated that exposures to EMF are a human-health hazard	low
National Cancer Institute (NCI)	cancer (breast)	no association between exposure to EMF and breast cancer in Long Island	low
National Cancer Institute (NCI)	cancer (leukemia)	little support for hypothesis that EMF is related to risk of childhood leukemia	low
National Institute of Environmental Health Sciences (NIEHS)	health	weak evidence for possible health effects from EMF; but they cannot be ruled out, especially epidemiological associations with childhood leukemia	low

[18] State of Connecticut, Connecticut Siting Council, "*Current Status of Scientific Research, Consensus, and Regulation Regarding Potential Health Effects of Power-Line Electric and Magnetic Fields (EMF)*", January 2006, modified from Appendix A.

Summaries of Scientific Consensus Group Assessments cont'd

Scientific Group	Health Endpoints Considered	Overall Conclusions	Level of Concern
National Toxicology Program (NTP)	cancer	no increased neoplasm incidences at sites in highly exposed rats and mice for which epidemiology studies have suggested an association with EMF	low
Netherlands Health Council (NHC)	cancer	adheres to its previously expressed view that, on the basis of the current level of knowledge, there is no reason to take action to reduce EMF levels	low
Occupational Safety and Health Administration (OSHA)	health	no specific OSHA standards address ELF fields; however, there are national consensus standards which OSHA could consider (ACGIH and ICNIRP)	low
World Health Organization(WHO)	health	cause-and-effect link between ELF field exposure and cancer has not been confirmed	low
California Department of Health Services	health	concern about possible health hazards - childhood leukemia, adult brain cancer, Lou Gehrig's disease and miscarriage, but evidence is incomplete, inconclusive and often contradictory	low
California Public Utilities Commission (CPUC)	health	interim measures adopted because of the lack of scientific or medical conclusions about potential health effects from utility electric facilities and power lines	low / med
Connecticut Department of Public Health	health/cancer	health risk caused by EMF exposure remains an open question; some studies show a weak link between EMF exposure and a small increased risk of childhood leukemia at average exposures above 3 mG; for cancers other than childhood leukemia, none of the studies provide evidence of an association	low
Florida Department of Environmental Protection	health	no convincing evidence for carcinogenic effects of ELF fields	low
Maryland Department of Natural Resources	health	EMF exposures remain suspect, but remaining unknowns are the reason for continued lack of firm affirmation of health risks from EMF exposures	low
Massachusetts - Energy Facilities Siting Board	health	informally adopt edge of ROW permissible levels of 85 mG for magnetic fields	
Minnesota Department of Health	health	body of evidence insufficient to establish a cause and effect relationship between EMF and adverse health effects	low
New Jersey Department of Environmental Protection	health	not known at this point whether exposure to magnetic fields from power frequency sources constitutes a health hazard	low
New York Department of Environmental Protection	health	interim policy requires transmission lines to be designed, constructed and operated such that magnetic fields at the edges of their ROWs will not exceed 200 mG	
Utah Department of Environmental Quality	health	no convincing evidence in the published literature to support the contention that exposures to extremely low frequency electric and magnetic fields (ELF-EMF) generated by sources such as household appliances, video display terminals, and local power lines are demonstrable health hazards	
Vermont Department of Health	health	data insufficient to establish a direct cause and effect between EMF exposure and adverse health effects	low
Virginia Department of Health	health	scientific proof of a causal association has not been satisfied for the implicit adverse effects of power-line frequency EMF	low

The Public Service Commission of Wisconsin is an independent state agency that oversees more than 1,100 Wisconsin public utilities that provide natural gas, electricity, heat, steam, water and telecommunication services.

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Appendix C – Agricultural Impact Statement

The DATCP AIS was not completed as of the publication date of this EIS. It is intended by DATCP to be completed in time for inclusion in the hearing record and to be available on the DATCP website in mid-December. Included in Appendix C at this time are two items:

- The Executive Summary of the AIS that provides readers with an overview of how agricultural impacts were identified and analyzed at DATCP, as well as the agency's recommendations for construction practices to minimize adverse agricultural effects.

- A draft Table of Contents for the AIS that gives readers a preview of the agricultural impacts identified and analyzed.

AGRICULTURAL IMPACT STATEMENT

EXECUTIVE SUMMARY

North Appleton-Morgan Transmission Lines

PSCW Docket #: 137-CE-166

American Transmission Company is proposing to construct 345 kV and 138 kV transmission lines known as the North Appleton-Morgan Project. This Agricultural Impact Statement (AIS), developed by staff at the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP) is an informational and advisory document that describes and analyzes the potential effects of the proposed project on farm operations and agricultural resources. The AIS provides information that will help affected landowners understand the potential effects of the project on their land and their rights in the review and construction processes; aid the Public Service Commission (PSC) in making decisions regarding project approval and route alternatives; offer the project Applicant practices and techniques to avoid or mitigate damages to farmland and farm operations; and give the general public a better understanding of the impacts the proposed project could have on agriculture.

The DATCP is not involved in determining whether or not eminent domain powers will be used or the amount of compensation to be paid for the acquisition of any property, nor can the information in the AIS stop a project. The AIS reflects the general objectives of the DATCP in recognition of the importance of conserving important agricultural resources and maintaining a healthy rural economy.

ATC proposes to construct approximately 40-48 miles of two new independent, co-located 345 kV and 138 kV transmission lines on separate structures from the North Appleton Substation to the Morgan Substation, which may require rebuilding certain existing 345 kV and 138 kV transmission facilities depending on the route alternative selected. ATC additionally proposes to construct a new Benson Lake Substation located on ATC-owned property adjacent to the existing Amberg Substation, electrically separate an existing Morgan–Stiles 138 kV circuit into two circuits, and perform miscellaneous substation work including the relocation of several existing transmission lines to support the project. The Applicant has proposed routes for the line which have been divided into Segments for ease of comparison. The AIS attempts to describe impacts associated with each segment alternative in a comparison format so readers are aware of the agricultural impacts associated with choosing one route segment over another.

Agriculture is extremely important for the economy of Wisconsin and for each of the potentially affected counties this project would cross. Should the PSC determine that this project is needed, significant consideration should be given to choosing routes and construction practices that impact agricultural operations and agricultural landowners to the smallest extent possible. Specific considerations to assess route segment decisions, construction requirements, and the degree of impacts to agriculture include:

- Multiple transmission line poles and wider right-of-ways affecting production practices

- Total agricultural land along segment corridor
- New versus existing right-of-way extent on agricultural land
- Right-of-way extent on prime and other highly productive farmland classes
- Number and type of agricultural operations impacted (dairy, organic, specialty, row crop, etc.)

If the project is approved, DATCP strongly requests that the Commission consider and possibly require double-circuiting the two proposed lines on a single structure. Doing so will significantly reduce the amount of farmland affected by easements and reduce the number of poles in cropland that farmers would need to farm around. Obstacles in fields reduce a farmer's efficiency and productivity by:

1. Removing land from production where the pole stands as well as where adjacent land becomes inaccessible to farm equipment (240-320 square feet per pole).

2. Increasing the potential for weed infestation in the adjacent field from land that has been made inaccessible to cultivation because of the pole.

3. Causing the equipment operator to overlap parts of the field to avoid the pole, resulting in multiple applications of seed and chemicals to those areas.

4. Increasing the collision risk of farm machinery with poles leading to equipment damage as the operator attempts to minimize the loss of productive cropland by maneuvering as close to the poles as possible. Depending on the individual circumstances for a farm, these losses could be significant.

Easement values for right-of-ways on this project should consider the long term impacts of multiple transmission line poles on field operations that will remain for the life of the project.

The Applicant and the affected landowners should be aware of and prepared to mitigate the major potential impacts to agriculture, including:

- Damage to drainage structures and restrictions or elimination of irrigation systems
- Topsoil and subsoil mixing
- Soil compaction
- Erosion control during construction and restoration
- Crop loss due to construction
- Impacts on farm viability and future farm expansions
- Impact on farm residences
- Effects on property values

DATCP CONCLUSIONS AND RECOMMENDATIONS

If approved, the proposed North Appleton-Morgan Transmission Line Project would have considerable effects on farmland owners and agricultural resources, regardless of which routes are

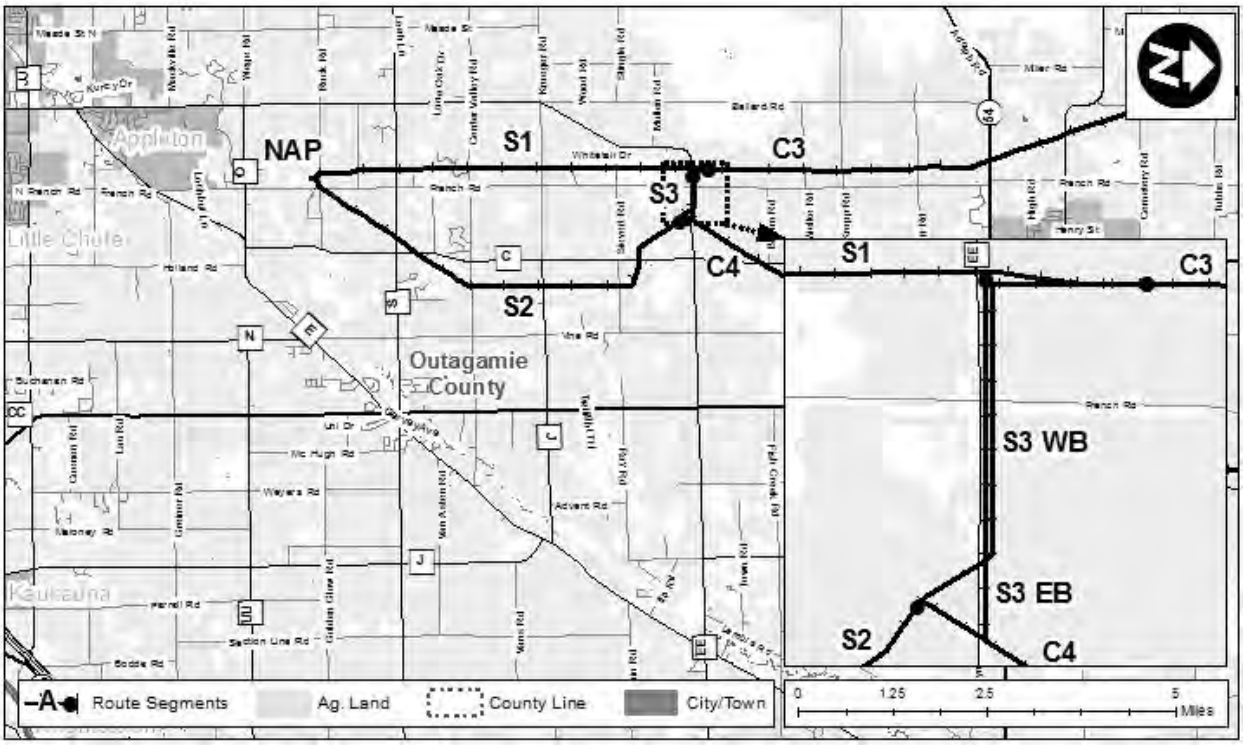
chosen. Many of the potential impacts could be mitigated through actions taken by the Applicant, including hiring one or more experienced, independent agricultural monitors to make daily evaluations of project construction. Other potential impacts are more difficult to define with certainty and, consequently, more difficult to mitigate. If the project is approved, DATCP recommends the Commission include in its order the requirement that the Applicant works with DATCP to hire one or more qualified, independent agricultural monitors to train construction crews on proper procedures when working on agricultural land, to observe construction and restoration work on agricultural land, to identify damaging construction practices that must be stopped or corrected, and to report regularly to DATCP about their observations.

Farmland owners should become familiar with *Wisconsin Statute* §182.017 also known as the "Landowners' Bill of Rights" included in Appendix III of the AIS. This statute describes the obligations and responsibilities of utilities when constructing and maintaining transmission lines on easements. Landowners may agree to waive some or all of their rights identified in this statute, but they are not required to waive any of these rights. DATCP recommends that farmland owners carefully consider the protections provided in the statute before negotiating conditions in their easement that would offer less protection.

Farms in the path of the proposed project range from small life style farms and organic producers to large cash-crop and dairy operations. If the project is approved by the PSC, the project would have both temporary and permanent impacts on the farms that it crosses. The AIS describes the potential impacts that could be caused by the proposed project. Temporary impacts could include the disruption of farm work during construction and soil compaction along the right-of-way. Permanent impacts include the loss of cropland that becomes inaccessible to farm equipment due to the placement of poles in fields. In order to gain an understanding of the concerns that farmers and farmland owners have about the project, DATCP surveyed the farmland owners with 4 or more acres of their land crossed by the project right-of-way. In all, 144 surveys were sent and 73 were returned for a useable response rate of 51 percent.

From the North Appleton Substation to the Morgan Substation, the project would follow one of sixteen potential routes. The number of routes is affected by the possible combinations of segments at the northern end of the project. The following six tables summarize some of the agricultural impacts of these routes by segment. These tables also indicate how substantially this project will affect farms and agricultural land regardless of which segments are chosen for the final route. Agricultural land is disproportionally impacts agricultural land uses over all other land use types, including wetlands, woodlands, and residential properties. Additionally, most of the agricultural land crossed contains drainage tile systems and a majority of affected landowners expressed concerns that construction would damage those drainage systems.

The South Routing Area consists of two main routes (S1 & S2) and a connector (S3), which can run east or west depending on the Southern and Central routes are chosen. Both S1 and S2 follow existing transmission lines in Outagamie County and are proposed to have three sets of transmission line poles in the right-of-way.



The following table summarizes the predominant agricultural impacts listed by landowners with right-of-ways along the South Routing Area and respective segments.

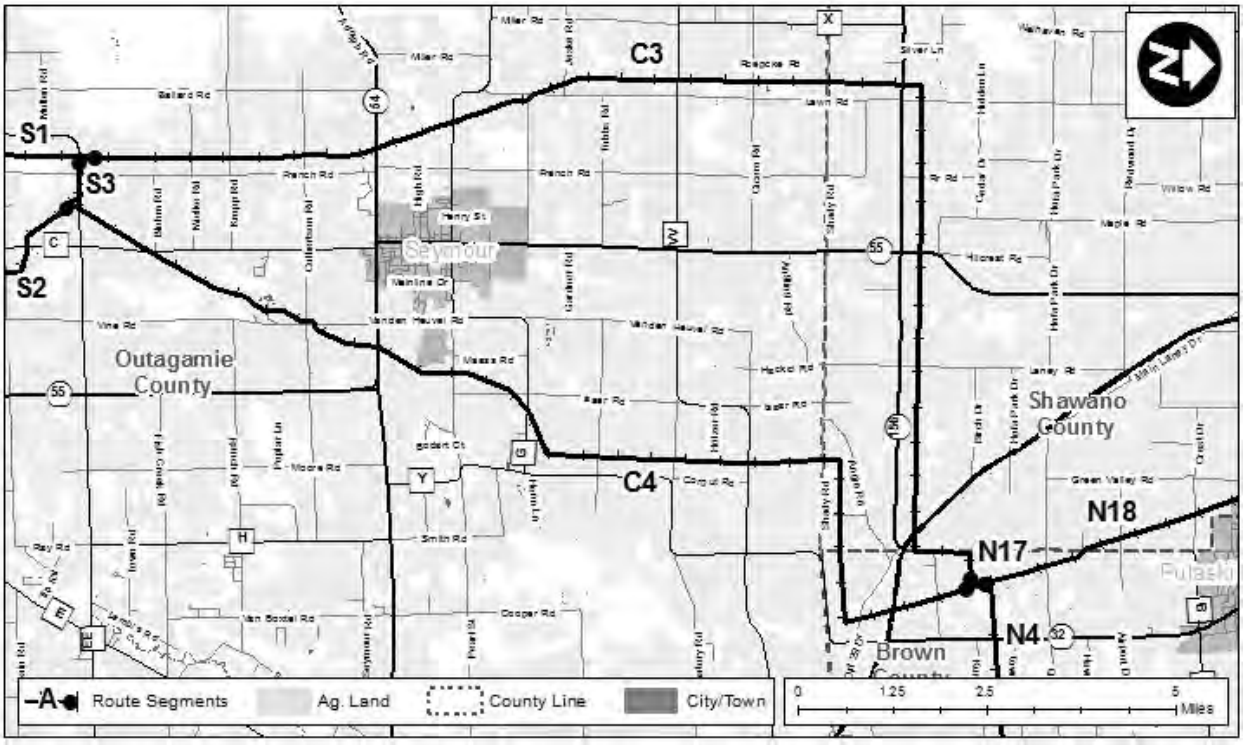
Segment Alternatives	**S1**	**S2**	**S3**
Segment Length (miles)	5.1	5.8	0.7
Total ROW Area (acres)	126.8	131.8	21.7
ROW in Agriculture (acres)	102.2 81% of Segment ROW	109.4 83% of Segment ROW	21.3 98% of Segment ROW
Existing ROW in Agriculture (acres)	71.6	19.8	11.6
New ROW in Agriculture (acres)	30.6	89.7	33.3
Poles in Agricultural Land	82	73	16
Prime Farmland in ROW (acres)	21.8	58.8	27.2
Prime Farmland when Drained in ROW (acres)	6.9	24.4	4.8
Dairy Operations within 300 ft of ROW	0	0	0
Farms responding to DATCP's survey and indicating concerns:			

Segment Alternatives	S1	S2	S3
Aerial Application[a]	0 farms	0 farms	0 farms
Poles Impact Field Operations [a]	1 farm	5 farms	2 farms
Organic Farm*[a]	0 farms	2 farms	0 farms
Access During Construction[a]	2 farms	4 farms	2 farms
Drainage Tiling and/or Grassed Waterways[a]	2 farms	5 farms	2 farms

[a] Data are from responses to survey and comments by farmland owners and are NOT totals, but do provide an indication of the degree of impact.
*Certified organic or in the process of becoming certified.

Over eighty percent of the right-of-ways in the South Routing Area cross agricultural land. Difficulties farming around transmission line poles and drainage were the most common issues listed by farmers in this area followed by access to land during construction. There are two organic farms located in Segment S2.

The Central Routing Area is located in Outagamie, Shawano, and Brown Counties and consists of two segments which can be combined with any of the Southern segments listed above. C3 runs parallel to an existing transmission line north until the route turns east, while C4 follows a gas pipeline over much of its route. C3 will have three sets of transmission poles over most of its route while C4 will have two sets of poles.



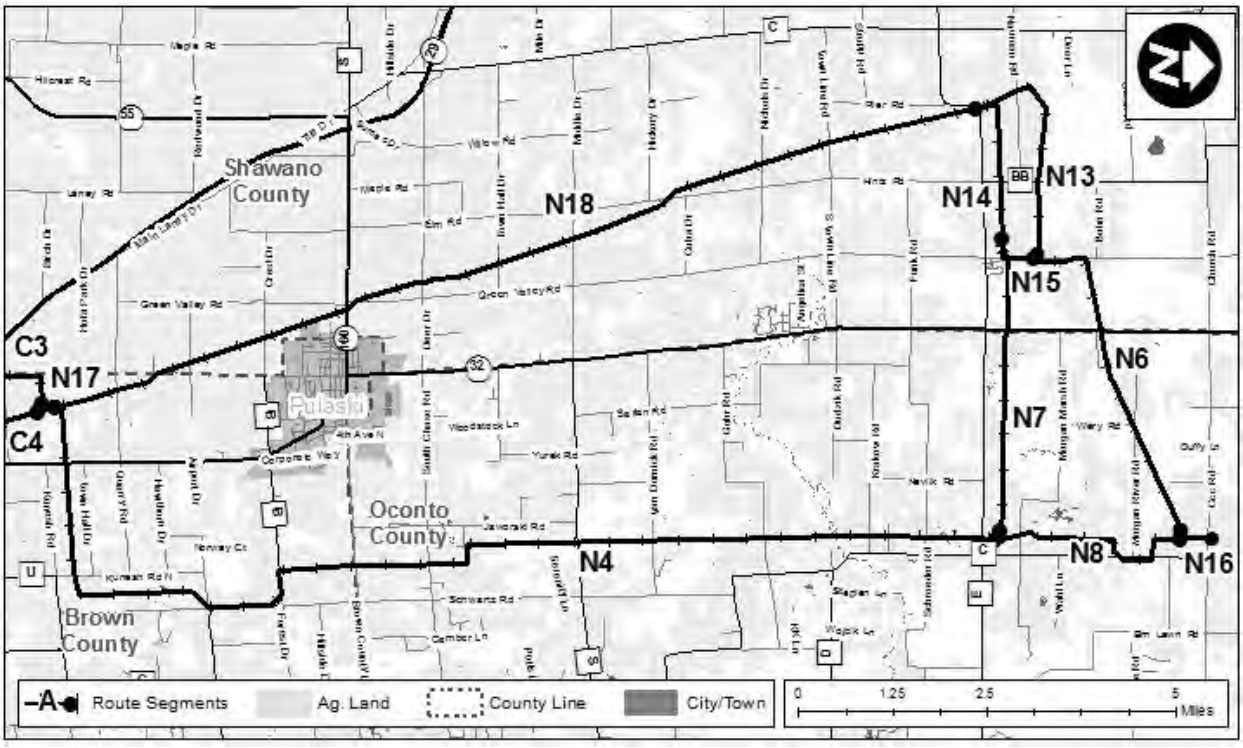
The following table summarizes the predominant agricultural impacts listed by landowners with right-of-ways in the Central Routing Area.

Segment Alternatives	**C3**	**C4**
Segment Length (miles)	18.5	15.4
Total ROW Area (acres)	414.5	332.0
ROW in Agriculture (acres)	374.3 90% of Segment ROW	305.9 92% of Segment ROW
Existing ROW in Agriculture (acres)	75.6	8.6
New ROW in Agriculture (acres)	298.7	297.3
Poles in Agricultural Land	214	196
Prime Farmland in ROW (acres)	114.9	138.5
Prime Farmland when Drained in ROW (acres)	148.7	150.4
Dairy Operations within 300 ft of ROW	1	1
Farms responding to DATCP's survey and indicating concerns:		
Aerial Application[a]	3 farms	4 farms
Poles Impact Field Operations[a]	14 farms	13 farms
Organic Farm*[a]	0 farms	0 farms
Access During Construction [a]	6 farms	12 farms
Drainage Tiling and Grassed Waterways[a]	12 farms	16 farms

[a] Data are from responses to survey and comments by farmland owners and are NOT totals, but do provide an indication of the degree of impact.
*Certified organic or in the process of becoming certified.

At least ninety percent of the right-of-way land in the Central Routing Area is agricultural land. Transmission line poles affecting field operations and drainage were the most frequent issues raised by farmers in this area.

The North Routing Area has two main segments, N18 which is routed along an existing gas pipeline easement and N4 which does not run along existing transmission or gas right-of-ways. N6, N7, N8, N13, N14, N15, and N16 are route segment options leading to the Morgan Substation at the northern end of the project. If segment N4 is chosen, segment N8 continues directly north to the Morgan Substation. If segment N18 is chosen, there are multiple potential routes to the Morgan substation in Oconto County.



The following tables summarize the predominant agricultural impacts listed by landowners with right-of-ways in the Northern Routing Area.

Segment Alternatives	**N18**	**N4**
Segment Length (miles)	12.9	15.4
Total ROW Area (acres)	282.1	337.8
ROW in Agriculture (acres)	243.9 87% of Segment ROW	222.3 66% of Segment ROW
Existing ROW in Agriculture (acres)	13.8	3.7
New ROW in Agriculture (acres)	230.2	218.6
Poles in Agricultural Land	140	131
Prime Farmland in ROW (acres)	38.3	74.0
Prime Farmland when Drained in ROW (acres)	186.3	100.0
Dairy Operations within 300 ft of ROW	1	2
Farms responding to DATCP's survey and indicating concerns:		
Aerial Application[a]	4 farms	2 farms
Poles Impact Field Operations[a]	11 farms	8 farm

Segment Alternatives	**N18**	**N4**
Organic Farm*[a]	0 farms	1 farm
Access During Construction[a]	5 farms	3 farm
Drainage Tiling and Grassed Waterways[a]	9 farms	10 farms

[a] Data are from responses to survey and comments by farmland owners and are NOT totals, but they provide an indication of the degree of impact.
*Certified organic or in the process of becoming certified.

Segment N18 crosses more farmland (87%) than Segment N4 (66%). Landowners in both segments indicated that working around transmission line poles and drainage issues were the primary concerns. There was one organic farm located on Segment N4. Both Segments pass within 300 feet of dairy milking facilities.

Route segments N13 and N14 run eastward parallel to one another toward the Morgan Substation starting at the northern end of N18. Segment N13 is routed along an existing transmission line, which would result in three poles in the right-of-way while Segment N14 would have two poles.

Segment Alternatives	**N13**	**N14**
Segment Length (miles)	3.1	2.1
Total ROW Area (acres)	68.3	46.0
ROW in Agriculture (acres)	62.7 92% of Segment ROW	43.4 94% of Segment ROW
Existing ROW in Agriculture (acres)	7.2	0.1
New ROW in Agriculture (acres)	55.5	43.3
Poles in Agricultural Land	38	23
Prime Farmland in ROW (acres)	18.4	17.9
Prime Farmland when Drained in ROW (acres)	18.5	19.6
Dairy Operations within 300 ft of ROW	2	0
Farms responding to DATCP's survey and indicating concerns:		
Aerial Application[a]	1 farm	1 farms
Poles Impact Field Operations[a]	1 farms	2 farms
Organic Farm*[a]	0 farms	0 farms
Access During Construction[a]	1 farms	1 farms
Drainage Tiling and Grassed Waterways[a]	1 farm	2 farms

[a] Data are from responses to survey and comments by farmland owners and are NOT totals, but they provide an indication of the degree of impact.

*Certified organic or in the process of becoming certified.

Agricultural land composes over ninety percent of the right-of-way land in Segments N13 and N14. Segment N13 passed within 300 feet of two dairy milking barns.

Segment N6 continues Segment N13 in a northeast direction along an existing transmission line towards the Morgan Substation. N7 continues segment N14 eastward. Segment N8 continues N4 north to the Morgan Substation. Again, N6 will have three sets of poles while N8 has two sets. Segments N6, N7 & N8 cross through woodland but still affect farmland. There is an organic farm in N7 and a dairy milking facility in N8 that is within 300 feet from the right-of-way. Poles impacting field operations and access to land during construction were the major concerns listed by landowners.

Segment Alternatives	**N6**	**N7**	**N8**
Segment Length (miles)	4.6	3.9	2.9
Total ROW Area (acres)	122.5	84.9	64.6
ROW in Agriculture (acres)	69.5 57% of Segment ROW	37.5 44% of Segment ROW	41.6 64% of Segment ROW
Existing ROW in Agriculture (acres)	24.0	0.1	1.1
New ROW in Agriculture (acres)	45.5	40.4	48.2
Poles in Agricultural Land	40	19	32
Prime Farmland in ROW (acres)	16.1	13.3	25.5
Prime Farmland when Drained in ROW (acres)	23.0	17.7	1.9
Dairy Operations within 300 ft of ROW	0	0	1
Farms responding to DATCP's survey and indicating concerns:			
Aerial Application[a]	1 farm	1 farm	0 farms
Poles Impact Field Operations[a]	1 farms	2 farms	1 farm
Organic Farm*[a]	0 farms	1 farm	0 farms
Access During Construction[a]	0 farms	2 farms	2 farms
Drainage Tiling and Grassed Waterways[a]	1 farm	1 farm	0 farms

[a] Data are from responses to survey and comments by farmland owners and are NOT totals, but do provide an indication of the degree of impact.

*Certified organic or in the process of becoming certified.

Two route segments (N15 and N17) are connector segments which allow an increased number of route combinations. Segment N16 connects to the Morgan Substation. Segments N15 and N17 will be included in any route option chosen.

Segment Alternatives	**N15**	**N16**	**N17**
Segment Length (miles)	0.6	0.4	0.3
Total ROW Area (acres)	13.6	9.9	5.5
ROW in Agriculture (acres)	13.2 97% of Segment ROW	9.9 100% of Segment ROW	5.5 100% of Segment ROW
Existing ROW in Agriculture (acres)	1.7	5.4	0.3
New ROW in Agriculture (acres)	11.5	4.4	5.2
Poles in Agricultural Land	10	4	2
Prime Farmland in ROW (acres)	1.8	4.4	0.0
Prime Farmland when Drained in ROW (acres)	7.7	0.0	5.2
Dairy Operations within 300 ft of ROW	0	0	0
Farms responding to DATCP's survey and indicating concerns:			
Aerial Application[a]	0 farms	0 farms	1 farm
Poles Impact Field Operations [a]	0 farms	0 farms	2 farms
Organic Farm*[a]	0 farms	0 farms	0 farms
Access During Construction[a]	0 farms	0 farms	2 farms
Drainage Tiling and/or Grassed Waterways[a]	0 farms	0 farms	1 farm

[a] Data are from responses to survey and comments by farmland owners and are NOT totals, but do provide an indication of the degree of impact.
*Certified organic or in the process of becoming certified.

The previous tables show that any route chosen for this project will have a significant impact on agricultural activity in and near the rights-of-way. Farmers will have to negotiate around two or three sets of transmission line poles during field operations and this becomes more difficult as farm equipment increases in size. Construction impacts will be greater due to multiple lines and wider rights-of-way.

Because much of the farmland along the routes contains tile drains, producers indicated widespread concern about damage to drainage systems during construction.

Many farmers were also concerned about the loss in value to their land and noted that replacement land was hard to find and expensive if available. Some producers on smaller farms commented that the easements would limit the possibility of expanding or modernizing their operations or make the farm less likely to be operated by their children.

Where the routes crossed woodland, there was concern about loss of firewood and logging options. Farmers also commented on the effects that the transmission line project would have on aerial spraying, irrigation systems, manure systems, and pasture access. Those with livestock expressed animal health and stray voltage concerns.

The DATCP recommends the following as ways to mitigate the potential adverse impacts associated with the proposed project if it is approved by the PSC:

1. If the project is approved, the Commissioners should consider requiring double-circuiting of the proposed 345 kV and 138 kV lines to reduce the negative impacts of the project by having one set of transmission line support structures in cropland instead of two. A double-circuit would also impact a narrower corridor and require the acquisition of less right-of-way.

2. The Applicant should hire independent agricultural monitors, who are approved by DATCP, to oversee compliance with the portions of the PSC's order for the project dealing with agricultural issues; and to observe and document project construction and construction-related work on agricultural property. These monitors must be adequately trained, experienced and knowledgeable in agricultural issues and practices, and in measures to prevent and mitigate damage to agricultural land caused by transmission line projects. The agricultural monitors should be granted stop work authority.

3. The Applicant should hire an agricultural specialist to conduct pre-construction interviews with farmers and farmland owners who will be directly affected by the acquisition of easements for this project. At a minimum, the interview should determine whether the affected farm operation has a biosecurity plan, the types of crops grown and livestock raised, and the location of any existing or planned drainage systems or other agricultural infrastructure.

4. Information from the pre-construction farm interviews should be incorporated into the bid packages and line lists used by the contractors, inspectors, and monitors.

5. The Applicant should consult with affected farmland owners to determine the least damaging locations for transmission support structures.

6. Landowners who will have easements acquired for the proposed project should be familiar with the "Landowners' Bill of Rights" which is found in Wis. Stat. §182.017 (7). The Applicant may ask landowners to waive some or all of the rights listed in this statute, but the

landowners are not required to waive any of these rights. Refer to the Appendix for the text of the "Landowners' Bill of Rights."

7. The County Conservationists in the counties affected by the proposed project should be consulted to ensure that construction proceeds in a manner that minimizes drainage problems, crop damage, soil compaction, and soil erosion.

8. If an approved route passes through a drainage district, the Applicant should consult with the relevant Drainage Board(s) to ensure that construction will not permanently disrupt the operation of the district(s).

9. All farmland owners and operators should be given advance notice of acquisition and construction schedules so that farm activities can be adjusted accordingly. To the extent feasible, the timing of ROW acquisitions and construction by the Applicant and its contractors should be coordinated with farmers to minimize crop damage and disruption of farm operations.

10. The Applicant should implement training for all construction supervisors, inspectors and crews to ensure that they understand the steps needed to protect the integrity of agricultural lands during project construction and restoration.

11. The Applicant should ensure that its contractors and subcontractors incorporate all necessary site-specific easement conditions to protect agricultural resources, as well as all statutory requirements and PSC permit conditions regarding agricultural land protection into its construction line list, and into any bid documents for the project.

12. Construction on agricultural land should occur as much as possible when the ground is frozen. This will minimize soil compaction and reduce the risk of spreading diseases and pests between farms.

13. If ruts are created in the portion of the ROW that crosses farmland, the Applicant should make reasonable attempts to restore the affected soils as quickly as possible.

14. The Applicant should strip and segregate the topsoil over and around all excavation sites on the project to ensure that the uniquely valuable topsoil is not mixed with lower quality subsoil and underlying parent material.

15. The Applicant should make sure that all excavated soil below the topsoil layer displaced by the pole and foundation, and other spoil material, are removed from the site and not deposited on or mixed with any cropland.

16. If the Applicant removes any existing power line support structures within or immediately adjacent to cropland, it should remove all of the support structure and replace it with clean fill to the level in the adjacent soil where the topsoil begins. Imported topsoil of similar quality to the adjacent top soils should then be placed over the remainder of the hole. If a support structure cannot be completely removed from cropland, as much of the structure as

possible should be removed and the site flagged so the farmer can avoid collisions between his/her equipment and the remainder of the buried structure.

17. After construction of the line is complete, the Applicant should test the soil profile to determine whether the soils in the ROW have been compacted by construction or other equipment. This is commonly done by comparing the compaction levels of soils on the portion of the ROW that carried the traffic to comparable soils off the ROW. If soils are compacted, steps should be taken to correct this problem.

18. The Applicant should undertake long-term, post-construction monitoring to ensure that no damage to agricultural fields along the project route has occurred. This should be conducted for a minimum of two years after construction is completed to ensure that there is no permanent damage to soils, drainage fields or facilities that would affect agricultural production. DATCP AIS staff should remain informed of post-construction monitoring results and any associated reporting.

19. Landowners should be given phone and email information for whom to contact within the Applicant's organization should impacts from the project on their farmland arise or continue after project completion.

Agricultural Impact Statement for the Proposed North Appleton-Morgan Transmission Line
Wisconsin Department of Agriculture, Trade and Consumer Protection
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Right-of-Ways and Easements for Electric Facility Construction

Introduction

The Public Service Commission of Wisconsin (PSCW) offers this overview to landowners who must negotiate easement contracts with utilities for new electric transmission lines or sales of land for substations. It explains the utility easement process so that the negotiations might have a balanced foundation for reaching agreement.

The Commission understands that there are concerns among landowners about the eminent domain process (condemnation.) The procedures of eminent domain are addressed in this overview, but a more complete discussion is contained in a publication from the Wisconsin State Energy Office[1] entitled, ***"The Rights of Landowners under Wisconsin's Eminent Domain Law."*** Because easement agreements are private contracts, the PSCW does not participate in the negotiations between utilities and landowners. The processes for negotiation and condemnation are covered by the laws in Chapter 32 of the Wisconsin Statutes. Several appropriate citations from Chapter 32 are identified in this overview.

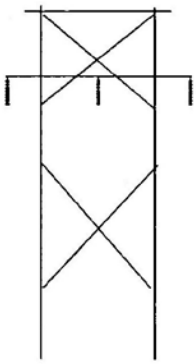
This overview explains what a transmission "right-of-way" is and how a utility normally obtains the rights-of-way it needs to build and protect its facilities. It also explains the relationship between initial contract negotiations and the eminent domain process. Finally, it discusses some concerns about landowner rights and utility easement contracts. If easement negotiations for an easement between a utility and a landowner fail and the condemnation process begins, the landowner should review the ***"Rights of Landowners"*** state publication.

Electric Transmission Line Right-of-Way

An electric transmission line right-of-way (ROW) is a strip of land that an electric utility uses to construct, maintain, or repair a large power line. The easement for the ROW allows the utility to keep the line ROW clear of vegetation, buildings, and other structures that could interfere with line

[1] The Wisconsin State Energy Office is part of the Department of Administration. The eminent domain publication is currently located on the state website under Relocation Assistance Program, http://www.stateenergyoffice.wi.gov/

operation. If the utility needs access roads to get to the power line ROW, it also obtains easements for those access roads.



A transmission line ROW is wider than a ROW for a smaller "distribution" line that serves homes and businesses directly. Transmission lines may operate at several hundred thousand volts and can serve several hundred thousand customers. Distribution lines operate at several thousand volts and can serve a few thousand customers. A service connection to a home operates at a few hundred volts.

A transmission line is usually centered in the ROW. The structures (usually poles and cross arms) keep the wires away from the ground, other objects, and each other. Structure height, type, span length (distance between structures), and ROW width are interrelated. If landowners wish to have fewer transmission structures installed on their land, they might ask if a longer span length is possible. To increase the span length, the utility might need to increase the structure height. If the span length and height are greatly increased, a wider ROW is sometimes needed. Attachment of the distribution wires (distribution underbuild) to the structures limits the transmission span length to maintain safe clearances below the distribution line.

How a Utility Obtains a ROW

A utility obtains a ROW for an electric transmission line through the purchase of an easement (purchasing rights to the land) or fee title ownership (purchasing the land).

Easements

The most common arrangement for a utility to obtain land rights is an easement. A utility real estate agent contacts a landowner to purchase an easement for a specific parcel or strip of land that is to be used for the power line, and negotiations begin.

An easement contract between the utility and the landowner is a legal restriction on land use that allows the utility to build, maintain, and protect the power line and allows the landowner to retain general ownership and control of the land. In addition, the landowner retains the obligation to pay taxes on the parcel. The landowner sells the easement to the utility for a negotiated amount of money, generally paid in one lump sum. The contract specifies restrictions on both the utility's and the landowner's use of the land and specifies the rights of the utility. It is binding upon the utility, the landowner, and any future owners of the land until the contract is dissolved.

Sometimes, a new line needs to be installed in place of an older line that is in poor condition. If the existing ROW is not appropriate for the new line, a new ROW must be obtained through a new easement. Newer transmission easement agreements must specify the:

- type, height limits, and number of new structures;
- line voltage;
- ROW width.

If the existing ROW and structures are still appropriate but the old easement can be improved in other ways, the utility might offer to renegotiate the easement contract. For example, some older easement contracts have wording that is difficult to interpret or a legal description that refers to an entire 40-acre parcel for the ROW when only a 60-foot-wide strip is needed. The utility may ask to renegotiate a contract when rebuilding an old line on existing ROW in order to clarify its relationship with the affected landowner.

Fee Simple Purchases

Another arrangement for obtaining new power line ROWs is for the utility to purchase fee simple ownership. In this arrangement, a landowner sells the strip of land to the utility outright. The utility owns the ROW in "fee simple." In this situation, the landowner gives up ownership of the land along with all the rights and responsibilities that ownership entails. This is a common arrangement for new substations, but it is used only occasionally for power line ROWs.

Substation Lands

Transmission substations vary in size because of the different numbers of lines and different size lines and transformers in each one. A simple distribution substation may require less than one acre. Other types of substations may require up to six acres or more. Some land outside the substation fence may be needed for an access road. If landscaping or earthen berms are used to screen the substation, more land may be necessary. If more land is purchased than is needed for the substation, the utility may sell the excess land, rent it out for farming or other local uses, or retain it for potential substation expansions.

How a Utility Obtains Easements

A utility acquires easements by negotiating with landowners on whose lands the power line will be placed. Easement negotiations begin at different times, depending on the type of project and the type of certification the utility must receive from the PSCW. An applicant must receive a Certificate of Public Convenience and Necessity (CPCN) from the Commission for a transmission project that is either:

- 345 kilovolts (kV) or greater
- Less than 345 kV but greater than 100 kV, over one mile in length, and needing new ROW.

According to Wis. Stat. § 32.03(5), a utility may not acquire an easement for transmission projects requiring a CPCN until it receives the CPCN from the Commission. The Commission determines the transmission line route and structure designs that should be used after reviewing the record of the public hearing. However, Wisconsin's eminent domain law (Wis. Stat. § 32.03(5)(c)) does allow a utility to negotiate before a CPCN is issued if the utility advises the landowner that it doesn't have authority to acquire the property by condemnation until the CPCN actually is issued.

For lower voltage lines where a Certificate of Authority (CA) is required, there may be only one proposed route and structure type. For these types of proposed construction cases, the utility may be certain enough about its project to begin easement negotiations before the CA has been granted by the Commission.

Although the negotiation for an easement is a private transaction between the utility and the landowner, a formal process protects the rights of the landowner during the negotiation. A utility agent presents the easement contract to the landowner along with an estimate of the value of the property interest it wants to buy. The landowner has the right to have his or her own appraisal made by a qualified appraiser. The reasonable cost of this appraisal must be reimbursed by the utility if 1) it is submitted to the utility within 60 days after receipt of the utility's appraisal and 2) it meets the standards of the law in Wis. Stat. § 32.09.

The precise easement agreement between a utility and an individual differs from case to case and depends on many factors. The landowner should not sign an easement agreement without first examining it, asking questions, and negotiating. Under Wis. Admin. Code § PSC 113.0509, the landowner can have a minimum period of five days to examine the materials. Also, there is nothing barring one landowner along a proposed transmission route from discussing easement concerns with other landowners before signing. In the case of high-voltage transmission lines, Wis. Admin. Code § PSC 113.0509(2) states that the easement contract must have certain descriptive details about the line.

For a newly proposed project, the landowner may also examine the project application that the utility submitted to the PSCW for review. For projects that require a CPCN, the PSCW ensures that copies of the application are available to the cities, villages, towns, and county clerks in the project area and also to the main public library in each county in the project area. Interested persons can also request copies directly from the utility or review it on the PSCW Electronic Regulatory Filing (ERF) web site (http://psc.wi.gov). All documents for proposed construction cases can be accessed on the website by using a project application's unique PSCW docket number (http://psc.wi.gov/apps40/ERF_public/info/howto.aspx). More information about using the PSCW's ERF system can be found on the website or by contacting the PSCW Gas & Energy Division at (608) 266-5481.

Landowners' Rights and Waiving Those Rights

Wisconsin law lists some rights of landowners whose properties will be affected by a transmission line that is 100 kV or larger and over one mile in length. Table 1 lists these rights. The landowner may be asked to waive or give up, one or more of these rights but does not have to do so. In the easement contract, marked or crossed-out items in the list are "waived" or no longer applicable if the landowner signs the contract. The contract should not be signed unless the landowner absolutely agrees to waive the items as indicated.

As contracts, easements should be written in legally precise language. The landowner's rights listed in Table 1 are generally included as part of the contract by being attached as an "Exhibit." A term of the contract will state that those rights that are listed, marked, or crossed out in the exhibit would be "waived," i.e., not included in the contract. Table 2 gives an example of contract language that one might see for waiving landowner rights. (The "Grantor" is the landowner and the "Grantee" is the utility.)

Waiving these rights, as well as any other part of the contract not required by law, are negotiable.

Table 1 Landowners' Rights

Landowners who have signed easement agreements with the utility have the specific rights listed in the Wisconsin Statutes. These rights are applicable for high voltage power lines that are 100 kV or larger, longer than one mile, and built after 1976. If landowners have questions or problems related to these rights, they should contact the PSCW at (608) 266-5481 or (888) 816-3831.

Under Wisconsin law (Wis. Stat. § 182.017(7)(c) to (h)), the rights are expressed as utility requirements:

(c) In constructing and maintaining high-voltage transmission lines on the property covered by the easement the utility shall:

1 If excavation is necessary, ensure that the top soil is stripped, piled and replaced upon completion of the operation.

2. Restore to its original condition any slope, terrace, or waterway which is disturbed by the construction or maintenance.

3. Insofar as is practicable and when the landowner requests, schedule any construction work in an area used for agricultural production at times when the ground is frozen in order to prevent or reduce soil compaction.

4. Clear all debris and remove all stones and rocks resulting from construction activity upon completion of construction.

5. Satisfactorily repair to its original condition any fence damaged as a result of construction or maintenance operations. If cutting a fence is necessary, a temporary gate shall be installed. Any such gate shall be left in place at the landowner's request.

6. Repair any drainage tile line within the easement damaged by such construction or maintenance.

7. Pay for any crop damage caused by such construction or maintenance.

8. Supply and install any necessary grounding of a landowner's fences, machinery or buildings.

(d) The utility shall control weeds and brush around the transmission line facilities. No herbicidal chemicals may be used for weed and brush control without the express written consent of the landowner. If weed and brush control is undertaken by the landowner under an agreement with the utility, the landowner shall receive from the utility a reasonable amount for such services.

(e) The landowner shall be afforded a reasonable time prior to commencement of construction to harvest any trees located within the easement boundaries, and if the landowner fails to do so, the landowner shall nevertheless retain title to all trees cut by the utility.

(f) The landowner shall not be responsible for any injury to persons or property caused by the design, construction or upkeep of the high-voltage transmission lines or towers.

(g) The utility shall employ all reasonable measures to ensure that the landowner's television and radio reception is not adversely affected by the high-voltage transmission lines.

(h) The utility may not use any lands beyond the boundaries of the easement for any purpose, including ingress to and egress from the right-of-way, without the written consent of the landowner.

Table 2 Examples of Easement Contract Language that Waive Certain Landowner Rights

In the Contract: "The parties hereto do hereby agree to the terms and conditions set forth in Exhibit(s) ____, attached hereto and incorporated therein."
At the top of the Exhibit: "As part of the foregoing High Voltage Electric Line Easement, Grantor(s) do hereby specifically waive certain of the following rights as designated at the bottom hereof . . ."
At the Bottom of the Exhibit: "The Grantor(s) do hereby waive the rights provided in the following paragraphs of this Exhibit A . . ." [with spaces following for listed rights to be waived]

PSCW Involvement in Easement Negotiations

The easement contract is a private agreement between the landowner and the utility. The PSCW, therefore, cannot become involved in easement negotiations unless it is asked to respond to complaints about unfair utility practices.

Agricultural Land as a Special Case

Agricultural land presents a special case. A negotiation tool that may be available to farm operators or farmland owners is the Agricultural Impact Statement (AIS) prepared for certain power line projects by the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP). Any power line or substation that involves taking an interest in over five acres from any single farm operation requires preparation of an AIS before easement or purchase contract negotiations can begin. (A "farm operation" is defined by law as an activity conducted primarily for the production of commodities for sale or home use in such quantity that the commodities contribute materially to the support of the farm operator.)

Even if the taking is less than five acres, DATCP may decide to prepare an AIS if it believes the acquisition will have a significant effect on farm operations. The completed AIS will be sent to affected farmland owners and farm operators. By law, the DATCP must also distribute copies to certain local municipal offices and libraries in the potentially affected area. The utility is not allowed to negotiate with the property owner or begin condemnation for at least 30 days after publication of the AIS. (For more on condemnation, see discussion below.)

According to Wisconsin law (Wis. Stat. § 32.09(6r)), if the line is at least 100 kV and more than one mile long, the utility's offer for land zoned or used for agricultural purposes must be in two forms: a lump sum payment and an annual payment. The agricultural landowner chooses which type of payment to accept. If annual payments are chosen, payments will be received only as long as the land remains in agricultural use.

When Negotiations Break Down - the Utility's Right of Eminent Domain

Despite earnest negotiations, it is possible that the landowner and the utility will not reach agreement on the terms and conditions of the easement contract. Under these circumstances, the utility has the right to take the easement or property through court action. It may "condemn" the land, if needed, using its statutory right of eminent domain.

Utilities have been granted the right of eminent domain because it is in the public interest to provide safe and reliable electric service at a fair price. For major transmission lines, however, a utility may not condemn property before the utility receives a CPCN from the PSCW. A public hearing in the project area is required for these types of projects.

In a condemnation action, the local condemnation commission determines the fair price to be paid, based on testimony provided by the utility and the landowner's witnesses. Landowners have rights in this process under the Wisconsin Eminent Domain Law (Wis. Stat. ch. 32). These rights are described in a state-produced brochure the utility must provide to landowners. It can also be accessed on the Internet by searching for, ***"The Rights of Landowners under Wisconsin Eminent Domain Law"*** (http://www.stateenergyoffice.wi.gov/docview.asp?docid=22817&locid=160). This publication is currently offered by the Wisconsin State Energy Office. If the utility begins the condemnation process, it is important for the landowner to review the information outlined in this publication.

The Importance of Negotiation

A landowner does not have to sign the standard easement form as the utility agent initially presents it. Landowners have the right to negotiate for terms in the easement contract that will avoid or reduce the line's impact on their land. The utility, in turn, has an obligation to negotiate. The utility will make an initial offer of money to be paid for the easement, but this amount is also negotiable. To complete a satisfactory easement negotiation, however, both the landowner and the utility must have reasonable expectations and be reasonable in negotiations.

If the landowner feels threatened about condemnation during the easement negotiations with the utility, the best action is to continue to negotiate. Some landowners find that hiring a lawyer is helpful if negotiations are not progressing. Utilities generally do not prefer condemnation. Condemnation procedures are expensive and time consuming, not only for the landowner but also for the utility.

The Condemnation Process

If other potential solutions cannot be reached, the utility might begin the condemnation process. The condemnation process begins with the utility offering the landowner an official "jurisdictional offer," by personal delivery service or certified mail. The jurisdictional offer is an official written notice by the utility to the landowner that: 1) describes the proposed public use of the land; 2) describes what property is to be taken and the date when it will be taken; and 3) states the amount of compensation the landowner is to be paid. The landowner, by law, has 20 days from the receipt of this offer to accept it or reject it.

If the landowner accepts the offer, the offered payment is made by the utility and the condemnation process terminates. If the landowner rejects the offer or does not respond within 20 days, the utility may petition the court to have the county condemnation commission determine the appropriate level of compensation for the ROW. The condemnation process continues until the easement or property is obtained and the landowner is compensated. The process is outlined in the ***"Rights of Landowners"*** state publication previously mentioned.

ROW Restrictions

Utility Use

After acquiring an easement from the landowner, the utility owns the right to do only what the easement contract allows. If the utility buys the ROW in fee simple, it is limited only by the regulations, such as local zoning restrictions, that would apply to any landowner.

Property Owner Use

Modern easements specify a landowner's allowable uses. In general, property uses that do not interfere with the power line are acceptable. These uses can include dairy farming, crop farming, grazing, gardening, hunting, biking, hiking, snowmobiling, and parking, among other things.

Modern easements specify the type and location of buildings or woody plants allowed within the ROW. The State Electrical Code sets the minimum distance between power lines and buildings (such as storage sheds). It prohibits new power lines from being built over residential dwellings and prohibits new houses from being built under power lines. The easement can specify the types of trees and other woody species that would be allowable or prohibited.

Vegetation management in the ROW is overseen by the North American Electric Reliability Corporation (NERC). NERC has been certified by the Federal Energy Regulatory Commission (FERC) as the reliability organization for the North American electric transmission system, oversees reliability of the transmission system's lines, and has established a national reliability standard for ROW vegetation management on the transmission system. Each transmission owner must have a line clearance plan filed with the NERC with minimum standards related to clearances from the line. Landowner use of the ROW must conform to these standards as well. More details on vegetation management are provided in the section of this overview entitled "ROW Maintenance," which follows.

If the power line is installed underground, the ROW may be narrower than for an overhead line of the same voltage. However, buildings, shrubs, and trees would be prohibited throughout the ROW.

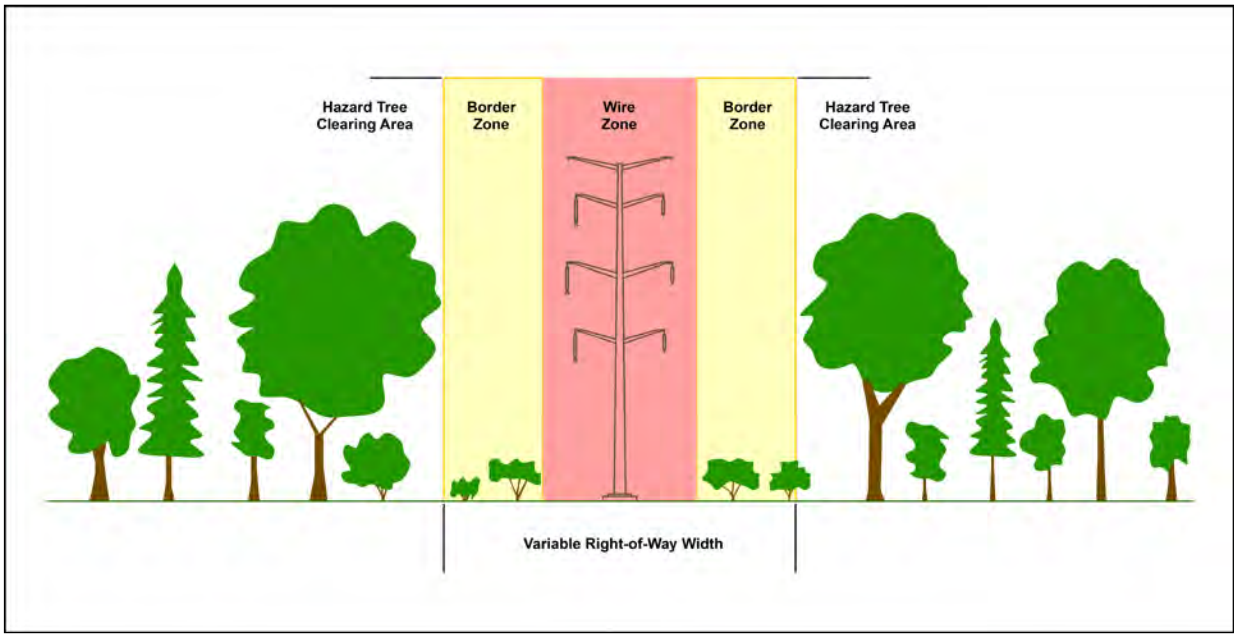
ROW Maintenance

After a power line is installed, the utility maintains the ROW as needed for the type, size, and voltage of the line. With the new NERC standards, the major transmission owners in Wisconsin employ an approach using a "wire zone" and a "border zone." Figure 1 illustrates the different vegetative zones in a ROW. The wire zone is directly under the transmission line's conductors and is kept in low-growing forbs and grasses to make it easier for line maintenance and repair. All woody vegetation in this zone is usually removed. The border zone is from the wire zone to the edge of the ROW as defined by the easement contract.

The utility may allow short-growing woody species, but it is important to note that anything located in an

easement can be at risk for removal if not specified in the easement contract or there is a change to the operation or maintenance requirement of the electrical facilities.

Figure 1 Typical ROW Vegetative Management Zones



Also, outside of the ROW, the transmission owner may conduct additional tree trimming or removal. Under state law, Wis. Admin. Code § 113.0512, transmission owners are required to trim or remove trees that could pose a threat to the transmission line even if those trees are located outside the border zone and ROW. These "hazard" trees are trees that pose an unacceptable risk of failing and contacting the line before the next ROW maintenance cycle. If identified, these hazard trees must be topped, pruned, or felled so that they no longer pose a hazard.

All woody vegetation is removed over underground lines.

The wire/border zone concept may not be totally appropriate for all ROW conditions. For an overhead line, trees and shrubs that remain short as they mature might be allowed to grow in the ROW but not under the line. There might be buffer zones necessary where low-growing woody plants are allowed to remain at streams and river crossings.

Under Wis. Admin. Code § PSC 113.0510, the utility must make a reasonable attempt at contacting landowners a minimum of 24 hours before beginning maintenance activities in the ROW (emergency repairs are exempted from this notification requirement). The ROW is inspected from the air at least once a year and inspected by ground patrol periodically, generally every three to four years. Property owners with concerns or questions about ROW management on their land should contact the operating utility. Herbicides may be used to remove trees and other woody vegetation unless prohibited in the easement agreement. If no herbicides or chemicals are used, the utility relies on cutting and other mechanical means of control. If the utility agrees, landowners may do this cutting and be reimbursed by the utility.

Public Use

Landowners retain the right to limit public access on their lands. Fences are allowed across the ROW. Fences constructed in ROWs of transmission lines that are 100 kV or larger, longer than one mile, and built after 1976 are specifically protected in Wis. Stat. § 182.017(7)(c) which states that the utility must satisfactorily repair to its original condition any fence that is damaged as a result of construction or maintenance operations. If the fence has no gate and the utility needs access to a ROW, the utility will cut the fence and a temporary gate will be installed. Any such gate may be left in place at the landowner's request. Utilities that damage fences located in ROWs not mentioned in Wis. Stat. § 182.017(7) (see Table 1) are required to meet the conditions specified in the easement contract.

ROW Abandonment

If the utility removes a power line, it might offer the landowners the opportunity to cancel their easement agreements. The utilities usually charge landowners a fee to release the utility's easement rights. For example, a utility might charge landowners the administrative costs or the current market value of the easement to clear the easement from the property deed.

Length of Easements Terms

The utility will retain its ROW rights and obligations forever unless it removes the line, abandons the ROW, and releases the easement rights. The easement becomes part of the property deed and is thereafter transferred with the property. Except in certain farmland situations, the easement compensation is a one-time payment by the utility to be allowed to maintain the ROW and protect the line in perpetuity. The utility, the landowner that signed the easement agreement, and all future owners of that property must abide by the terms of the easement contract.

The Public Service Commission of Wisconsin is an independent state agency that oversees more than 1,100 Wisconsin public utilities that provide natural gas, electricity, heat, steam, water and telecommunication services.

Public Service Commission of Wisconsin
P.O. Box 7854
Madison, WI 53707-7854

Telephone: 608-266-5481
Toll free: 888-816-3831
Consumer affairs: 608-266-2001 / 800-225-7729
TTY: 608-267-1479 / 800-251-8345
Fax: 608-266-3957

Website: http://psc.wi.gov

Electric 02 (05/14)

The Rights of Landowners Under Wisconsin Eminent Domain Law

Procedures Under sec. 32.06 Wisconsin Statutes

Revised February, 2012

FOREWORD

This pamphlet is published by the Wisconsin Department of Administration in cooperation with the Attorney General, pursuant to sec. 32.26 (6), of Wisconsin statutes. The pamphlet is to be given to property owners or their representatives by the acquiring authority prior to initiation of negotiations for property being acquired for a public project.

The material in this pamphlet provides information on how the condemnation process works in Wisconsin. It should serve as a reference for you, but it is not intended to cover every possible eventuality or every right you may have in individual cases. A further source of information is Chapter 32 of the Wisconsin statutes which contains the law that is summarized in this pamphlet.

Direct questions about this pamphlet to:

Relocation Unit
Bureau of Planning & Technical Assistance
Wisconsin Department of Administration
P.O. Box 7868
Madison, WI 53707
(608) 267-0317

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INTRODUCTION

Community growth sometimes necessitates the public's need to own certain properties and right-of-ways for the greater public good. This need may conflict with private ownership. Consequently, government has had to resort to its right to acquire private land for public uses even without the consent of private owners -- the eminent domain power.

This power derives from the Wisconsin Constitution, Art. IX, sec. 3. The Legislature has delegated this power by statute to numerous authorities and has specified the purposes for which such power can be used. Generally, departments, municipalities, boards, commissions, public officers, and various public and quasi-public corporations are delegated this power. Some of the purposes for which the Legislature has specified that condemnation can be used are highway construction or improvement, reservoirs, dams, public utility sites, waste treatment facilities, city redevelopment and energy lines.

> FEDERAL LAW
> When a project is receiving federal financial assistance, the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) may provide additional or different protections than those outlined in this pamphlet. You should receive supplemental information from the acquiring authority if federal law applies.

Wisconsin has long had statutes regulating the exercise of eminent domain power. This pamphlet is intended to give citizens information about Wisconsin's eminent domain procedure, the workings of the condemnation process, and the rights of property owners in this process. It is, by necessity, of a general nature and is not a substitute for legal advice in individual cases, since many aspects of Wisconsin law cannot be covered in general terms. Another source of information for citizens is the particular authority which is acquiring the property.

The goal is to achieve equality of information for both parties during the negotiation process and to reach satisfactory settlements, equitable to both the property owner and the public, through the statutory process.

THE LANGUAGE OF EMINENT DOMAIN

(This glossary defines terms used in the pamphlet)

Acquiring Authority
A public or quasi-public entity vested with the constitutional or statutory power to acquire private property for a public use.

Additional Items Payable
Persons displaced by the public project are to be fairly compensated by the payment of relocation assistance and assistance in the acquisition of replacement housing.

Appraisal
A written report, by a professional and disinterested person skilled in valuation, describing the property that is to be acquired and reaching a documented conclusion as to the fair market value of such property.

Certificate of Compensation
A document recorded with the register of deeds when a sale is negotiated between the owner and the acquiring authority. It contains the names of persons with a record interest in the property, a legal description, the typed of interest acquired, and the amount of compensation. All persons named should be sent a copy and a notice of the right to appeal the amount of compensation.

Condemnation Commission
A group of local residents, appointed by the circuit court of a county for fixed terms, who have the authority to determine just compensation for the property being acquired.

Date of Acquisition
The day the award of the condemnation commission is paid to the property owner or to the circuit court for the benefit of the property owner.

Date of Evaluation
The day on which the lis pendens is recorded in the office of the register of deeds in the county where the land is located. The fair market value of the property on this day is just compensation to the property owner for the acquisition. For negotiated sales, the date of acquisition and the date of evaluation is the date the conveyance is recorded with the register of deeds.

Determination of Necessity
A finding, made by the acquiring authority or the court, that the authority has the right to acquire private land for a specific public use.

Easement
An interest in real property which gives the acquiring authority the legal right to use the property for a specific purpose or to restrict the property owner's use of the land. Ownership and title to the property remain with the property owner.

Eminent Domain
The power of the state to acquire private property for a public use.

Fair Market Value
The amount for which property could be sold in the open market between a willing buyer and a willing seller.

Full Narrative Appraisal
A detailed and comprehensive description of the process an appraiser uses in regard to a certain property to reach an opinion of its fair market value. The opinion must contain the appraiser's rationale for determining value and be documented by market data which supports the appraiser's rationale.

Incidental Expenses
Reasonable and necessary amounts, defined by statute, payable to the owner of real property acquired for a public use. Generally, incidental expenses compensate for expenses you may incur in transfer of your property to the acquiring authority. They include recording fees, mortgage prepayment penalties and other items.

Jurisdictional Offer
A written notice given by the acquiring authority to the owner of property and any mortgagee of record which informs the recipients of the proposed public use, what property is being acquired, and the amount of compensation to be paid.

Lis Pendens
A notice filed with the register of deeds when the acquiring authority files a petition with the court seeking a hearing before the condemnation commission. It notifies all interested parties that the property described is in the process of being acquired for a public use. The day the lis pendens is filed is the "date of evaluation," except in the case of an acquisition by a public utility, or a negotiated sale.

Litigation Expenses
The sum of the costs, disbursements and expenses including reasonable attorney, appraisal and engineering fees necessary to prepare for, or participate in, actual or anticipated proceedings before a condemnation commission or any court.

Severance Damages
Damages which may result when only part of a person's property is condemned. Generally, these items of damage compensate for any loss in value of the remaining property due to the acquisition.

Uneconomic Remnant
Any portion of the property remaining after a partial acquisition which is of little value or substantially impaired economic viability due to its size, shape or condition.

PART ONE
BEFORE NEGOTIATIONS TO ACQUIRE PROPERTY BEGINS

After you have been contacted by the acquiring authority, you have the right to a **full narrative appraisal** of the property sought to be acquired. This appraisal is done by an appraiser hired or employed by the agency, and the law requires the appraiser to confer with the owner or the owner's representative, if reasonably possible, when making the appraisal. Any and all appraisals made by the acquiring authority must by provided to you.
You have the right to have your own full narrative appraisal of the property made by a qualified appraiser. The reasonable cost of this appraisal may be submitted to the acquiring authority for

payment, if the appraisal meets the standards set forth in sec. 32.09 of Wisconsin statutes, but, if you have such an appraisal made and wish to be paid for its cost, it must be submitted to the authority within 60 days after you receive the authority's full narrative appraisal. Your appraisal will be considered during negotiations.

The acquiring authority is required to make a determination of its need for the property. The way this **determination of necessity** is made varies depending on what type of agency is acquiring the property and the purpose for which it is being acquired.

If a public utility seeks your property for an electric generating plant or high-voltage transmission line, it applies to the Public Service Commission for a **certificate of public convenience and necessity**. This application must be filed by the Public Service Commission with the city or town clerk in the area where the facility is located, as well as the main public library in the county. The issuance of the certificate of public convenience and necessity provides the determination of necessity for the acquisition of the needed property.

Most other authorities seeking land for proposed projects make their own determinations of necessity. The statute lists the authorities who have the power to make their own determinations. In all other cases, the circuit court, upon a petition by the acquiring authority, makes the determination. These records are available for public inspection.

If a public project, other than a town highway, involves the acquisition of any interest in any farm operation of more than five acres, the Department of Agriculture, Trade and Consumer Protection (DATCP) may be required to prepare an **agricultural impact statement** prior to the acquisition of any land. Even if the acquisition is less than five acres, DATCP may prepare a statement if the acquisition will have a significant effect on the farm operation.

If an environmental impact statement is required by another statute, the requirements of the agricultural impact statement may be met by the environmental impact statement. Also, if an easement for an electric transmission line, excluding a high voltage line, is being acquired over a farm operation, an agricultural impact statement is not required.

A "farm operation" is defined by law as an activity conducted primarily for the production of commodities for sale or home use in such quantity that the commodities contribute materially to the support of the farm operator.

The acquiring authority may gather the necessary information for the impact statement. DATCP must prepare the statement within 60 days after receiving the information from the acquiring authority. After preparation, the statement must be published by DATCP. For a 30 day period after publication, the acquiring authority is precluded from negotiating with the property owner or making a jurisdictional offer.

The law also requires that the agricultural impact statement be distributed by DATCP to various offices and individuals. You can obtain a copy from your local library or from any local unit of government in the area affected. You may also request a copy directly from DATCP.

PART TWO
THE NEGOTIATION PERIOD

After appraisals are completed, the acquiring authority must attempt to negotiate with the owner or the owner's representative for purchase of the needed property. The statutes require that you be provided an informational pamphlet on eminent domain procedure **before** negotiation

begins. If you are also displaced as a result of the acquisition, the law requires that you receive a pamphlet on **relocation benefits**. The owner's full narrative appraisal must be considered as a part of the negotiation. Also, any rights you may have for additional items payable (relocation benefits) can be included in the negotiations.

During negotiations, the acquiring authority must provide a map showing all property affected by the proposed project. Along with this map you must be given the names of at least 10 neighboring landowners to whom offers are being made. The names of all offerees if less than 10 owners are affected must be given. Any maps in the possession of the authority showing the property affected can be inspected, and copies will be made available at reasonable cost. At this point, condemnation is not involved, only negotiations for purchase.

If you agree to a negotiated purchase, the acquiring authority must record the conveyance and a **certificate of compensation** with the register of deeds in the county where the land is located. Also, all owners of record should receive by certified mail the certificate of compensation and a notice of their right to appeal within **six months** after the date of the recording of the certificate. Such an appeal would challenge the amount of compensation received by the property owner. The appeal would be initiated by filing a petition with the circuit court. The judge then assigns the appeal to the chairperson of the county condemnation commission. All persons with a record interest in the property will be notified of the appeal.

The date the conveyance is recorded is the date of acquisition and the date of evaluation.

PART THREE
PARTIAL ACQUISITIONS AND EASEMENTS

If only a part of your property is acquired, other than for an easement, two different calculations may be made to determine the fair market value of the part acquired. In such partial acquisitions, fair market value is the greater amount of either the fair market value of the part acquired or the difference between the value of your property **before** the acquisition and its value after, giving effect to severance damages set forth in sec. 32.09 of Wisconsin Statutes.

If only part of your property is acquired and you are left with an **uneconomic remnant**, the acquiring authority must also offer to acquire the uneconomic remnant. You must consent to the acquisition in order for the remnant to be acquired.

When an easement over your property is acquired, the compensation required is the difference between the value of your property immediately **before** the date of evaluation and its value immediately **after** the date of evaluation. Severance damages may also be paid where such damages exist and are allowed by statute.

If your land is zoned or used for agricultural purposes and an easement is acquired for a high voltage transmission line or a fuel pipeline, you will be entitled to choose between a lump sum payment for the easement or an annual payment representing just compensation for the acquiring of the easement for one year. The acquiring authority should be able to answer any questions on your eligibility for this choice and the terms of each alternative. Sec. 32.09 (6r) (a), (b), and (c) of Wisconsin statutes details the law on lump sum versus annual payments.

PART FOUR
THE JURISDICTIONAL OFFER TO PURCHASE

If negotiations do not lead to a purchase of the needed interest by the acquiring authority, a **jurisdictional offer** must be given to the owner and to any mortgagee of record. You will receive the notice by personal service or by certified mail.

This very important document will provide you with vital information on the acquisition of your property. Items that must be included are a statement of the nature of the project, a description of the property to be acquired, and a statement of the proposed date the acquiring authority will occupy the property. Included in the document is the amount of compensation to be paid for your property, including a statement that any additional items payable may be claimed for relocation assistance. An owner has **20 days** from the receipt of this offer to accept or reject it. If you accept the jurisdictional offer, title will be transferred and you will be paid the amount specified in the offer within 60 days. This 60 day period can be extended by mutual written consent of the property owner and the acquiring authority. **Incidental expenses** for which you may be eligible under sec. 31.195 of the statutes relating to transfer of your property to the acquiring authority will also be paid.

If the property owners of record reject the jurisdictional offer in writing, or do not act upon it within the 20 day period, the acquiring authority may petition the court to have the county condemnation commission make a determination of just compensation for the property.

PART FIVE
HEARING BEFORE THE COUNTY CONDEMNATION COMMISSION

The acquiring authority, after a jurisdictional offer is **not accepted**, may petition the circuit court to initiate a hearing before the condemnation commission. If a determination of necessity has not been made by the agency, the petition may ask the court to make the determination of necessity at this time. You will receive notice of the acquiring authority's petition.

An important event which coincides with the filing of this petition is the filing of a **lis pendens**. The lis pendens is filed with the register of deeds in the county where the property is located. It provides notice to any interested party of the possibility that your property may be acquired for a public use.

The day this lis pendens is filed is the "date of evaluation." The value of your property on this day is just compensation to you for its loss under the law. A different "date of evaluation" may apply when your property is acquired by a public utility. The date depends on when the certificate of public convenience and necessity and the advance plans were filed. For negotiated sales the date of evaluation is the day the conveyance is recorded with the register of deeds.

A hearing on the petition the acquiring authority has filed with the court must be held at **least 20 days** after the date the petition was filed. If the court finds that the authority has a right to condemn your property, the court will assign the matter to the condemnation commissioners for a hearing.

A county will have six to 12 commissioners, depending on the county population. They are local individuals, residents of the county or adjoining county, and are appointed by the circuit court. They serve staggered three year terms and generally sit in groups of three.

Within seven days after the chairperson of the commission is notified of the petition by the judge, three of the commissioners are selected to hear the case. The hearing date, time and place are fixed by the chairperson, and will not be less than 20 days nor more than 30 days from the day the court assigned the petition to the chairperson. At least 10 days prior notice will be given to all parties. The commission proceedings are more informal than court proceedings, and are governed by statute. The amount of the jurisdictional offer or award of compensation cannot, by law, be disclosed to the commission. You have a right to appear and to present evidence. A majority of the members have the power to make all decisions. **Within 10 days** after the end of the hearing, a **written award** is made and filed with the clerk of circuit court. The clerk will notify the parties of the award.

An acquiring authority may elect to abandon proceedings to acquire your property within 30 days after the filing of the condemnation commission's award by petitioning the circuit court where the property is located. You will receive five days notice by certified mail of this petition. The court will set the terms by which the abandonment can take place. If the judge formally discontinues condemnation by making an order, the order removes any title in the acquiring authority and automatically discharges the lis pendens.

Should the commission's award exceed the amount paid by the acquiring authority, and if neither party appeals from the award of the commission to the circuit court, interest is paid on the amount of the increase for the period from the date of acquisition until the date of the commission award, if the amount of the increase is paid within 14 days of the commission award. This payment passes title of the property to the acquiring authority.

If you or the acquiring authority are dissatisfied with the award of the condemnation commission, either can appeal to the circuit court of the county where the property is located. This must be done within **60 days** of the filing of the condemnation commission's award. If an appeal is made to the circuit court by either party, the owner will not be entitled to receive the amount of compensation paid to the circuit court unless the owner posts a bond equal to one-half of the award. This bond protects the acquiring authority in case the judgment of the court on appeal is less than the award of the condemnation commission.

PART SIX
APPEAL OF JUST COMPENSATION TO CIRCUIT COURT

The statutes require certain notices and papers to be filed to accomplish an appeal. It would be advisable to secure legal counsel to aid you in your appeal to the circuit court. The procedure may be found in sec. 32.06 (10) of Wisconsin statutes. You have a right to a jury trial on the issue of **just compensation**.

The measure of just compensation is the fair market value of the property acquired from you as of the date of acquisition, as calculated under sec. 32.09, stats. Should a court or jury determine that the amount you were paid for your property exceeded its fair market value as of the date of acquisition, you will be required to repay to the acquiring authority the amount of the difference. On the other hand, if the jury verdict is greater than the award of the commission, you are entitled to receive legal interest on the excess from the date title vests in the acquiring authority.

If the jury verdict or judgment of the court **exceeds** the amount of the commission's award, the acquiring authority has 40 days after the filing of the judgment to petition for abandonment of the condemnation. (The procedure followed is the same as the procedure for abandonment after the award of the condemnation commission is filed.)

If no appeal is taken to the Wisconsin court of appeals, and no petition for abandonment is filed by the acquiring authority, the judgment must be paid **within 60 days** after it is entered. If the judgment is not paid within 60 days, it will bear interest from the date of entry of the judgment until the date of payment at 10% a year.

PART SEVEN
ACTION TO CONTEST THE RIGHT OF CONDEMNATION

Such an action challenges the right of the authority to condemn the property described in the jurisdictional offer. This action must be commenced in circuit court **within 40 days** from the postmark of the certified letter containing notice of the jurisdictional offer.

If you do not challenge the acquiring authority's right to acquire your property within this 40 day period, you will lose your right to do so.

In addition, if you accept and retain any money awarded for your property, you may not challenge the acquiring authority's right to acquire.

In this proceeding, you may challenge any defects in the procedure the authority has used and the "public" nature and necessity of the proposed use.

PART EIGHT
LITIGATION EXPENSES AND COSTS

The law provides for the payment of litigation expenses by the acquiring authority under **any one** of the following circumstances:

- if the proceeding is abandoned by the acquiring authority;
- if it is determined by a court that the acquiring authority does not have the right to condemn;
- if the award of the condemnation commission is **greater** than the jurisdictional offer, or the highest written offer prior to the jurisdictional offer, by at least $700 and 15%, **and** the award is not appealed;
- if the property owner appeals an award of the condemnation commission which exceeds the jurisdictional offer or the highest written offer prior to the jurisdictional offer, by at least $700 **and** 15%, and the court approved jury verdict **exceeds** the award of the condemnation commission by at least $700 **and** 15%;
- if the acquiring authority appeals an award of the condemnation commission, and the court-approved jury verdict is $700 **and** 15% greater than the jurisdictional offer or the highest written offer prior to the jurisdictional offer;
- if the property owner appeals an award of the condemnation commission which **is not** 15% greater than the jurisdictional offer or the highest written offer prior to the jurisdictional offer, and court-approved jury verdict is at least $700 **and** 15% higher than the jurisdictional offer or highest written offer prior to the jurisdictional offer.

Unless you come under one of these specific categories, you will not be able to recover litigation expenses from the acquiring authority.

The Legislature has provided "costs" (statutorily determined payments to successful parties in proceedings challenging just compensation) to litigants who are successful but who do not fit into any of the categories mentioned above. If the just compensation awarded by the court or

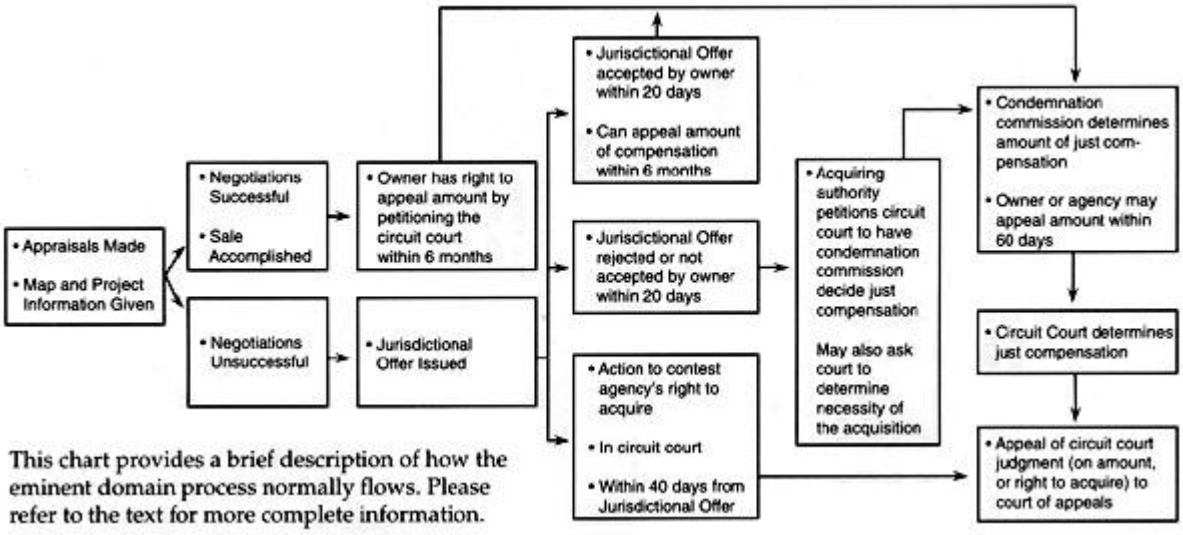
condemnation commission exceeds the jurisdictional offer or the highest written offer prior to the jurisdictional offer, the property owner will be deemed the "successful" party. You may be required to pay "costs" to the acquiring authority if you are unsuccessful in challenging the compensation you have received or the acquiring authority's right to acquire the property. "Costs" are defined in Ch. 814 of Wisconsin statutes.

PART NINE
OCCUPANCY

No occupant may be required to move from a dwelling or move a business or farm without at least 90 days' written notice from the acquiring authority. An occupant shall have rent free use of the property for 30 days beginning with the 1st or 15th day of the month after title vests in an agency, whichever is sooner. Rent charged for use of a property between the date of acquisition and the date of displacement may not exceed the economic rent, the rent paid by a tenant to the former owner or the occupant's financial means if a dwelling, whichever is less.

The acquiring authority may not require the persons who occupied the premises on the date title vested in the acquiring authority to vacate until a comparable replacement property is made available. (You may have a different right of occupancy if the property is acquired by a public utility.)

If you damage or destroy any acquired property after the date that title vest in the acquiring authority, you may be liable for the damage.



This chart provides a brief description of how the eminent domain process normally flows. Please refer to the text for more complete information.

Document Number

ELECTRIC TRANSMISSION LINE EASEMENT
CERTIFICATE OF COMPENSATION
NOTICE OF RIGHT OF APPEAL
Wis. Stat. Sec. 182.017(7)

Recording Area

Name and Return Address

Parcel Identification Number(s)

The undersigned grantor(s)**,** for themselves and their respective heirs, successors and assigns **(hereinafter cumulatively referred to as "Grantor")**, in consideration of the sum of one dollar ($1.00) and other good and valuable consideration, receipt of which is hereby acknowledged, does hereby grant, convey and warrant unto **American Transmission Company LLC, a Wisconsin limited liability company, and its manager ATC Management Inc., a Wisconsin Corporation (hereinafter jointly referred to as "Grantee")**, the perpetual right and easement to construct, install, operate, maintain, repair, replace, rebuild, remove, relocate, inspect and patrol a line of structures, comprised of wood, concrete, steel or of such material as Grantee may select, and wires, including associated appurtenances for the transmission of electric current, communication facilities and signals appurtenant thereto (hereinafter referred to as the Electric Transmission Facilities), upon, in, over and across property owned by the Grantor in the **of , County of , State of Wisconsin, described as follows:**

A parcel of land being part of 1/4 section town range or lot/block etc.

The legal description and location of the Perpetual Easement Strip is as shown on the Exhibit B, attached hereto and incorporated by reference in this easement document.

The perpetual easement has the following specifications:

PERPETUAL EASEMENT STRIP:

Length: Approximately _____ feet

Width: Approximately _____ feet

TRANSMISSION STRUCTURES:

Type: _____

Number: __

Maximum height above existing ground level: _____ feet

TRANSMISSION LINES:

Maximum nominal voltage: _____ volts

Number of circuits: __

Number of conductors: __

Number of static wires: __

Minimum height above existing landscape (ground level): ____ feet

The Grantee is also granted the associated perpetual and necessary rights to:

1) Enter upon the Perpetual Easement Strip for the purposes of fully exercising and enjoying the rights conferred by this perpetual easement; and
2) Trim, cut down and remove any or all brush, trees and overhanging branches now or hereafter existing in, on and over the Perpetual Easement Strip; and
3) Cut down and remove such dead, dying, diseased, decayed, leaning trees or tree parts now or hereafter existing on the property of the Grantor located outside of said Perpetual Easement Strip that in Grantee's judgment, may interfere with Grantee's full use of the Perpetual Easement Strip for the purposes stated herein or that pose a threat to the safe and reliable operation of the Electric Transmission Facilities; together with the right, permission and authority to enter in a reasonable manner upon the property of the Grantor adjacent to said Perpetual Easement Strip for such purpose.

The Grantee shall pay a reasonable sum for all damages to property, crops, fences, livestock, lawns, roads, fields and field tile (other than brush, trees and overhanging branches trimmed or cut down and removed from the Perpetual Easement Strip), caused by the construction, installation, operation, maintenance, repair, replacement rebuilding, relocation, inspection, patrol or removal of said Electric Transmission Facilities.

Within the Perpetual Easement Strip, and without first securing the prior written consent of the Grantee, **Grantor** agrees that they will not:

1) Locate any dwelling or mobile home intended for residential occupancy; or
2) Construct, install or erect any structures or fixtures, including but not limited to swimming pools; or
3) Construct any non-residential type building; or
4) Store flammable goods or products; or
5) Plant trees or shrubs; or
6) Place water, sewer or drainage facilities; or
7) Change the grade more than one (1) foot.

The parties hereto do hereby agree to the terms and conditions set forth in Exhibit "A", "B" and "C", attached hereto and incorporated by reference herein. The term "utility" in Exhibit "A" shall mean Grantee.

This perpetual easement agreement is binding, in its entirety, upon the heirs, successors and assigns of the parties hereto, and shall run with the lands described herein.

As provided by PSC 113, the Grantor shall have a minimum period of five days to examine materials approved or provided by the Public Service Commission of Wisconsin describing the Grantor's rights and options in the easement negotiating process. The Grantor hereby voluntarily waives the five-day review period, or acknowledges that they have had at least five (5) days to review such materials.

Grantor warrants and represents that Grantor has good title to the property described herein, free and clear from all liens and encumbrances, except: _____

The Grantor hereby accepts a lump sum payment in consideration of the grant of this perpetual easement.

WITNESS the signature(s) of the Grantor this _____ day of _____, 20___.

_____(SEAL) Signature	_____(SEAL) Signature
_____ Printed Name	_____ Printed Name
_____(SEAL) Signature	_____(SEAL) Signature
_____ Printed Name	_____ Printed Name

Grantor

ACKNOWLEDGEMENT

STATE OF WISCONSIN)
) SS
COUNTY OF)

Personally came before me this _____ day of _____, 20___, the above named _____ to me known to be the person(s) who executed the foregoing instrument and acknowledged the same.

_____
Signature of Notary

_____
Printed Name of Notary

Notary Public, State of Wisconsin

My Commission expires (is) _____

This instrument was drafted by on behalf of American Transmission Company, PO Box 47, Waukesha, WI 53187-0047.

EXHIBIT "A"
[WI Sta. 182.017(7)]

1. In constructing and maintaining high-voltage transmission lines on the property covered by the easement, the utility shall:

   a) If excavation is necessary, ensure that the topsoil is stripped, piled and replaced upon completion of the operation.

   b) Restore to its original condition any slope, terrace, or waterway, which is disturbed by the construction or maintenance.

   c) Insofar as is practicable and when the Grantor requests, schedule any construction work in an area used for agricultural production at times when the ground is frozen in order to prevent or reduce soil compaction.

   d) Clear all debris and remove all stones and rocks resulting from construction activity upon completion of construction.

   e) Satisfactorily repair to its original condition any fence damaged as a result of construction or maintenance operations. If cutting a fence is necessary, a temporary gate shall be installed. Any such gate shall be left in place at the Grantor's request.

   f) Repair any drainage tile line within the easement damaged by such construction or maintenance.

   g) Pay for any crop damage caused by such construction or maintenance.

   h) Supply and install any necessary grounding of a Grantor's fences, machinery or buildings.

2. The utility shall control weeds and brush around the transmission line facilities. No herbicidal chemicals may be used for weed and brush control without the express written consent of the Grantor. If weed and brush control is undertaken by the Grantor under an agreement with the utility, the Grantor shall receive from the utility a reasonable amount for such services.

3. The Grantor shall be afforded a reasonable time prior to commencement of construction to harvest any trees located within the easement boundaries, and if the Grantor fails to do so, the Grantor shall nevertheless retain title to all trees cut by the utility.

4. The Grantor shall not be responsible for any injury to persons or property caused by the design, construction or upkeep of the high-voltage transmission lines or towers.

5. The utility shall employ all reasonable measures to ensure that the Grantor's television and radio reception is not adversely affected by the high-voltage transmission lines.

6. The utility may not use any lands beyond the boundaries of the easement for any purpose, including ingress to and egress from the right-of-way, without the written consent of the Grantor.

EXHIBIT "C"

CERTIFICATE OF COMPENSATION

SECTION 32.06 (2a) WISCONSIN STATS.

DATED THIS _____ DAY OF _____ , 20___ .

Pursuant to Section 32.06(2a) notice is hereby given of the acquisition of a certain Perpetual Easement attached hereto and made a part hereof by this reference. The names of all persons or parties having an interest of record in the property affected by such Perpetual Easement immediately prior to the acquisition of the Perpetual Easement are the following:

Grantor: _____

Mortgagee(s): _____

Land Contract Vendor(s): _____

Others: _____

Such Perpetual Easement grants unto Grantee, its successors and assigns, licensees and manager the right, permission and authority to construct, install, operate, maintain, repair, replace, rebuild, remove, relocate, inspect and patrol (an) electric transmission line(s) for the purpose of transmitting electric energy, communications and signals upon, in, over and across the Perpetual Easement Strip as described on the instrument to which this exhibit is attached.

The total consideration paid for such Perpetual Easement was $ _____.

NOTICE OF RIGHT OF APPEAL

In accordance with Section 32.06(2a) Wisconsin Stats., any of the above named persons or parties shall have six (6) months from the date of the recording of this certificate to appeal the amount of compensation herein stated by filing a petition with the Judge of the Circuit Court of _____ County, Wisconsin, who shall assign the matter to the Chairperson of the County Condemnation Commissioners for hearing under Sec. 32.06(8). Notification of such petition shall be made to all persons or parties having an interest of record in the above property, and the procedures prescribed under Secs. 32.06(9)(a) and (b), 32.06(10), 32.06(12); and Chs. 808 and 809 shall govern such appeals.

Appendix E – Summary of Comments Received on the Draft Environmental Impact Statement and Responses

INTRODUCTION

The applicant, two parties to the docket, two township governments, one county government, one local Regional Planning Commission, and 114 members of the public provided written comments during the comment period on the draft EIS for this project. The comments included new information, criticisms of portions of the EIS, questions and comments regarding Commission policies, and shorter statements in opposition to the project itself or in opposition to one of the proposed transmission line routes. Many individuals commented on the utility's stated need for the project and on alternatives to the project that they believed could be considered.

Three of the 114 members of the public commenting included signed petitions. The petitions are not reproduced in the EIS but are on file at the Commission offices.

Twenty of the 114 members of the public commenting sent or included with their own comments a "boilerplate" statement provided to them by an outside organization that is not a party to the docket, but has shown an interest in opposing recent 345 kV transmission line proposals around the state. This statement is discussed later in this appendix.

DNR and PSC staff considered all the comments that were received during the comment period in their preparation of the final EIS. The comments are summarized below, and the final EIS has been substantially modified to address many of the comments.

Because of the volume of comments received, the comments are not reproduced in full in the final EIS. However, all comments have been uploaded to the Commission's ERF system, which can be accessed on the PSC website at http://psc.wi.gov by clicking on the "ERF – Electronic Regulatory Filing" button, then the "Search ERF" button, and then entering the docket number 137, CE, 166 in the three boxes in the middle of the page. Or, simply enter the docket number in the three boxes at the bottom of the PSC home page. Once on the ERF list page, search for specific comments by inserting a commenter's name using the "Find on this page…" function under the "Edit" tab at the top of the page.

Comments from the applicant, intervenors, and local governments are noted below. Comments from the public are summarized in the matrix at the end of this appendix. Members of the public and local governments are also encouraged to participate in the public hearings on the final EIS and the project that will be held in Oconto Falls and Pulaski in 2015.

Project Applicant – PSC REF#: 224839
The applicant submitted numerous comments on the draft EIS, many of them proposing small changes in EIS text or table numbers.

Response and related modifications to the final EIS
Commission staff has verified and incorporated many of the suggested changes provided.

Clean Wisconsin – PSC REF#: 224845

Clean Wisconsin is a full party in the docket and has received intervenor compensation to conduct environmental analysis. Clean Wisconsin has stated that it believes the draft EIS is "…inadequate and incomplete, failing to fulfill the Agencies' obligations under the Wisconsin Environmental Policy Act…" and the related administrative codes for the PSC and DNR. In terms of natural resources, Clean Wisconsin states specifically that aspects of wetlands, including farmed wetlands, wetlands associated with surface waterways, use of herbicides for vegetation management in or near wetlands, the potential for wetland avoidance, and the potential for wetland impact mitigation, are discussed insufficiently or not at all. It also states that the discussion of potential impacts and mitigation of those impacts on endangered resources are too vague and short and "highlight the need for deeper investigation of the area." It notes that there is no mention of bald eagles or threatened bat species.

In terms of potential social and economic impacts, Clean Wisconsin has two primary comments. One is that the EIS is inadequate in its discussion of socioeconomic impacts, including potential impacts on residential property values and local businesses. The other comment is that the EIS does not consider "the role future technological advancements will have on the American grid" and thus on the proposed transmission project and its operation. More particularly, Clean Wisconsin states that, if the Commission approves this project, it will "shackle Wisconsin's energy future to transmission lines" instead of allowing for advancements in distributed generation such as rooftop solar power.

Response and related modifications to the final EIS

Clean Wisconsin's points are addressed below.

It is correct that not all wetlands, including farmed wetlands, have been field-delineated. If the project is approved by the PSC, the applicant must delineate all wetlands on the approved route prior to beginning construction. A more detailed account of impacts on farmed wetlands was added to the Chapter 5, Section 5.5.17.2.1.

Wetlands associated with surface waters are discussed throughout the document. Chapters 7, 8, and 9 address the impacts to wetlands adjacent to surface waters such as Duck Creek, the West Branch of the Suamico River, and the Pensaukee River, and others.

Text was added to Chapter 5, Section 5.4.7, to address impacts of herbicide applications in wetlands within utility ROWs.

The EIS addresses impacts to wetlands where only part of the wetland is directly impacted. Such wetlands along Segments N4 and N7, for example, were noted and discussed in Chapter 9, Sections 9.2.3.3 and 9.2.3.10 of the DEIS.

DNR has worked with PSC and the applicant throughout the review process to identify and analyze route alternatives and construction measures that minimize impacts on wetlands.

A discussion on wetland mitigation was added to the general impacts Chapter 5, Section 5.5.17.3.

The bald eagle is not discussed because there are no documented occurrences of nesting eagles within the vicinity of the project. A paragraph was added to the EIS providing this information and stating that surveys may be recommended, if warranted.

As with bald eagle, no state-listed bats have been documented (hibernacula or maternity roosts) as occurring within the vicinity of the project. However, language has been added to Chapters 7, 8, and 9

with regards to the northern long-eared bat, as this species would be federally-listed prior to the start of the project if the project is approved. Project requirements, if any, are unknown at this time.

Based on information provided by local citizens, potential economic impact information and analyses for specific properties and businesses are included in Chapters 7, 8, and 9. A lack of readily available relevant data does not allow staff to conduct studies or socio-economic assessments. Commission staff anticipates substantial testimony from local residents, landowners, and business owners about potential economic impact that could result from the project will be added to the record during the upcoming public hearings.

Finally, the potential for load reduction is discussed in Section 3.5.2.2 of the EIS. Neither the Commission nor the applicant has the authority to ensure that distributed generation projects such as rooftop solar are placed into service. Given that the need for this project is primarily reliability driven and related to the ability to conduct needed maintenance outages, distributed generation, such as rooftop solar, is not considered to be a viable alternative to the proposed project.

Lila Zastrow and Dave Hendrickson – PSC REF#: 224126, PSC REF#: 224162, PSC REF#: 224734

Zastrow and Hendrickson are local citizens and landowners in the proposed transmission project area who are a full party to the docket. They have strong concerns based on personal experiences with ATC's vegetation management practices on an existing ROW on their property. In terms of constructing the new transmission lines proposed for the North Appleton-Morgan project, their comments and attention focus on how ATC's past treatment of utility ROWs and landowners can be avoided or changed if the proposed lines are approved and built.

Response and related modifications to the final EIS

The concern about ATC's vegetation management practices are shared by many landowners throughout the state. Staff have received numerous complaints over the past few years. More rigorous vegetation management practices were implemented by transmission owners in response to new NERC standards developed in response to the cascading regional electrical failure in the northeastern U.S. of a few years ago. The industry's response has focused on improving the reliability of the electric transmission system in many ways, including developing ROW vegetation management plans that create and maintain transmission line ROWs to avoid the potential for vegetation-related outages and clearances to support the possible need for emergency repair work.

On receiving the comment from Zastrow and Hendrickson, staff issued data requests to the applicant related to ATC's vegetation management practices. ATC responded to the twelve requests, and the responses can be found in the following ERF entries: PSC REF#: 224319, PSC REF#: 224320, PSC REF#: 224321, PSC REF#: 224322, PSC REF#: 224325, PSC REF#: 224326, PSC REF#: 224327, PSC REF#: 224328, PSC REF#: 224329, PSC REF#: 224331, PSC REF#: 224332, PSC REF#: 224333. These responses and further examination of NERC standards were used by staff to prepare a new version of Section 5.4.7 in Chapter 5. A new Appendix E was also added to include the ATC contract boilerplate for a transmission easement provided by the company.

Mel Schampers – PSC REF#: 222117

Mr. Schampers, who is also a party to the docket, submitted a copy of the form letter discussed below in the Public Comments section of this Appendix.

Response and related modifications to the final EIS
Commission staff acknowledges the concerns and issues expressed in the letter. Updated information is provided on the transmission situation in the area in Chapter 3, and on certain local economic and other impacts, in the Chapters 7, 8, and 9.

Brown County Planning Commission – PSC REF#: 223280, page 6
Brown County notes that the proposed transmission lines would cross numerous waterways, wetlands, floodways, and floodplains in the town of Pittsfield. If a CPCN is issued by the Commission, the County acknowledges that Shoreland Zoning Permits are not required, it would require certain setbacks.

Response and related modifications to the final EIS
This requirement for BMPs is noted. The project's proposed crossings of waterways and wetlands are discussed in Chapters 7, 8, and 9.

Town of Lessor, Shawano County – PSC REF#: 219837
The town of Lessor states that it opposes the proposed transmission lines passing through the town and that the lines would present hardships on its residents and destroy farmland.

Response and related modifications to the final EIS
The town's statement of opposition is noted for purposes of the EIS. Impacts to landowners, farm operators, and residents are described in the final EIS.

Town of Maple Grove, Shawano County – PSC REF#: 224959
The town of Maple Grove states that it opposes the project. It points out that, in 2010, the town was designated by the state as an Agriculture Enterprise Area (AEA). It also states its concern about the effect of the project on the environment.

Response and related modifications to the final EIS
The town's statement of opposition is noted for purposes of the EIS, as is its position as an AEA to encourage agricultural production and investment and potential Farmland Preservation participation. Farmland Preservation and Prime Farmlands are discussed in the EIS, particularly in Chapter 5.

East Central Wisconsin Regional Planning Commission (ECWRPC) – PSC REF#: 224249
ECWRPC has offered recommendations, particularly about reducing impacts to wetlands, especially those of significant quality that exist in the project area. It asks that the project be routed or the span lengths adjusted to avoid wetlands and that equipment be kept out of the wetlands. It also notes that karst geology in Outagamie County would require special care to avoid groundwater contamination.

Karst geology is characterized by fractures in the bedrock that allow for rapid movement of water or a direct conduit for water into groundwater aquifers. Deep foundations and excavations could cause negative impacts to nearby private wells. ECWRPC thinks that understanding the landscapes, aquifers and water flow regimes is critical.

The ECWRPC asks that staff urge the Commission to (1) select a route that has the least negative impact on the environment and residents and (2) select construction times that can limit the impact on croplands, wetlands, high quality natural areas, protected species, migratory birds, and limit the potential spread of invasive species and plant diseases. In general, it asks that the Commission and utility mitigate environmental impacts to the greatest extent possible.

Response and related modifications to the final EIS
The recommendations of ECWRPC are noted. The EIS discusses all of the mentioned potential impacts to varying extents, and a subsection has been added to Chapter 5 on potential groundwater impacts and karst geology.

It would be helpful if a representative of ECWRPC would offer detailed testimony at the public hearings in 2015.

Wisconsin Department of Agriculture, Trade and Consumer Protection – PSC REF#: 225360
The DATCP AIS program submitted comments on potential impacts of the project on agricultural operations in the project area. It pointed out that agriculture is the largest economic sector in the area that could be affected adversely by the project, and that "impacts on some farms could be significant." DATCP also described the AIS program survey of farm operators and its progress on the AIS. It then listed critical farm operations susceptible to adverse impact from the project, including:

- Obstacles in fields
- Damage to drainage systems, including especially farm systems in local drainage districts:
  - Duck Creek Drainage District in Outagamie County, potentially affected by Route Section S1
  - Hoffa Park Drainage District in Shawano County, potentially affected by Route Section C3
  - Drainage District #2 in Shawano County, potentially affected by Route Section C3
  - Oconto Falls South Drainage District in Oconto County, potentially affected by Route Sections N4, N6, N8, N15, or N18
- Contamination of organic farms -- three farms were identified:
  - Fischer farm on Route Section S2
  - Jaworski farm on Route Section N4
  - Niespodzany farm on Route Section N4
- Interference with center-pivot irrigation systems – four farms were identified
  - Wilkey farm on Sections C3 and N4
  - Wilkey farm on Section N18
  - Geiser farm on Section N13
  - Jacob Brothers farm on Sections N14, C4, N13, N18, N4, and N7, not all of which include center-pivot irrigation
- Interference with aerial applications

DATCP states also that the AIS will be available on the DATCP website by mid-December 2014.

Response and related modifications to the final EIS
DATCP has provided a copy of the AIS Executive Summary for this EIS. It is included in Appendix C. The potential impacts discussed in DATCP comments are also discussed in the EIS to varying extents.

Public Comments – Boilerplate form letter
In total, there were 114 members of the public commented during the comment period for the draft EIS. They are listed in Table E.2.

Twenty commenters provided a copy of a form letter. The form letter is titled "Boilerplate" in some comments from members of the local public. Several added additional comments in their posting. The boilerplate language of the form letter is shown below.

Boilerplate Language

State law clearly states the impact report must incorporate local energy priorities and account for non-transmission energy alternatives. I do not see this as having happened in the least. The justification for this string of 170` high towers cutting 150 foot wide swaths for 150 miles is weak and makes great assumptions that are counter to the facts. This project would have little to no positive impact on our local communities, and would continue the trend of Wisconsin exporting its energy dollars to other states, even as we, the ratepayers, bear the costs of energy transmission through our properties. I fail to see sufficient documentation of the need for this, or any of the other high-capacity transmission lines currently proposed when electricity use in US homes has been on the decline for seven years. In the Midwest, this rate, according to data supplied by the regional utilities, comes to approximately 2.5% per year. Meanwhile, every year since 2005 when Wisconsin utilities began adding charges for our larger, robust transmission system, our average electricity rates have ranked either the highest or second highest in the Midwest. Though once below national average, in 2013, only ten states had electricity rates higher than Wisconsin. As our electric bills continue to soar to pay the capital debt on the high capacity transmission system we have added in WI since 2002, we must stop and realize that this debt will remain on our bills for the next 40 years- even if this transmission line and four others utilities want to add- are not added.

Hundreds of submissions made during the Scoping Phase listing specific economic and environmental concerns are not accounted for in the draft. No estimated values have been placed on potential losses in tourism and housing, business and agricultural development. Positive impacts on local economies from Non Transmission Alternative Solutions based on Energy Efficiency and Local Power are avoided entirely. Plus, there is no mention that over the last three years, 90+ municipal WI governments have asked the PSC to please make sure that a cost-benefit analysis of all energy alternatives becomes available for us to evaluate and comment upon before the PSC sets any pen to paper on this report.

Please take these comments into account and make the following corrections and additions to the current draft:

Include and describe, in detail, all PSC measures taken to comply with the Municipal Resolution requests and supporting petitions and letter requests from Wisconsin lawmakers asking the PSC to study non-transmission energy alternatives economic and environmental impact assessments and make this information publicly accessible in advance of the current comment period. See WI State Statutes:

1.13(2); 1.11(2)(e)3; 1.11(2)(c)6 and 1.11(2)(e).

For the high voltage transmission option of this proposal, include dollar estimates of the following impacts in all affected Wisconsin communities: losses in local property values and tax revenue due to negative perceptions; long term decreased potential in housing, business and agriculture development for properties within view of the transmission system including economic activities associated with tourism. For an energy alternative based on a comparable, increased, investment in energy efficiency, provide (state wide) dollar estimates of home farm and business operation cost savings, local job creation and the value of the avoided carbon emissions.

Add these values to the transmission induced losses that would be avoided with the alternative solution and compare this sum to the "impact payments" affected communities would receive for the high voltage transmission option.

Thank you for your time and please consider the alternatives, especially, accelerated energy efficiency measures that would have the most immediate positive effect on energy use, the grid in general, and carbon emissions.

Response and related modifications to the final EIS
The details and costs of the project are discussed in Chapters 2 and 3 of the EIS. Ratepayer impacts are derived from the costs of the project shared among the owner utilities of ATC and passed along to their customers, as dictated in their individual rate cases before the Commission.

For a discussion of the economic and environmental concerns, see the response to Clean Wisconsin's comment and Chapters 5 through 10 of the EIS.

Non-transmission energy alternatives must continue to be a part of the discussion in the state. Discussion in this EIS is limited to information available and governmental development of energy policy in the state. Authorization of major construction projects is the Commission's statutory responsibility as a part of the Executive Branch of state government.

Public comment – petitions
There were also three sets of petitions submitted. The petitions can be found on the PSC website at PSC REF#: 224162, PSC REF#: 224776, and PSC REF#: 224959. They are not included verbatim in the EIS or this appendix.

Public comment – general
Subjects of comment among the submittals by members of the public are tallied in Table E.1.

Table E.1 Topics of comment by members of the public

Comment Content	Number of Comments Addressing this Topic
Economic impact	74
Environmental/wildlife concerns	63
Health concerns	61
Community impacts	54
Project need/reliability	48
Personal hardship	42
Property values	42
Agricultural concerns	39
Specific route concerns	33
Recreational impacts	31
Stray voltage	16
Vegetation management/herbicide use	9
EMF	9
Noise	6

The sum of percentages exceeds 100 percent because many people mentioned multiple concerns in each comment.

Comments by members of the public are listed and summarized in Table E.2. These comments arrived via the PSC internet comment system, by e-mail, or by first class mail. Staff considered each comment and made additions or changes to the EIS where possible and where statements were verifiable. Staff also made data requests to the applicant based on specific public comments received and attempted to modify the EIS based on the comments and responses to the data requests.

Table E.2 List of public comments received on the draft EIS

Last Name	First Name	Location	Comment Summary
Allen	Jesse	Oconto Falls	Health risks; environmental risks; negative financial impacts; safety concerns for family and future; risk to animals; impact on hunting land, land value; increased electric bill; effects on drinking water; project need.
Ambrosius	Jerry and Julie	Seymour	Renewables; agricultural concerns; project need; cost.
Ambrosius	Gerald	Seymour	Opposed to C4; negative effects on neighborhood, particularly the family of Linda Genke; property values; health and cancer risks; fairness; proposed project will not benefit WI communities; cost burden.
Anastasoupolous	Yanna	Not Specified	Economic/financial burden; Commission should look into other alternatives and/or conservation; ATC should purchase people's homes if they don't want to live near the line; condemnation is unfair; look into other alternatives such as solar; more data needed to prove project need; need should be explained to the public at an average person's level of understanding; increase in monthly electric bill.
Aprill	Welma	Oconto Falls	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts; noise.
Aprill	Gary and Renee	Pulaski	Form letter.
Arndt	Dean	Pulaski	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts.
Arndt	Kay	Pulaski	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts.
Artin	Patty and John	Seymour	Project need; feasibility study should be done that addresses the need; addresses statement in DEIS Section 7.3.3.2.
Bahrs	Fred	Seymour	Project need; C3 less cost effective than C4; research additional power plant generation and alternative options in NE WI.
Balthazor	Jennifer	Pulaski	Form letter.
Balthazor	Gregory	Pulaski	Form letter.
Behrend	Virginia	Oconto Falls	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts; personal hardship; community impact on town of Morgan; project need with decreasing load demand in WI and U.P.; use existing ROW.
Beilke-Koeffler	Susan	Seymour	Opposes line going through property, west of Seymour (town of Cicero); alternatives; health hazard; EMF and impact on animals (dairy production); devaluation of property and community; pursue corridor sharing before creating new ROW; need comprehensive data that reflects a history of using corridors to fullest capacity; included document on "Effects of High Voltage Transmission Lines on Humans and Plants" from http://electricalnotes.wordpress.com/2012/02/17/effects-of-high-voltage-transmission-lines-on-humans-and-plants. Form letter.
Blaser	Barbara	Krakow	Not enough information provided to landowners; stray voltage affecting cattle; decrease in property value; aesthetics; land is certified organic; corridor sharing.
Bleick	Jean	Pulaski	Project need; route line with existing corridors; environment; stray voltage concerns; health concerns.
Brunke	Ray	Athens	Form letter.
Brunke	Lynette	Athens	Form letter.
Brunke	Shara	Pulaski	Project need; impact on communities, families, health, environment; corridor sharing. Form letter.
Buchmann	Aletha	Seymour	Agricultural concern; personal hardship; NE field is already crisscrossed by gas pipelines; new utility line will make parcel undevelopable; financial burden; fairness; transmission line would go through active croplands; drain tiles would be impacted; large farming machinery wouldn't be able to go around large structures; soil compaction and impact on crop yield.

Last Name	First Name	Location	Comment Summary
Buchmann	Bill	Oakdale, CA	Property value; aesthetics and health hazards caused by high voltage power lines; study smaller, efficient wind or solar.
Buchmann	Beau	Toronto, Ontario	Two gas lines constructed on property have severely damaged the fertility and productivity of the field and ruined any chance for property development; proposed transmission lines would impact productivity and functionality of the crop field, and opportunity to develop the land.
Ciesielczyk	Bob and Barb	Seymour	Stray voltage concerns.
Citron	Michelle	Dodgeville	Urge that cost/benefit analysis be done prior to routing decisions being made.
Concerned citizen		Seymour	Property values, potential health hazard; EMF concerns.
Concerned citizen		Seymour	Stray voltage concerns; should consider more modern alternatives.
Crombie	Jeff	Seymour	Negative health impacts; safety concerns; increase route distance from any existing community; financial impact, burden on WI tax payers; documented devaluation of property near power lines (up to 10%); restitution of taxable property value.
DeBruin	Jim and Sue	Seymour	Project need; impact to acres of habitat and displacing wildlife; use of property; personal hardship; corridor sharing; create more green power options; desires strong protections in transmission ROWs for habitat, wildlife, and people. Form letter.
DeBruin	Jay and Deanna	Seymour	Invest in energy efficiency and renewables; negative impact on the health and well-being of the land, wildlife, and environment; the $307-326 million dollar cost of the project should be put towards sustainable, renewable energy sources; large ROWs disrupt farmlands, woodlands, and wetlands; endangers wildlife habitat; construction activity concern for contamination of privately-owned wells (arsenic and other contaminants); energy consumption down in WI; excess generation in the state; WI should promote the use of locally-produced solar and wind power; economic impact will last at least 40 years, but the environmental impact will last forever.
Dinse	Lorraine	Krakow	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts; project need.
Drella	Dave and Carol	Krakow	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts; concern for cattle; EMF; project need; pesticide use; noise; water contamination; property values; research alternatives such as energy conservation and local generation.
Eakles	Dena	Ontario	Project need; general environmental concerns.
Elwell	Bethany	Green Bay	Project need; property values; aesthetics of rural country side; alternative options that would not impact local land and residents.
Feltz	Nathan	Freedom	Negative impact on property; impact to high value subdivisions; opposes S2; concerned about potential health risks (especially on children) and environmental concerns. S2 would impact fewer homes, families, and children.
Gauthier	Randy and Peggy	Oconto Falls	Health risks; environmental risks; negative effects on wildlife including hunting and fishing; negative financial impacts; EMF and health risks; fear; water contamination; alternative route or alternative options; safety concerns.
Genke	Linda	Seymour	Electricity demand WI has been declining; financial burden; loss of property values because of scenic views; perceived health issues; stray voltage impact on plants and animals; proposed plan would go around house on two sides; personal hardship; recreational impacts; adverse effects on landscaping beauty; noise; TV and electronic equipment interference problems. Petition with 69 signatures.

Last Name	First Name	Location	Comment Summary
Giannunzio	Doug	Pulaski	Impact thousands of trees, wetlands, and wildlife habitat on property; oppose the line especially for environmental reasons; has spent decades managing and improving the vegetation, trees, and wildlife habitat on property; an entire hedge row of over 2,500 trees would be lost; the proposed lines would greatly affect this natural wildlife area; property home to badgers, blue and green herons, minks, otters, coyotes, and black bear; property has been Certified Wildlife Habitat by the National Wildlife Federation; property is also Certified Monarch Waystation; project need; negative impacts on health and wellbeing of human residents (especially children), the environment and wildlife; PSC should focus on renewable, cleaner energy; use existing ROWs instead of new corridors.
Goldsmith	Eric	Seymour	Project will detrimentally effect property value, health, and environment; live outside of easement areas and am not entitled to any compensation or loss of investment; project need; ATC staff are evasive when questioned; national oversight.
Gregg	Paul	Seymour	Project need; no benefit to WI ratepayers; WI presently has significant generation capacity, no need for radical expansion of WI transmission facilities; present ATC system with minor upgrades can easily accommodate export of current 30% excess of WI sourced electric power; smart grid concepts will likely evolve WI system into a grid that interconnects w/vast multitude of small generation sites (wind, solar, etc.); as energy efficiency rises, demand will decrease.
Gronski	Ray	Pulaski	Form letter. Included in comment is a proposed route along N4. PSC staff created data request 07.02, ATC response pending.
Haluska	Gertrude	Lena	Health risks (especially children); proximity of lines to house with young children.
Herms	Kevin and Lori	Krakow	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts; state licensed daycare within 1,500 ft of line; many customers are concerned about the health risks to their children; would hurt business; research alternatives such as repairing old lines; community impact.
Herning	John	Oconto Falls	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts.
Hintz	Marvin and Sharri	Seymour	Impact to farmland; property values; health issues; project need and feasibility; benefits of the project; gas pipeline already on property has created field drainage tile issues; requests a feasibility study.
Hockers	Charles and Karen	De Pere	Proposed corridor goes through center of south end of property which would jeopardize future plans for property. Property values.
Holewinski	Doug and Renee	Pulaski	MFL property, cutting ROW exceeds allowable acreage of trees removed and would lose tax deduction; economic hardship; environmental, wetland, wildlife concerns; aesthetic concerns; loss of income from trapping and hunting on property; health concerns; alternativ routing option further west through an open farm field.
Holtz	Todd and Julie	Seymour	Impact on neighborhood; reduction in property values; health concerns; environmental impacts; project need. There has not been full disclosure of this project regarding the issues; notified via neighbor. The project is over 2,000 feet from the neighborhood, and separated by a large forest block.
Ignatowski	Paul	Pulaski	Vegetation management of existing 345 kV line along the Pensaukee River (pictures included); health concerns; choose route along N7, fewer landowners impacted.
Jaworski	Chris	Pulaski	Land is certified organic since 2001; specialize in growing organic tofu beans; proposed power lines will represent challenges to ongoing business and could have detrimental impact on farming operations now and into future. Structures would disrupt existing tiles; would affect cultivation practices; concerned about herbicide use; use of GPS controlled weeding equipment to navigate around structures; compaction of soil by large equipment; concerns about transmission lines impacting organic certification; opposed to all re-route options (N4-02.06a, b, and c). Neighbors should share the burden of the line.

Last Name	First Name	Location	Comment Summary
Jones	Maggie	Blue River	Project need.
Justacki (sp?)	Terry	Morgan	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts. Opposes line on property. Proposes use smaller line as an alternative.
Kaczorowski	LeRoy (Nanle Properties)	Town of Maple Grove	Against transmission lines running through center of highly used agricultural land with drain tiles. The town of Maple Grove is zoned agricultural. Route lines along existing corridors.
Kaminski		Pulaski	Health concerns; property value; project need; costs.
Krueger	Mary	Seymour	Project need.
Krueger	Keith	Seymour	Cost benefit analysis needed; energy consumption in WI dropping because of energy efficiency and renewables; project need; impacts of proposed project on property; aesthetic concerns; would lose trees that currently block existing view of power lines; concerns for wells and setting of poles, and arsenic leaching into wells.
Krueger	David	Seymour	Devalue property; would destroy the woods that have been there for over 65 years. Against lines going through property.
Kussow	Kevin	Freedom	Opposes substation expansion; property values; noise issues; alternatives sites for substation; personal hardship. Expansion will put substation next to home.
Larscheid	Bill, Deb	Pulaski	Proposed N4 runs along the east side of property that has been in family >100 years and is currently farmed; recreational impacts; would impact future plans for property; the new access road would require significant removal of trees and impact use of area; project need.
Laurent	Kate	Seymour	Aesthetics; health and safety concern for young children. The project is over 2,000 feet from the Autumn Blaze Trail neighborhood, and separated by a large forest block.
Lehman	Nathan	Athens	Form letter.
Lehman	Gina	Athens	Form letter.
Linskens	Diane and Chuck	Seymour	Form letter.
Ludwig	Joseph and Heather	Freedom	More economical to use route 1S2A; more people would be affected by adverse health risks associated with 1S1A; property values in town of Freedom would reduce town income now and in the future; property located on 1S1A has 80+ mature trees that would be destroyed or moved.
Miller	Jeff	Pulaski	Negative financial impacts; proposed route passes this property on two sides; owners would look at the towers to the east and to the north/northeast; property values; personal hardship; aesthetics; economic burden; opposes N4.
Miller	Ed	Seymour	Project need; electricity use is in decline; state law clearly states the impact report must incorporate local energy priorities and account for non-transmission energy alternatives. Negative impact on local communities; financial burden on WI ratepayers and landowners. Wind turbine on property near proposed line and wouldn't be able to afford liability insurance. Form letter.
Moeller	Ken	Seymour	Stray voltage concerns.
Murphy	Patricia	Kaukauna	Opposes lines going through property; project need; requests another route.
Nickel, Jr.	Richard H.	Pulaski	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts; opposes line to cross property; safety; no benefit to town of Chase. Requests to not install this line through town of Chase.
Nooyen	JoAnn	Seymour	Project need; power use is dropping; DEIS only looks at damage done to the environment, not about the loss of value on properties; financial impact on electric bills; local generation and renewables as alternatives; aesthetics; ATC plans to use abandoned car lot for their equipment, however, two businesses are operating on this property for more than a year. Questions accuracy of DEIS.
Nowak	Carol	Seymour	Form letter.

Last Name	First Name	Location	Comment Summary
Pelkin	Scott	Freedom	Opposes S1; S2 is preferred by ATC; S2 is several million dollars less than S1; S1 has 2 large subdivisions with many young children; S1 affects 3 times more properties than S2; S2 has fewer people and already has a 345 kV corridor. Use existing corridor; health concerns; property values.
Pesola	Barbara	Seymour	Project need; benefit of project; existing line on property; aesthetics; safety concern for residents and wildlife.
Peters	Mandy	Shiocton	Form letter.
Peterson	Verna	Morgan	Health risks; environmental risks; stray voltage.
Peterson	Dennis	Oconto Falls	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts.
Popp	Rich and Amy	Seymour	Form letter.
Popple	Patricia	Chippewa Falls	Eminent domain concerns; tree removal; general concerns; advocates for renewable energy.
Porter	Dexter	Sheboygan Falls	Major impact on property; significant impact on sugar bush; wildlife habitat concern; MFL concerns; ability for farmers to follow nutrient management program that achieve water quality and other management objectives with large structures in fields; health concerns; property value; safety with gas pipeline; land legacy; project need.
Radecki	James	Seymour	Concern about line crossing 3 parcels of rich farm land; farming operation close to proposed lines; concerned about damage to tiles; compaction of soil; difficulty planting and harvesting and danger to humans and animals. Maple Grove township is zoned agricultural; lines will ruin soil and housing development; property values; electricity demand decreasing; cost; project need; more complete impact and needs statement needed for area. Form letter.
Radecki	Gail	Seymour	Energy need decreasing; project need; who benefits from project; financial burden on ratepayers; loss of fertile soil and ruined selling prices; damage tiling; township of Maple Grove zoned agriculture, farming equipment around large structures; stray voltage and husband's pace-maker concern; safety under lines; requests study by DATCP on the need for the electric lines; requests project be put on hold. Form letter.
Radke	Michael	Morgan	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts. Land values decrease, aesthetics and community impacts. Upgrade existing lines as alternative.
Schaumberg	Catherine	Seymour	The project will damage their ability to grow crops to feed livestock and decrease value of farm. The DEIS does not give information why the project is needed. Financial burden on WI ratepayers; little positive impact on local communities; energy use declining. Alternate forms of energy are the way of the future.
Schaumberg	Glen	Seymour	The proposed route puts poles in the middle of cropland of active dairy farm; project need; no positive impact on community; project damages landowner's property; financial burden on WI ratepayers; need a cultural and economic impact study.
Schindel	Michael	Appleton	Form letter.
Schneider	Lea	Seymour	Concern for neighborhood; heavy residential area; stray voltage effect on families, animals, and children; aesthetics; devaluation of property; impact on farms; requests alternatives; safety and wellbeing of people. The project is over 2,000 feet from the Autumn Blaze Trail neighborhood, and separated by a large forest block.
Schneider	Mark	Seymour	WI energy consumption decreasing; aesthetics; concern for impact on livestock and humans from static and stray voltage; decreasing property values. The project is over 2,000 feet from the neighborhood, and separated by a large forest block.
Schuh	Dave and Margaret	Seymour	Project need; impact on communities, families, health, environment; corridor sharing. Form letter.
Shepard	Greg	Freedom	Form letter.

Last Name	First Name	Location	Comment Summary
Sippl	Tracy	Seymour	Opposes S2; cites studies on health effects of transmission lines (childhood leukemia); EMF; stray voltage; corridor sharing favors placement of lines within or next to existing infrastructure; concern about lack of financial compensation for property owners living near property but not within easement area; property values.
Sippl	Pete	Seymour	Opposes C4; decreased land value; unpleasant appearance; stray voltage; TV and electrical equipment interference, detrimental health issues; area on the east side of Seymour is highly populated.
Smurawa	Matt and Judy	Seymour	The project will have very little to no positive impact on local communities; cost; project need; impact on property value and other associated problems.
Smurawa	Dale	Seymour	Existing and new stray voltage concerns; construction of huge poles would destroy good quality farmland; negative impact on personal livelihood; project will not benefit the community; project need.
Strache	Jeff and Jan	Exeland	Aesthetics; health risk; if approved the line should follow existing ROWs. Appears the West Route follows the most existing ROWs. Impacts to residential property, waterways, and wetlands should take priority over cost. Consider upgrading existing lines as an alternative.
Sutrick	Janice M.	Oconto Falls	Health Risks; environmental risks; negative effects on wildlife, including hunting and fishing; negative financial impacts; aesthetics of rural legacy; property values.
Sutrick	A.J.	Oconto Falls	Health risks; environmental risks; negative effects on wildlife including hunting and fishing; negative financial impacts.
Thompson	Karen	Lena	Health risks (especially young children); environmental risks; negative effects on wildlife including hunting/fishing; financial impacts; disrupt good farmland. Lives on Morgan Marsh Rd.; project need. If ATC wants to build lines, it should purchase the homes at value to allow people to leave the area. Explore route alternatives away from people's homes, explore other sources of energy.
Tomazevic	Barnaby	Freedom	Landowner on S1; S1 will affect far more houses than S2 and has a higher cost to install; S1 will affect 2 subdivisions and over 30 children; property values; S2 will have less effect on existing properties than S1 option.
Tyczkowski	Jennifer	Oconto Falls	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts; personal hardship; complicate current health issues; requests relocation of line.
Tyczkowski	Nicholas	Oconto Falls	Health risks (especially for young children); environmental risks; negative effects on wildlife including hunting/fishing; financial impacts; personal hardships; property value; requests relocation of lines; decrease capacity of line to decrease EMFs.
Van Boxtel	Dan	Seymour	Electrical use in WI is going down by 2.5% per year for the last few years; project need; invest in technology to help consumers use less.
Van Donsel	Carolyn	Krakow	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts; proximity to nearby homes; personal hardship. Alternatives should stay away from homes and farms; opposes the 1N4A line; prefers the 1N3A and 1N5A lines; town of Morgan does not want/need a distribution center.
Vandentlzen	Ray	De Pere	Project need; financial burden; benefit of project; already has transmission lines and a gas line that they have to farm around and lose crops to feed cattle; new lines will destroy more crop land; large equipment can't work around and harvest sharp corners; organic farm.
Ver Voort	Marlene	Seymour	Opposes power lines along S1; S2 already has a 345 kV line on it; S2 costs less and affects almost 3 time more houses than S1; S1 goes through 2 subdivisions and near a school with young children; project need.
Ver Voort	Jeff	Seymour	Concern for number of children on the route, property values, construction costs, health and environmental risks; property value.
Wallendal (sp?)	Tom	Pulaski	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts.

Last Name	First Name	Location	Comment Summary
Wesoloski	Theresa	Oconto Falls	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts; property value; requests relocation of lines.
Wesoloski	Syl	Oconto Falls	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts; property value; EMF risk; water contamination; impact to town of Morgan.
Wilinski	Jennifer	Oconto Falls	Concerned about impact transmission lines would have on personal life, children's lives, surrounding communities' financial/economic growth, and the environment. Hazards of building, concerned about basement foundation cracking, as well as local roads; negative effects of EMFs; financial strain put on people in town; size of line; property values. Works from home, worried about disruption of internet service. Health concerns; personal hardship; pesticide use and impact on children; water contamination; noise levels; agricultural concern; impact on town of Morgan; stray voltage. Requests alternative route options away from house. PSC staff created data request 07.01, ATC response pending.
Wilinski	Ron and Joyce	Kingsford, MI	Health concerns (especially for children); proximity of proposed lines to house; has numerous questions and concerns relating to health of children and transmission lines.
Wilinski	Jeff	Oconto Falls	Proximity of transmission line to house; youngest child very sick, potentially immunocompromised. Requests alternative route option away from house. PSC staff created data request 07.01, ATC response pending.
Wortner	Dawn	Oconto Falls	Health risks; environmental risks; negative effects on wildlife, including hunting and fishing; negative financial impacts; health concerns for young kids, prevent choice of growing family; safety concern; concern for animals on farm.
Zablocki	Michelle	Oconto Falls	Health risks; environmental risks; negative effects on wildlife including hunting/fishing; financial impacts; overuse of herbicide; keep energy local.
Zoromski	Susan	Coleman	Health risks; environmental risks; negative effects on wildlife, including hunting and fishing; negative financial impacts; concern for young children.
Sobieski	Megan	Not Specified	Opposes transformers near town of Pulaski; health effects of high voltage lines; project need; impact on land, homes, and families.
Not specified		Seymour	Continuation of Petition from ERF 224776. Electricity in WI declining; detrimental health issues; stray voltage issues; decrease of land and property values; adverse effects on landscaping beauty; noise; TV and electronic equipment interference problems. Petition included, 14 signatures.

DL: 00946819

December 2014

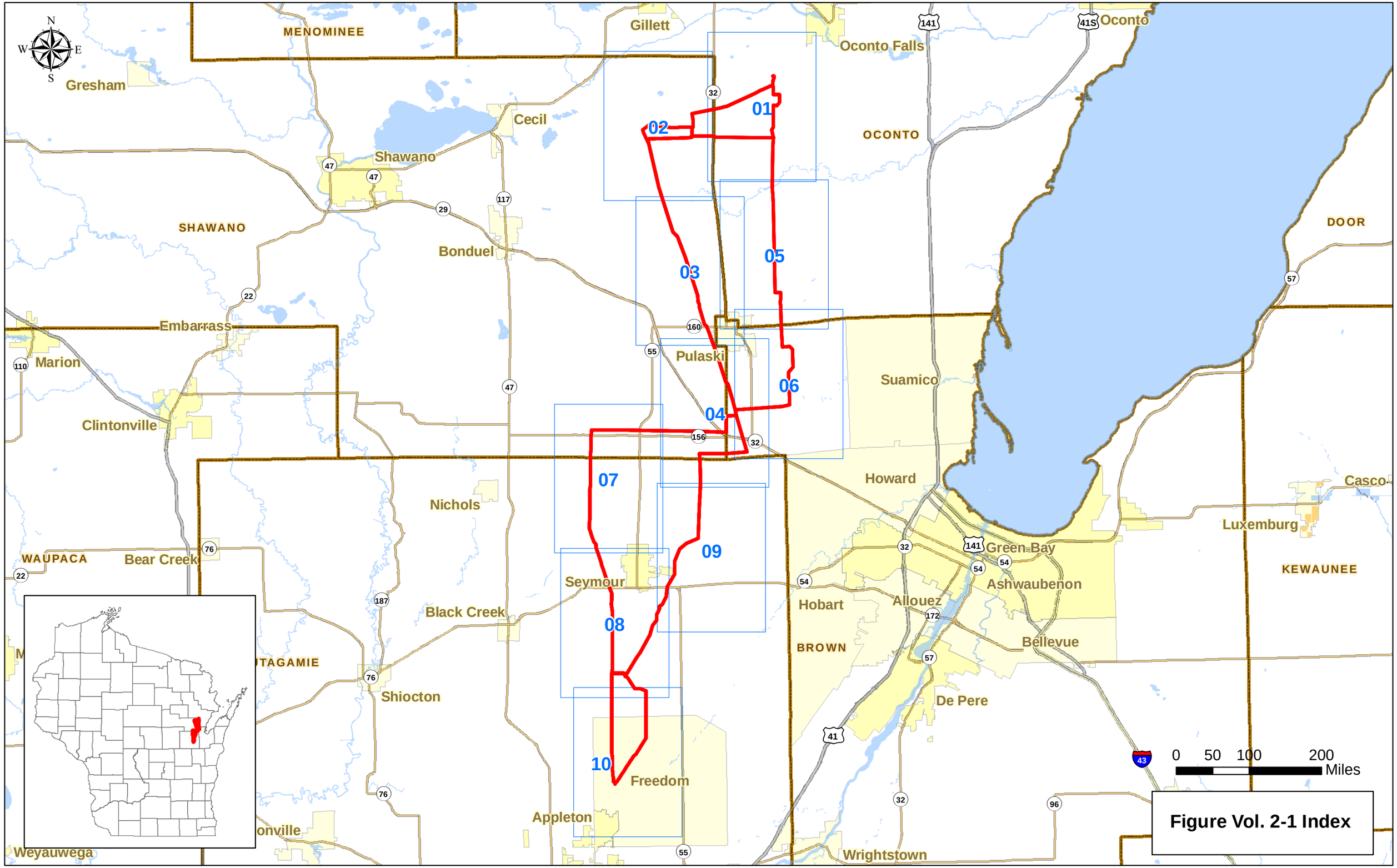
PUBLIC SERVICE COMMISSION OF WISCONSIN
WISCONSIN DEPARTMENT OF NATURAL RESOURCES

North Appleton-Morgan Transmission Lines Volume 2

Final Environmental Impact Statement

PSC Docket 137-CE-166

Date Issued: December 2014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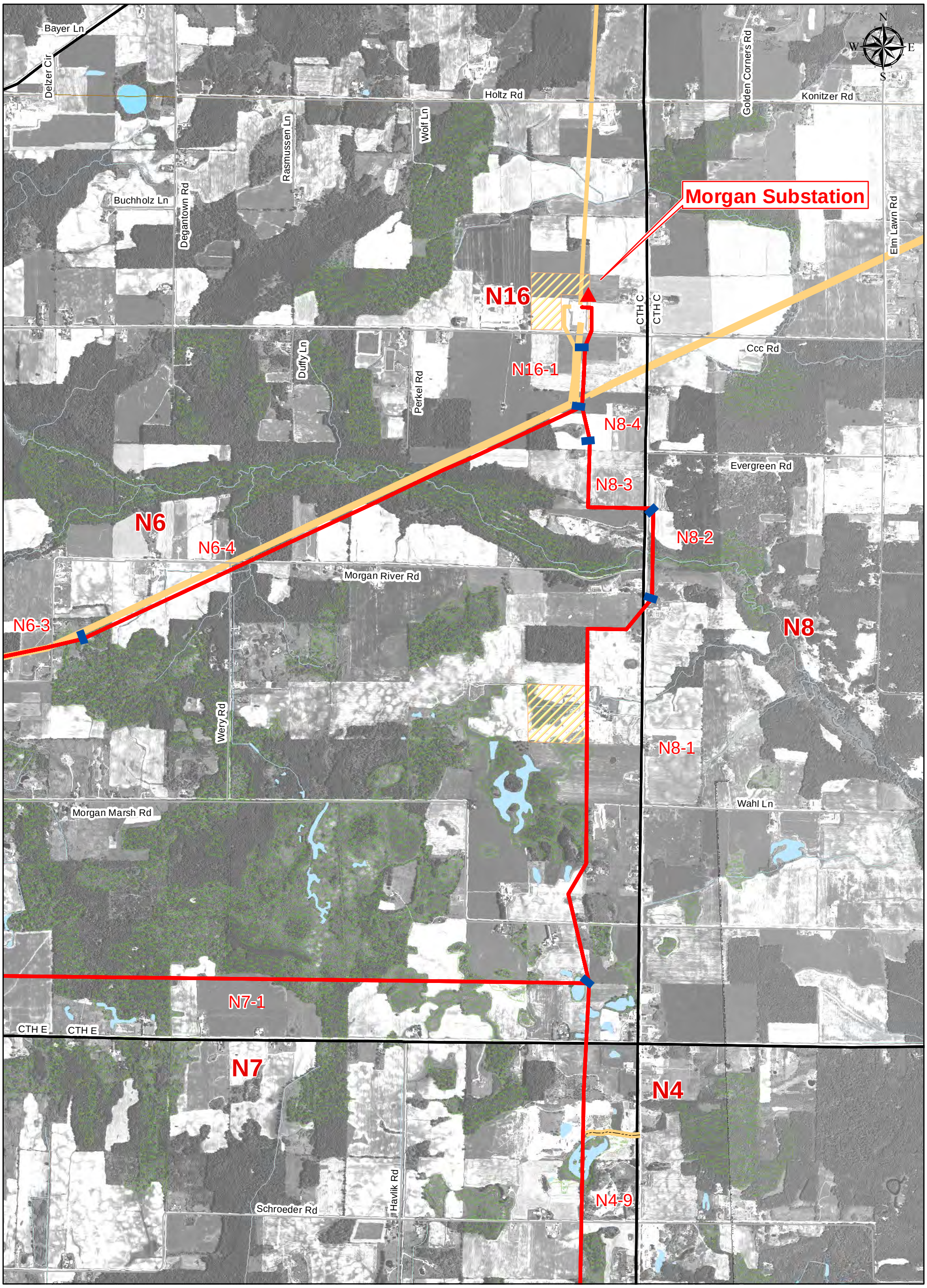
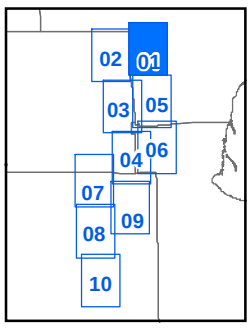


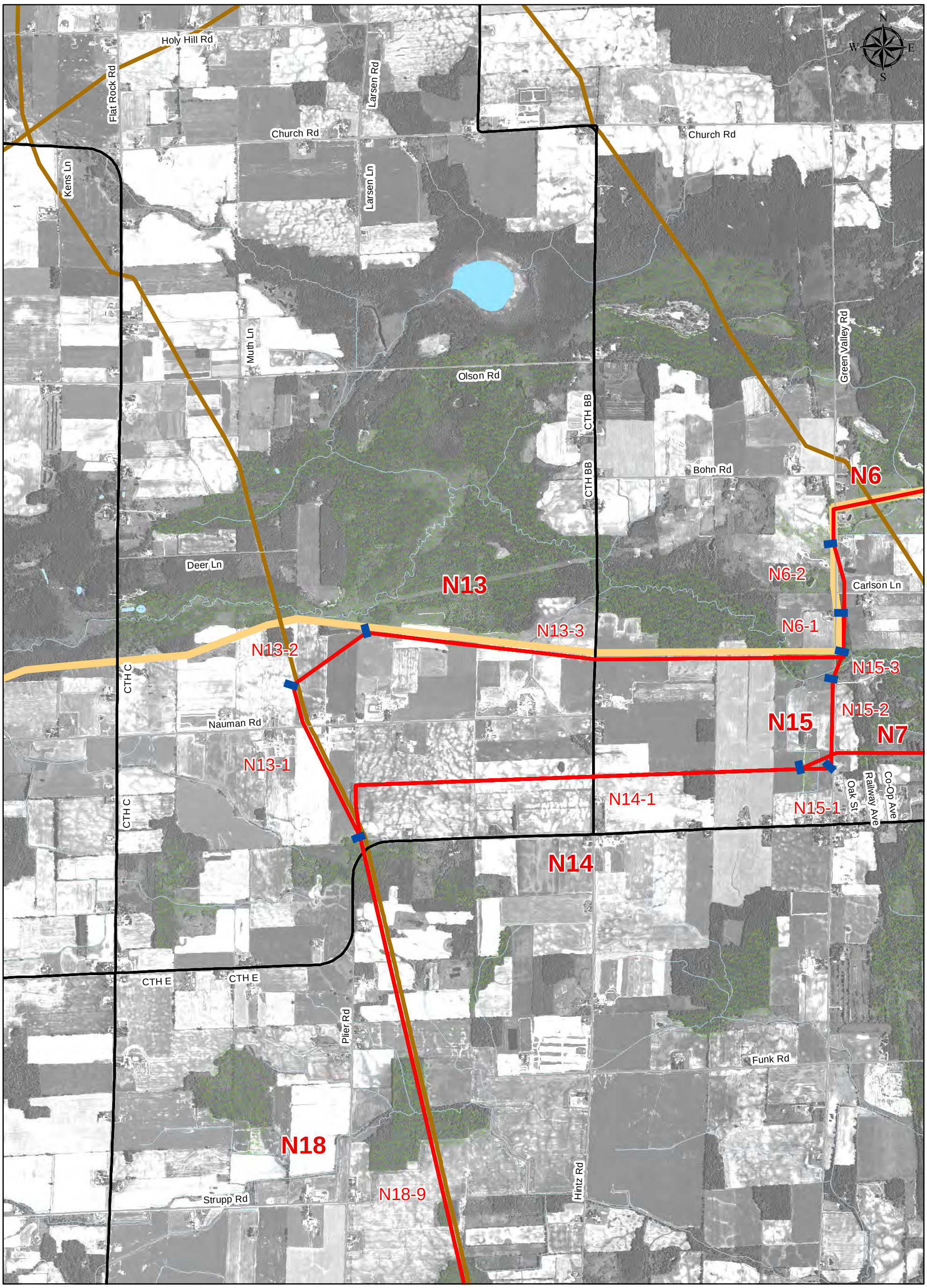
Possible Transmission Line Routes
Subsection Nodes
Off ROW Access
State Forests
County Forests
State Natural Areas
Native American Lands
Existing Transmission Lines
Existing Gas Pipelines
Laydown Yards
Wetlands

1 inch = 0.4 miles

Miles
0 0.275 0.55 1.1

Figure Vol. 2-1.01



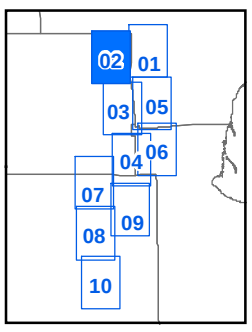


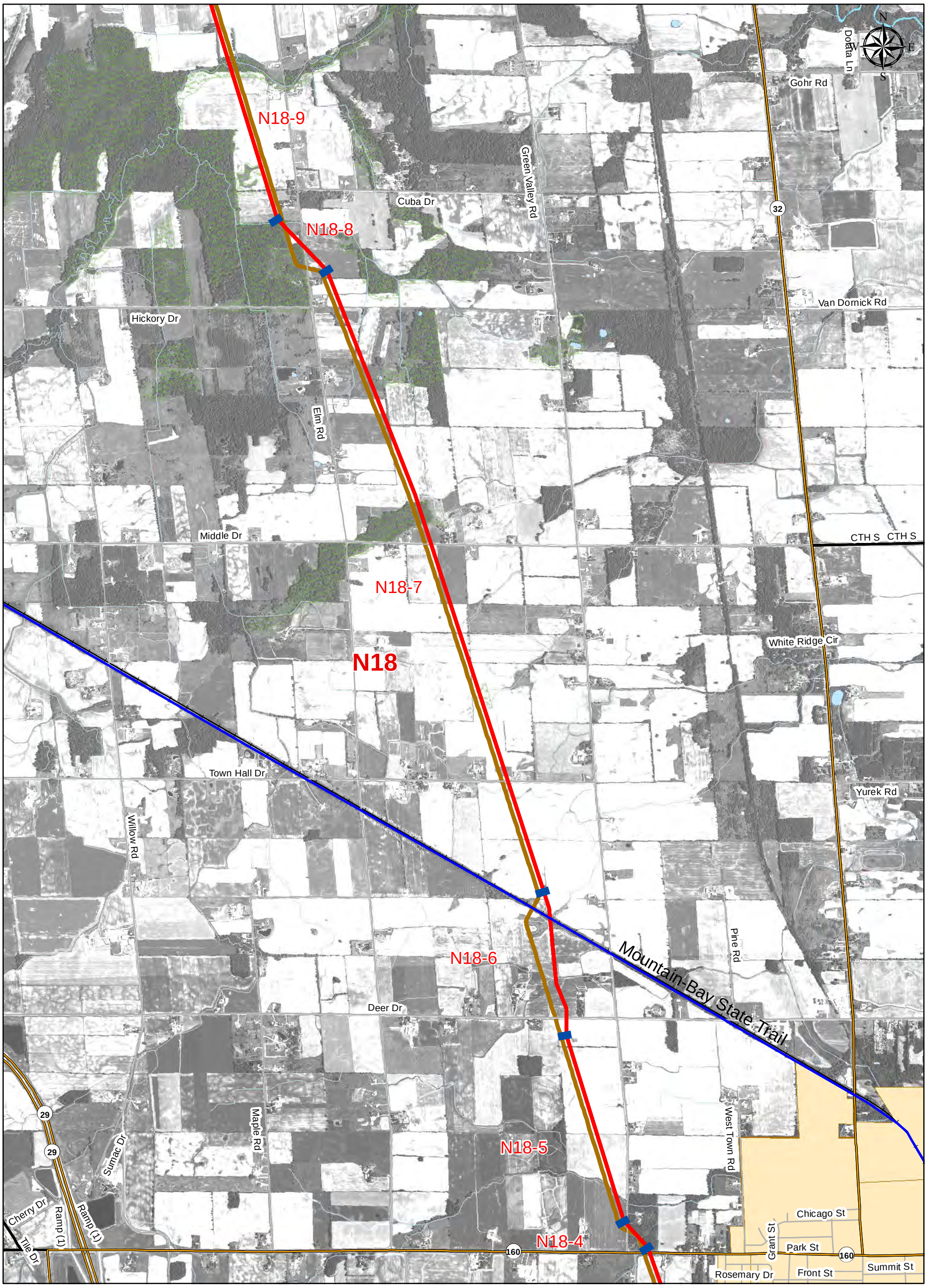
Possible Transmission Line Routes
Subsection Nodes
Off ROW Access
State Forests
County Forests
State Natural Areas
Native American Lands
Existing Transmission Lines
Existing Gas Pipelines
Laydown Yards
Wetlands

1 inch = 0.4 miles

Miles
0 0.275 0.55 1.1

Figure Vol. 2-1.02





Possible Transmission Line Routes
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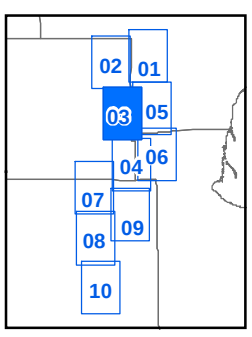
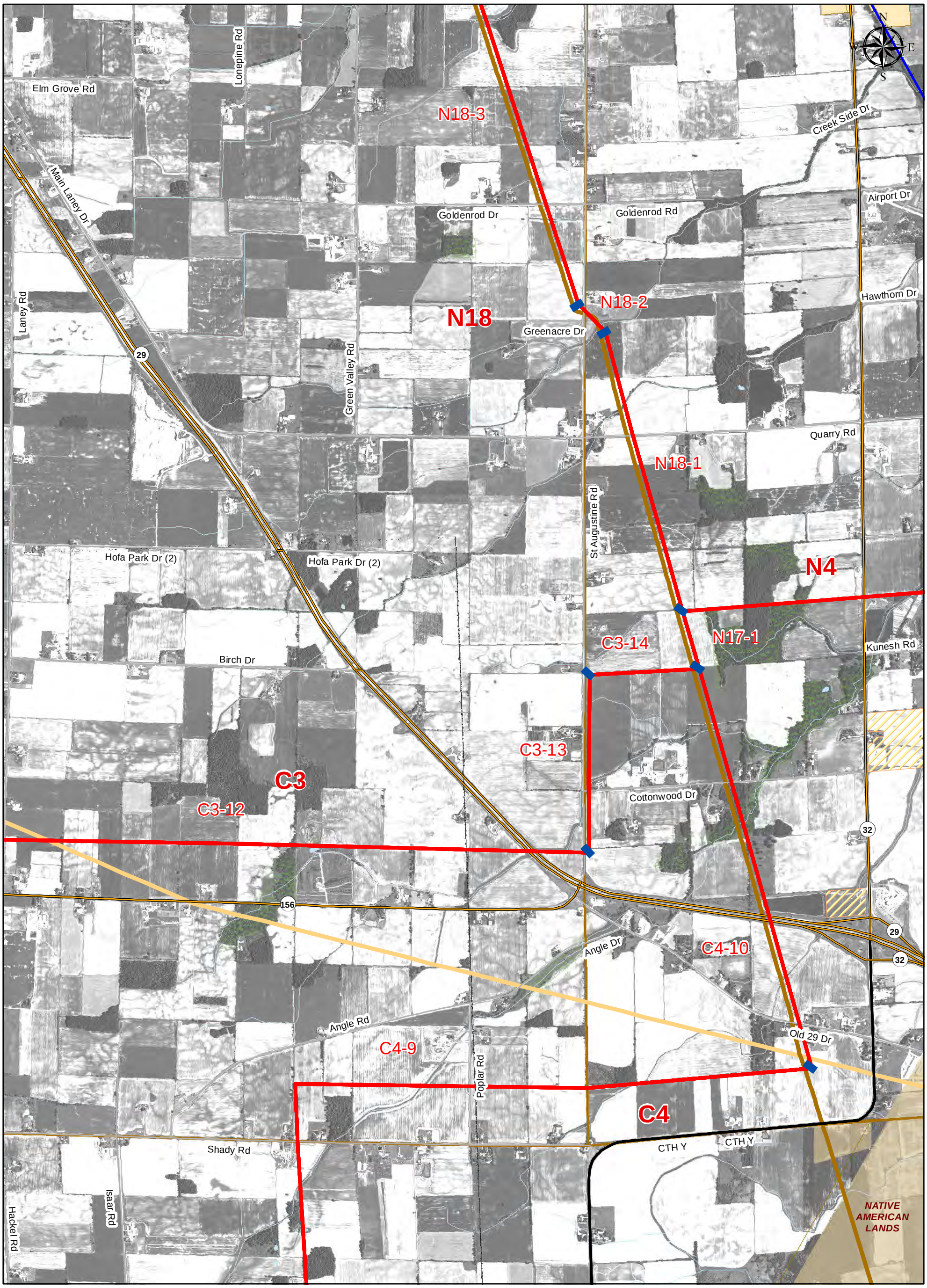
Off ROW Access
State Forests
County Forests
State Natural Areas
Native American Lands
Existing Transmission Lines
Existing Gas Pipelines
Laydown Yards
Wetlands

1 inch = 0.4 miles

Miles
0 0.275 0.55 1.1

Figure Vol. 2-1.03



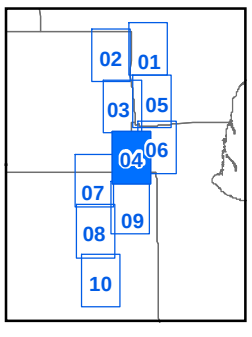


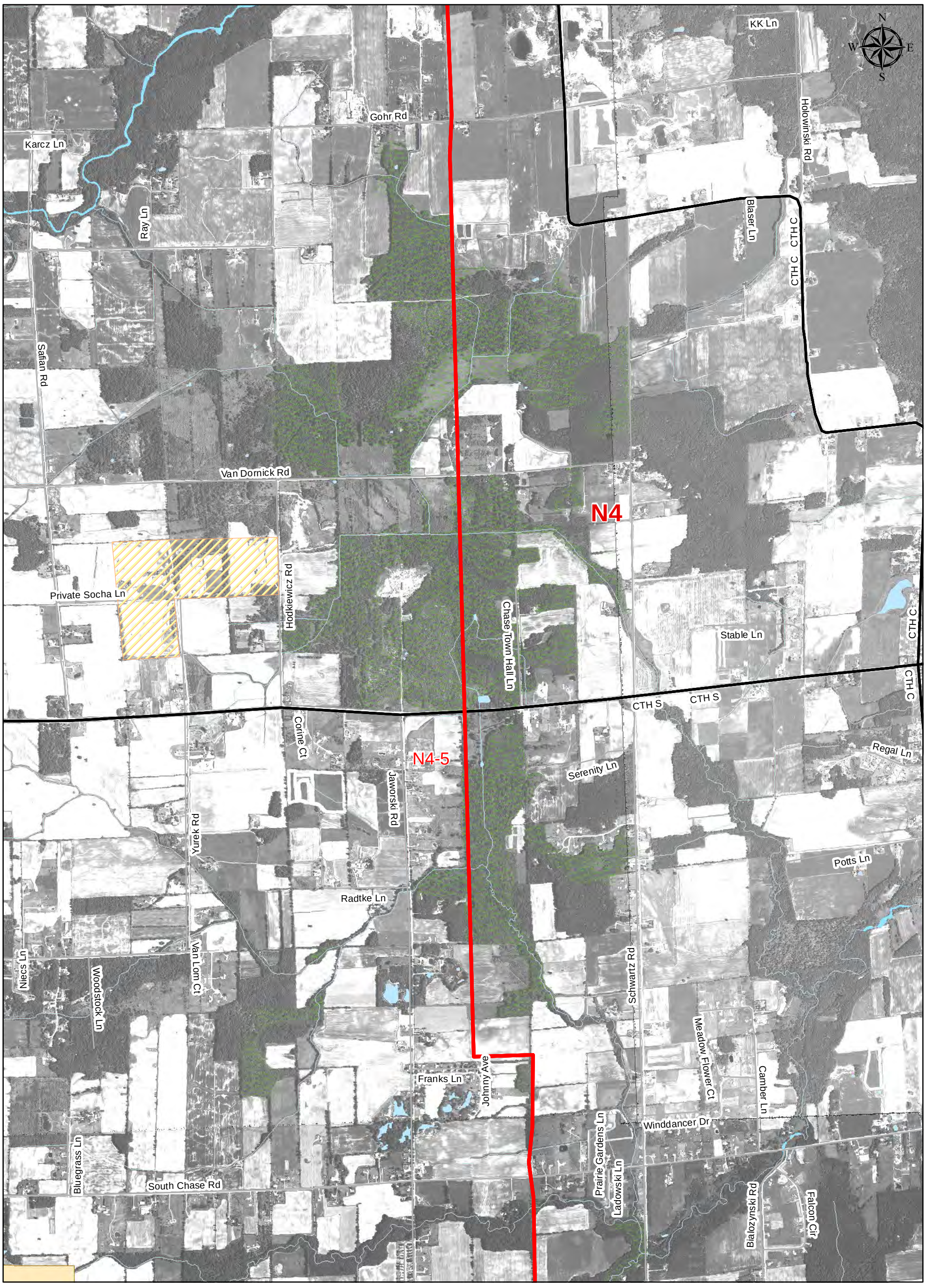
Possible Transmission Line Routes
Subsection Nodes
Off ROW Access
State Forests
County Forests
State Natural Areas
Native American Lands
Existing Transmission Lines
Existing Gas Pipelines
Laydown Yards
Wetlands

1 inch = 0.4 miles

Miles
0 0.275 0.55 1.1

Figure Vol. 2-1.04





Possible Transmission Line Routes
Subsection Nodes
Off ROW Access
State Forests
County Forests
State Natural Areas
Native American Lands
Existing Transmission Lines
Existing Gas Pipelines
Laydown Yards
Wetlands

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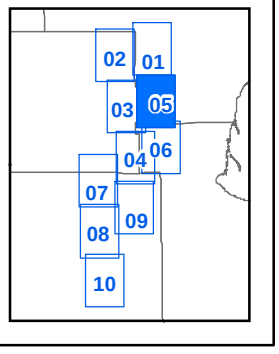
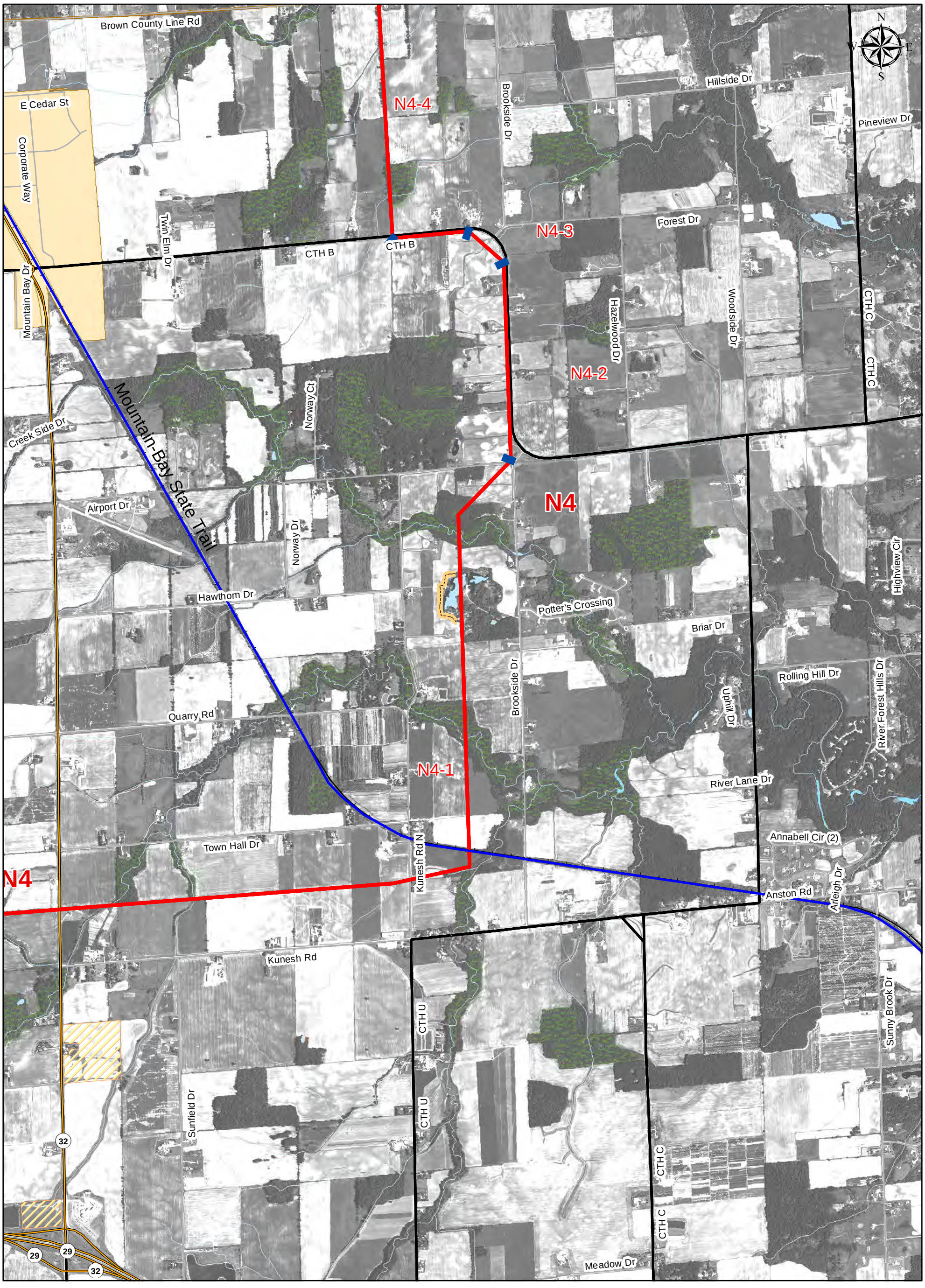
Miles
0 0.275 0.55 1.1

Figure Vol. 2-1.05



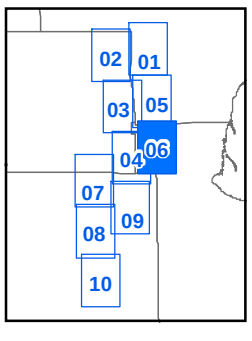


Possible Transmission Line Routes
Subsection Nodes
Off ROW Access
State Forests
County Forests
State Natural Areas
Native American Lands
Existing Transmission Lines
Existing Gas Pipelines
Laydown Yards
Wetlands

1 inch = 0.4 miles

Miles
0 0.275 0.55 1.1

Figure Vol. 2-1.06

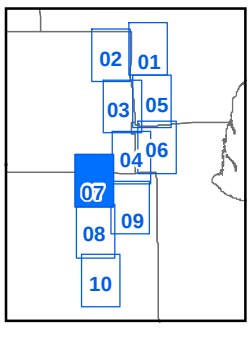


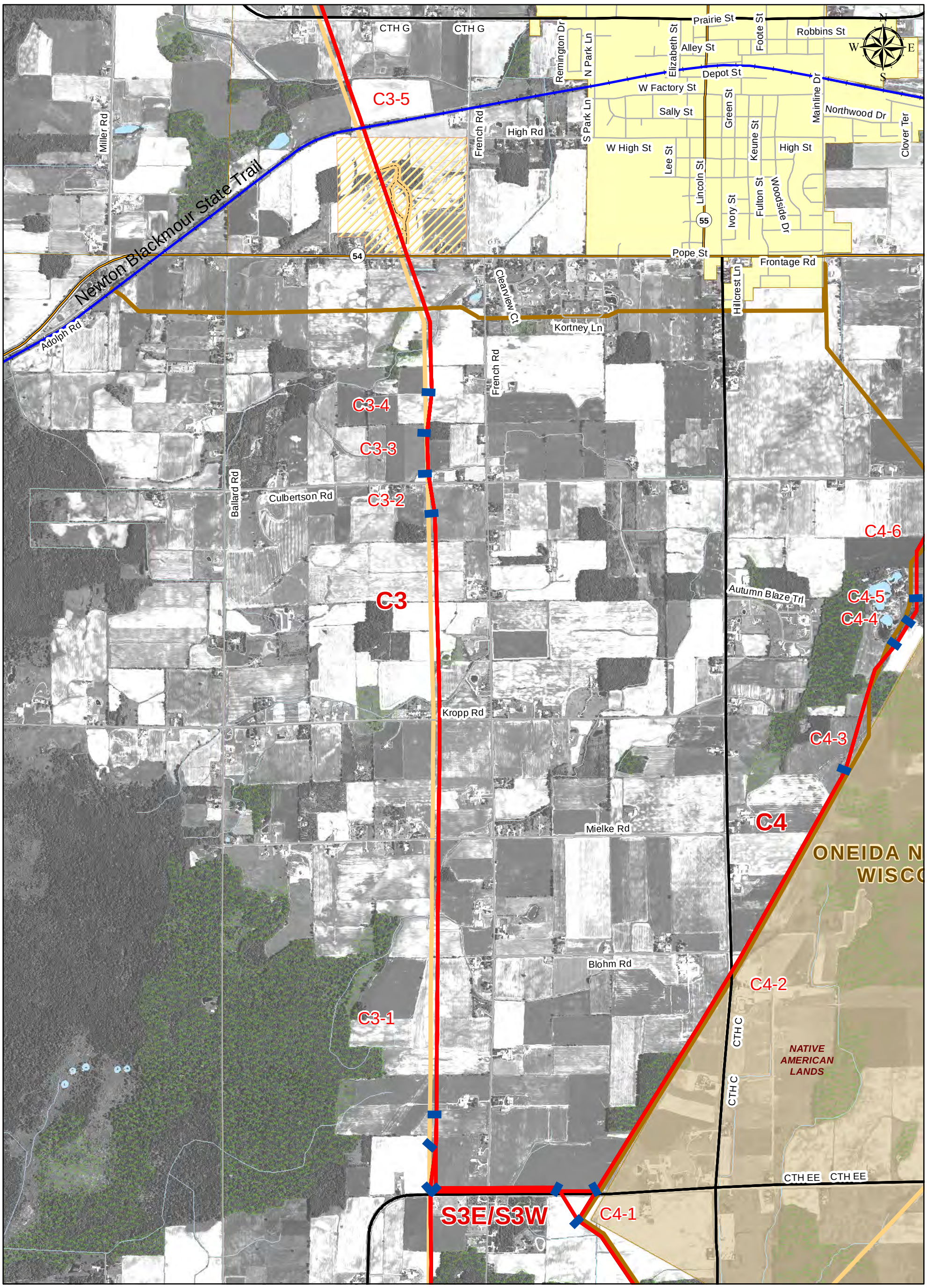
Possible Transmission Line Routes
Subsection Nodes
Off ROW Access
State Forests
County Forests
State Natural Areas
Native American Lands
Existing Transmission Lines
Existing Gas Pipelines
Laydown Yards
Wetlands

1 inch = 0.4 miles

Miles
0 0.275 0.55 1.1

Figure Vol. 2-1.07





Possible Transmission Line Routes
Subsection Nodes
Off ROW Access
State Forests
County Forests
State Natural Areas
Native American Lands
Existing Transmission Lines
Existing Gas Pipelines
Laydown Yards
Wetlands

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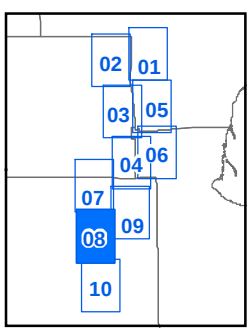
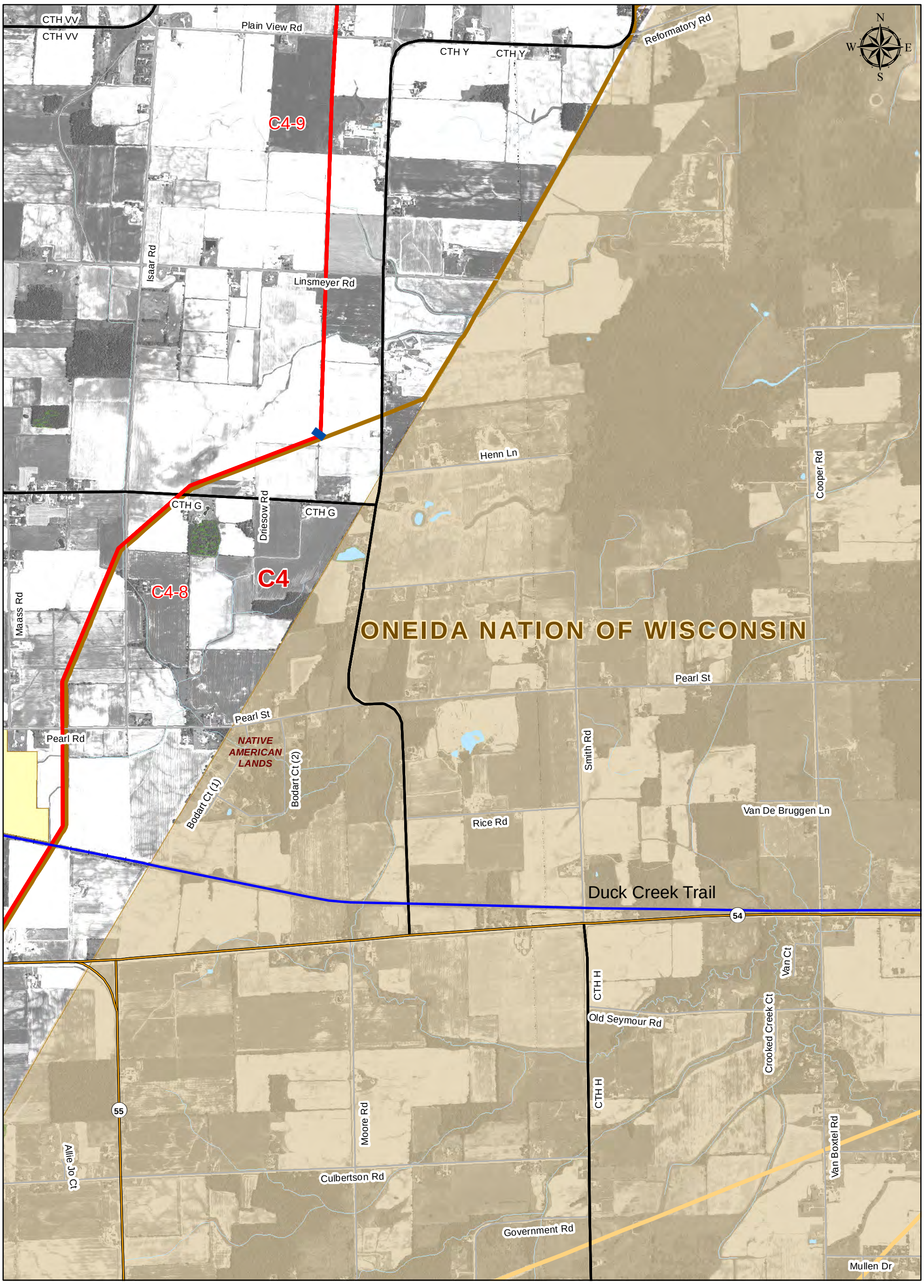
Miles
0 0.275 0.55 1.1

Figure Vol. 2-1.08





Possible Transmission Line Routes
Subsection Nodes
Off ROW Access
State Forests
County Forests
State Natural Areas
Native American Lands
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Existing Gas Pipelines
Laydown Yards
Wetlands

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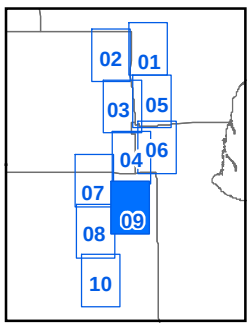
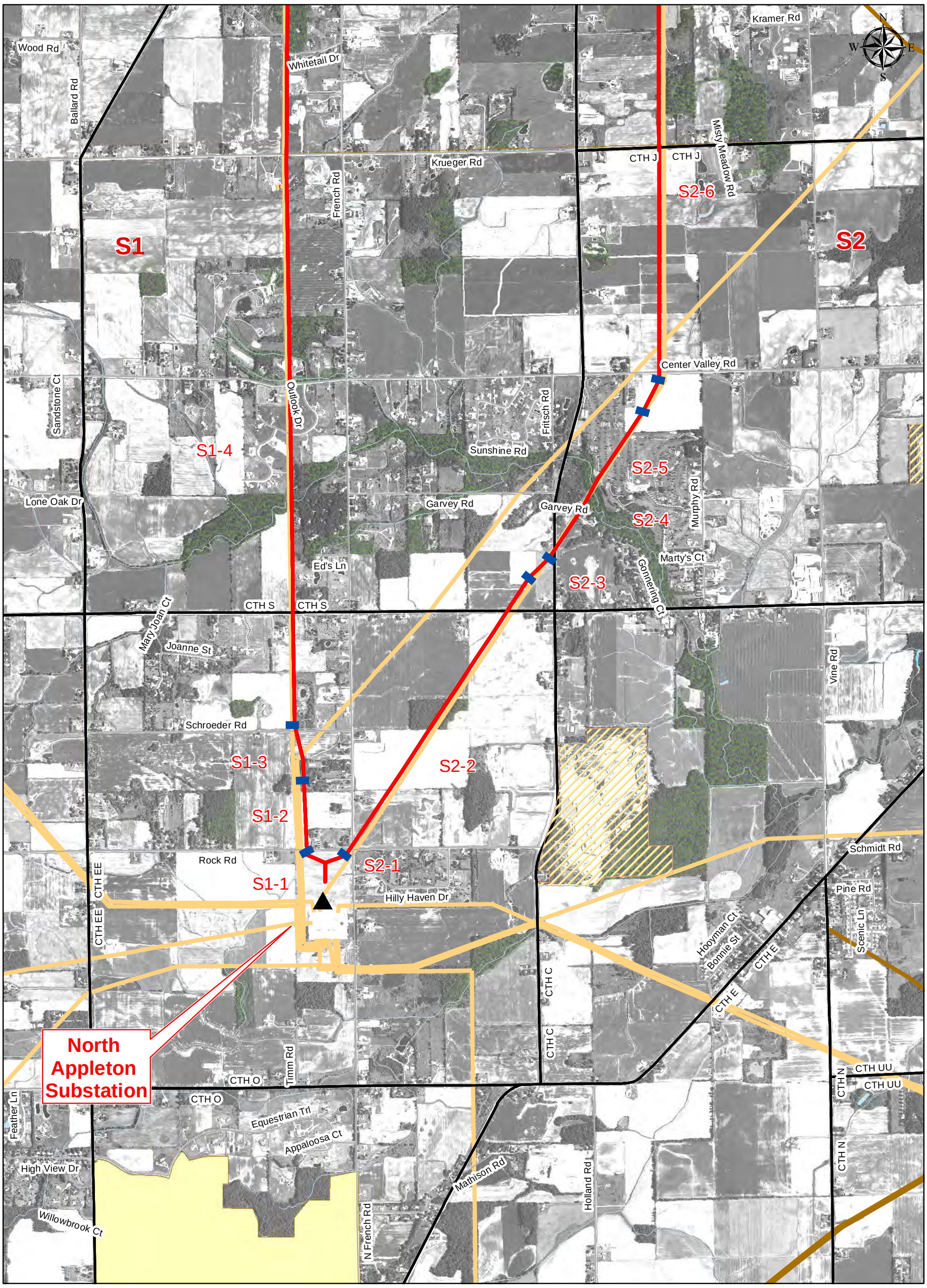
Miles
0 0.275 0.55 1.1

Figure Vol. 2-1.09





Possible Transmission Line Routes
Subsection Nodes
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State Forests
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State Natural Areas
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Wetlands

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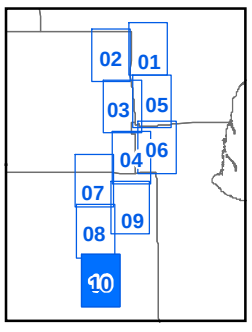
Miles
0 0.275 0.55 1.1

Figure Vol. 2-1.10



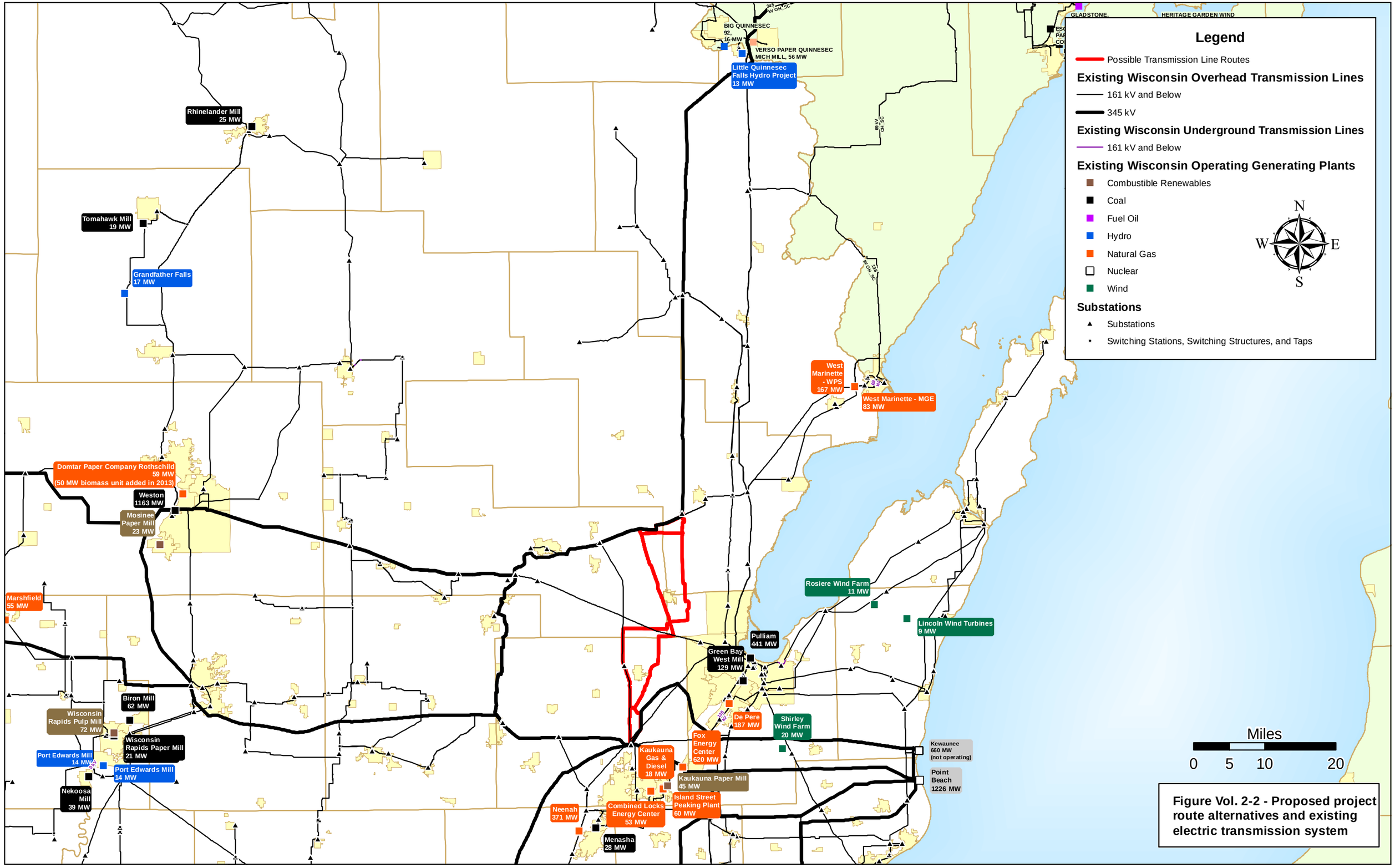


Figure Vol. 2-2 - Proposed project route alternatives and existing electric transmission system

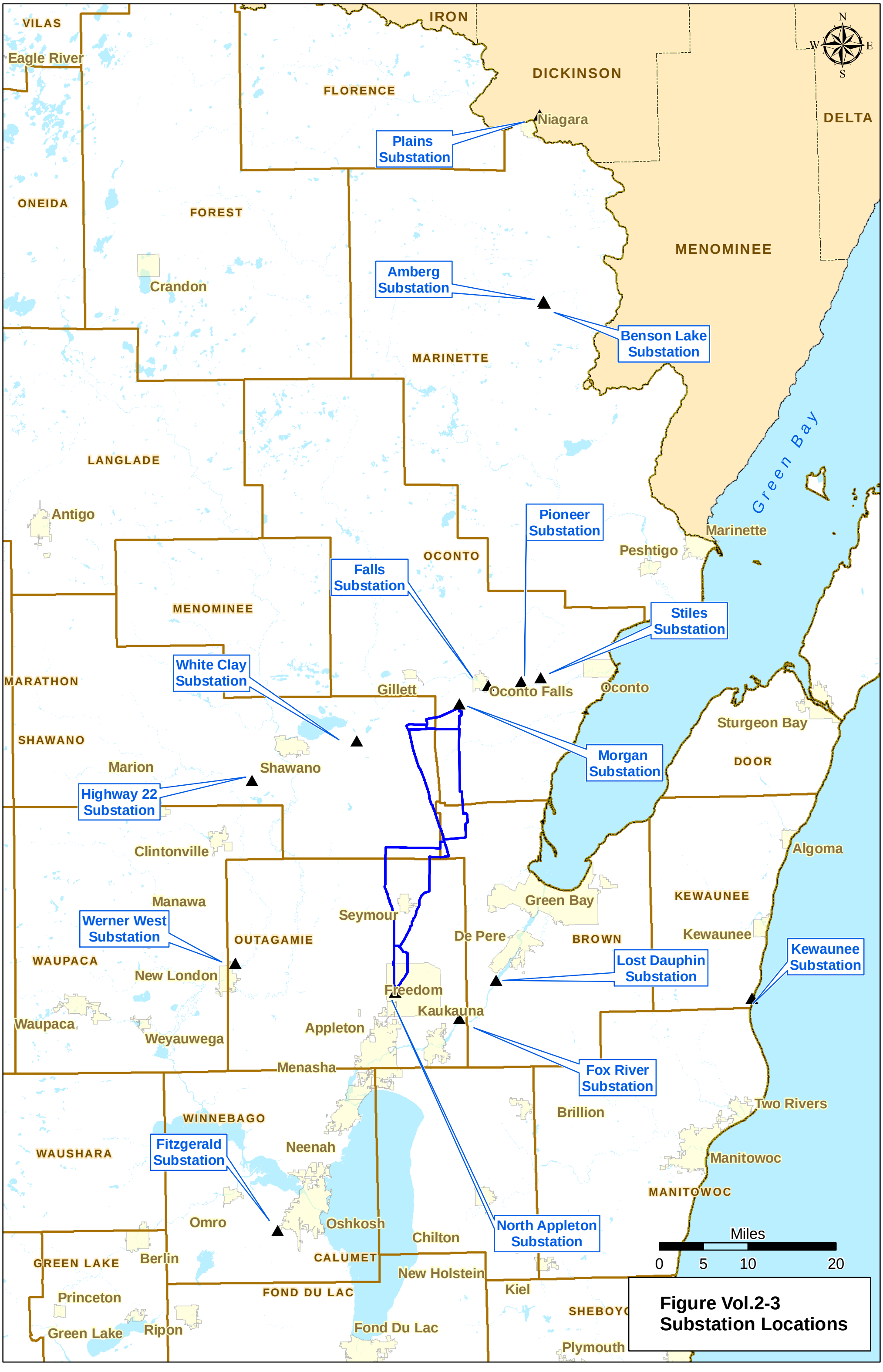


Figure Vol.2-3
Substation Locations

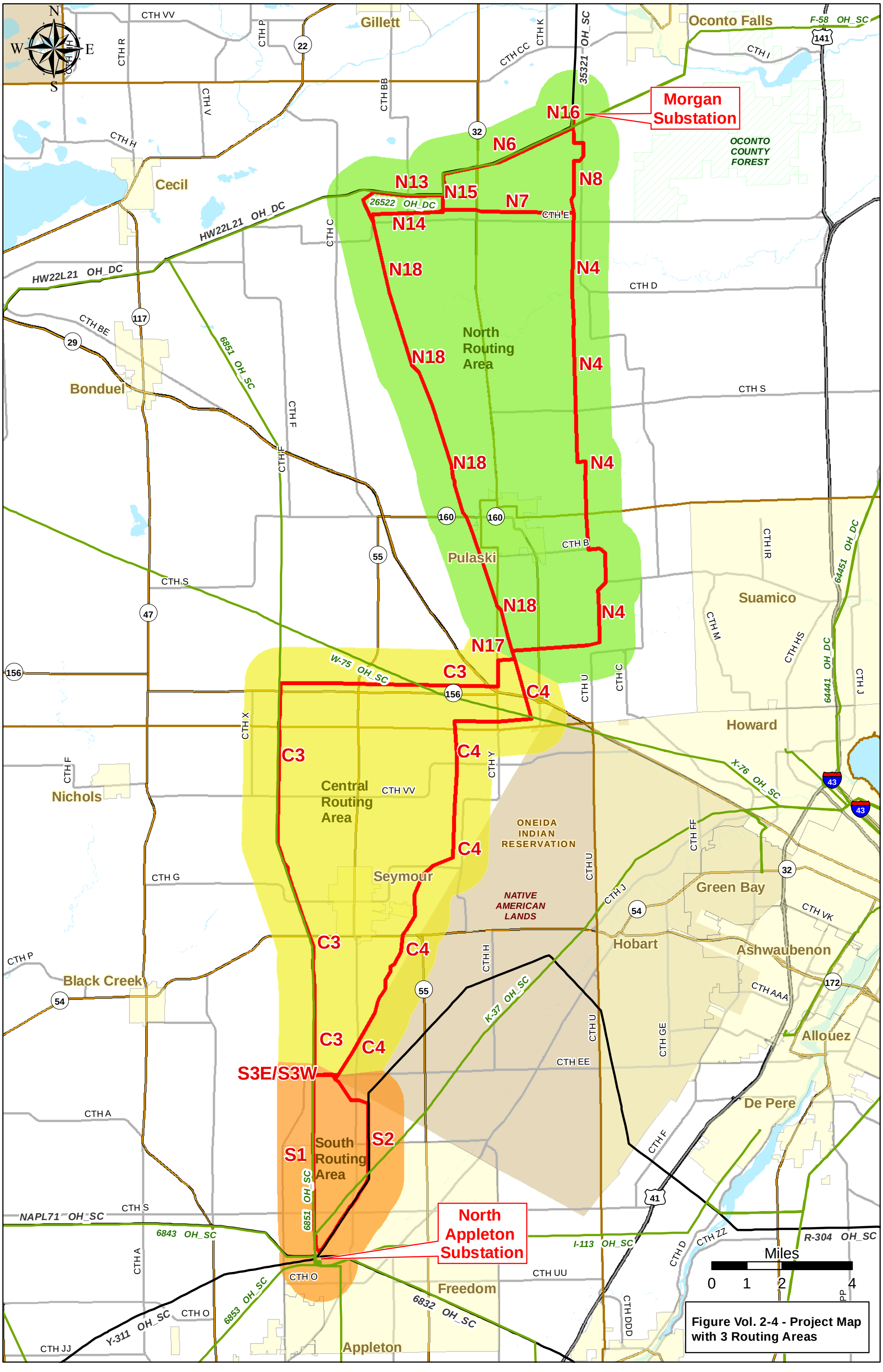


Figure Vol. 2-4 - Project Map with 3 Routing Areas

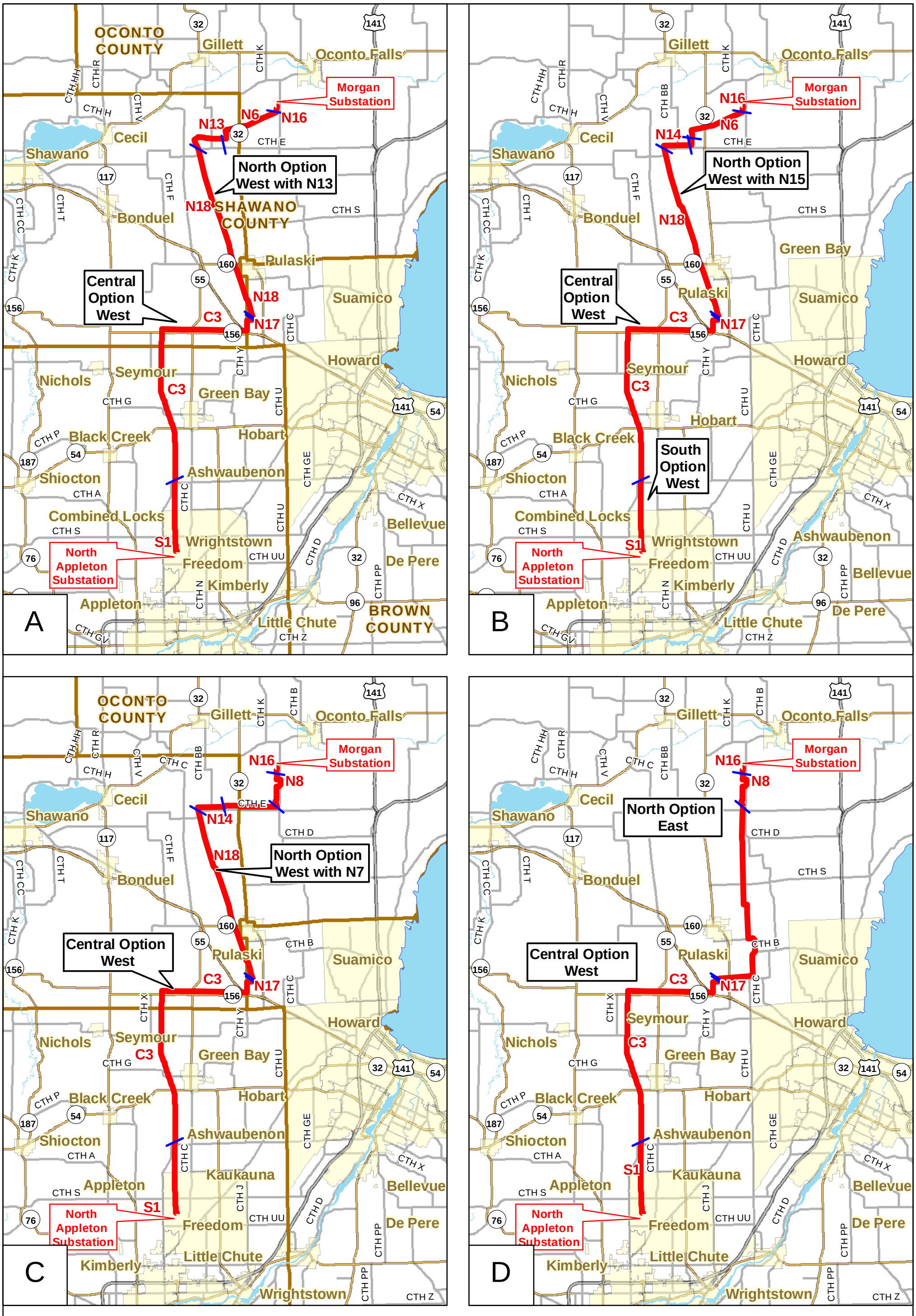
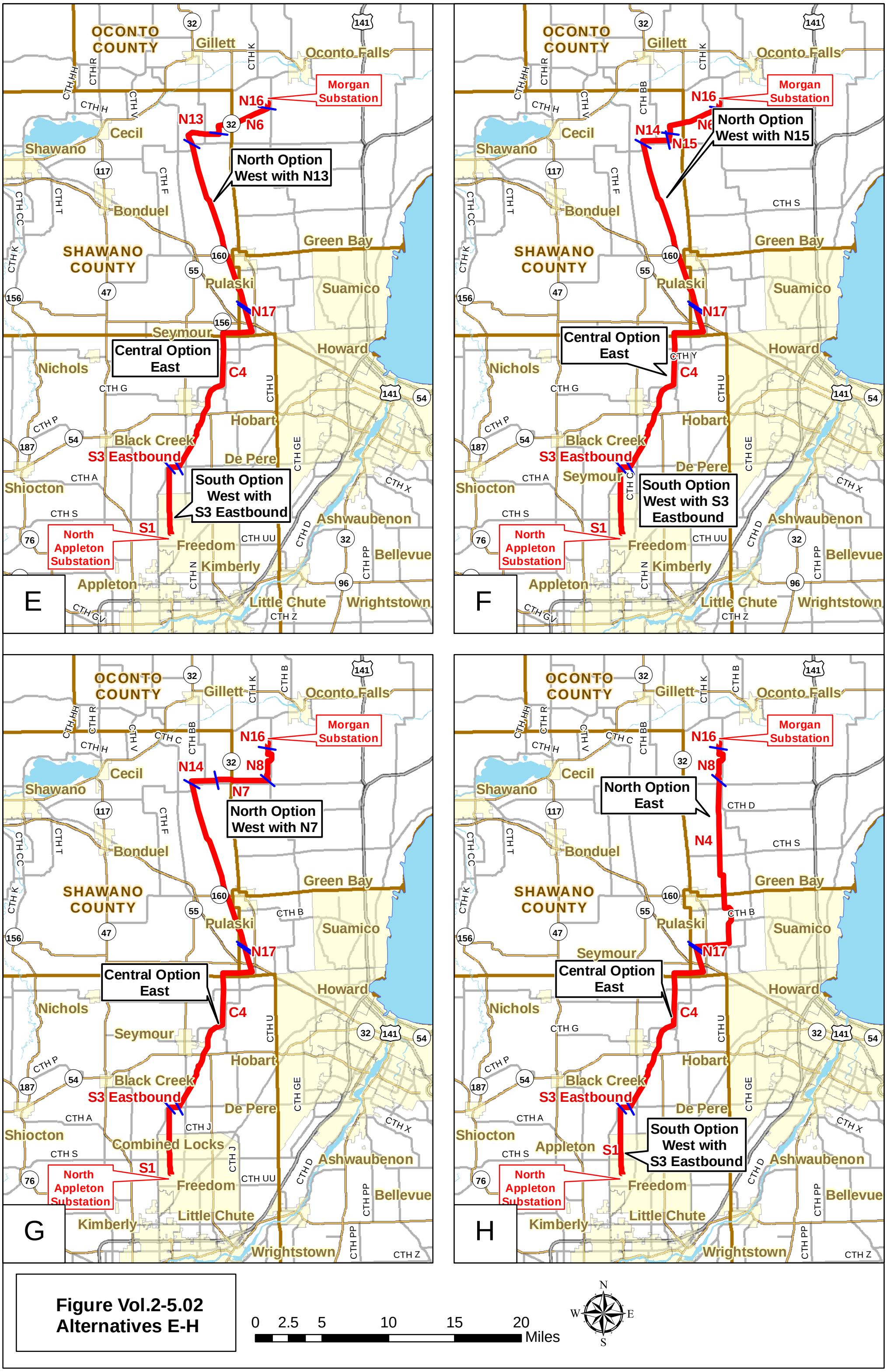


Figure Vol.2-5.01
Alternatives A-D


E
OCONTO COUNTY
Gillett
Oconto Falls
Morgan Substation
N16
N13
N6
North Option West with N13
Cecil
Shawano
Bonduel
SHAWANO COUNTY
Green Bay
Pulaski
Suamico
N17
Seymour
Central Option East
Howard
Nichols
C4
Hobart
Black Creek
S3 Eastbound
De Pere
South Option West with S3 Eastbound
Shiocton
S1
North Appleton Substation
Freedom
Ashwaubenon
Bellevue
Kimberly
Appleton
Little Chute
Wrightstown
F
N14
N15
North Option West with N15
G
N8
N7
North Option West with N7
H
North Option East
N4
Combined Locks
Figure Vol.2-5.02
Alternatives E-H
0 2.5 5 10 15 20 Miles
N
W
E
S

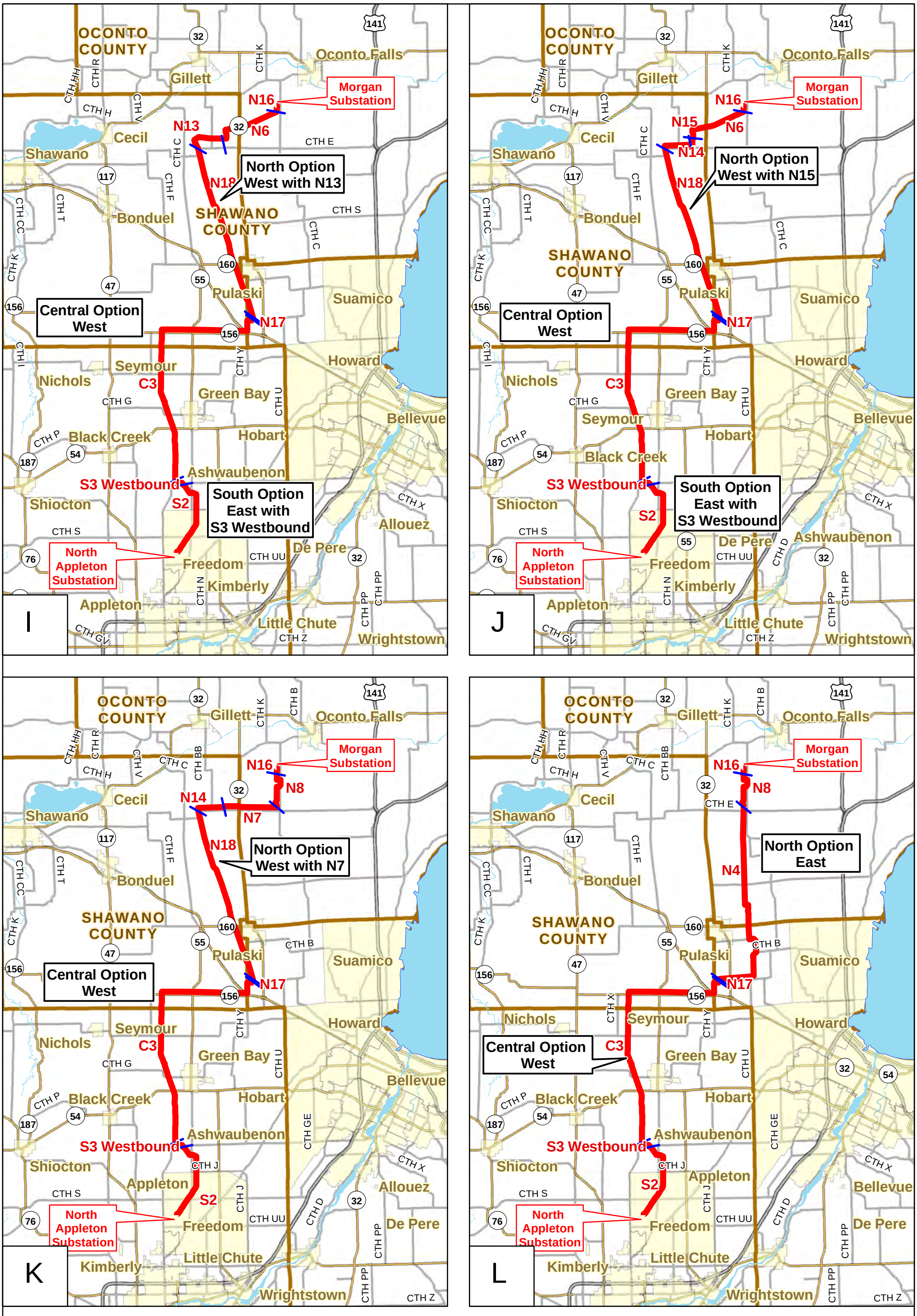


Figure Vol.2-5.03
Alternatives I-L

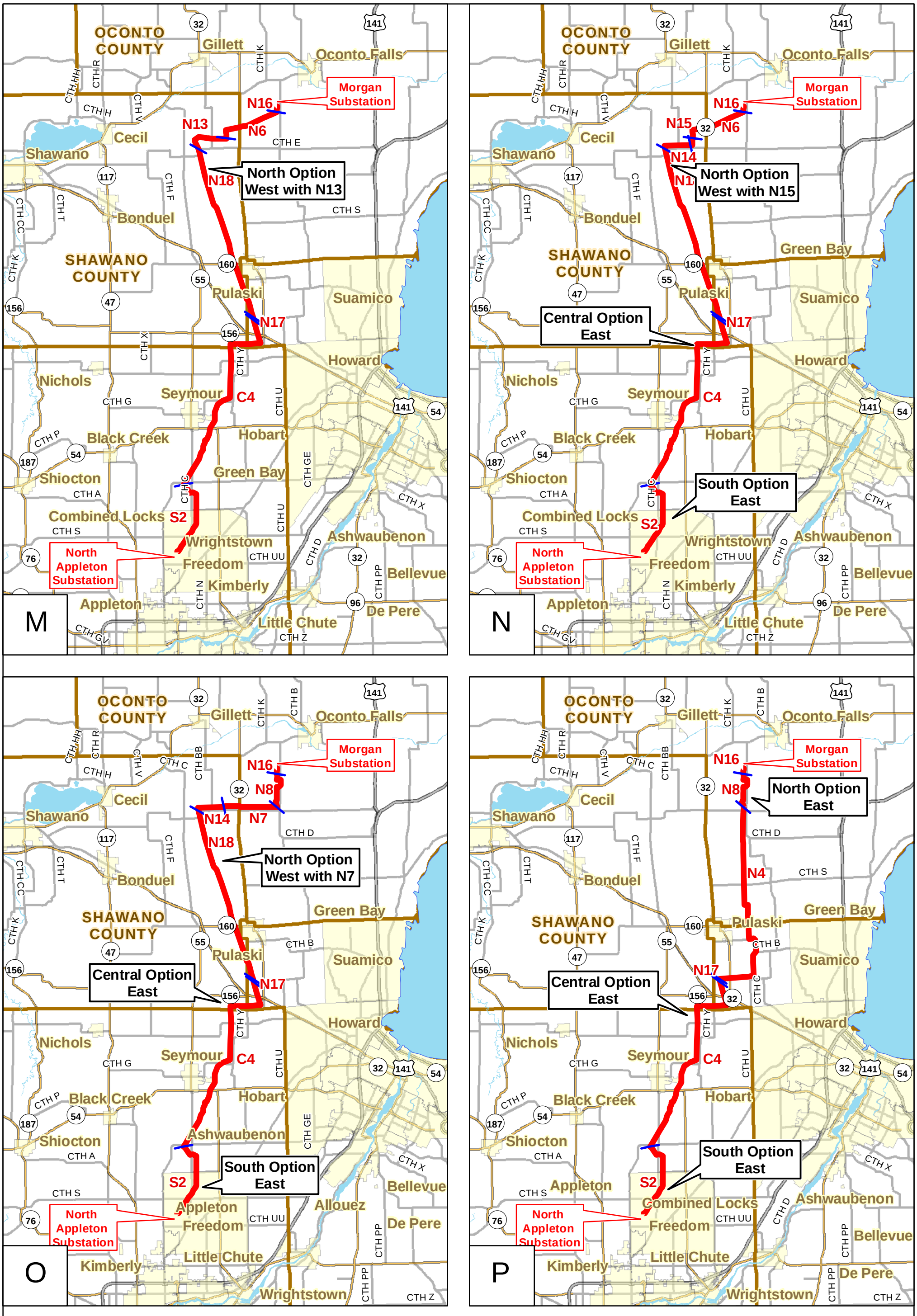


Figure Vol.2-5.04
Alternatives M-P

0 5 10 20 Miles

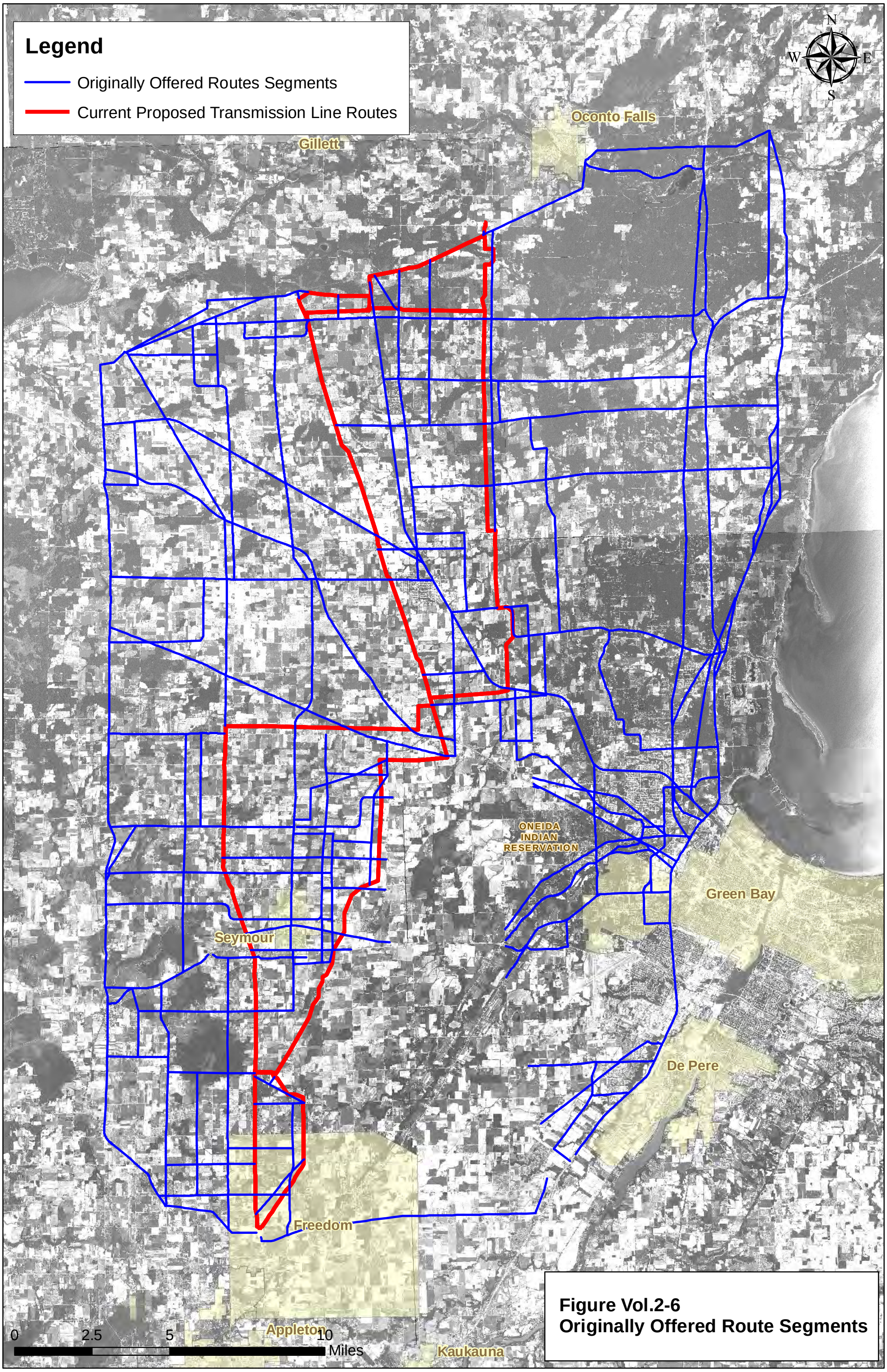


Figure Vol.2-6
Originally Offered Route Segments

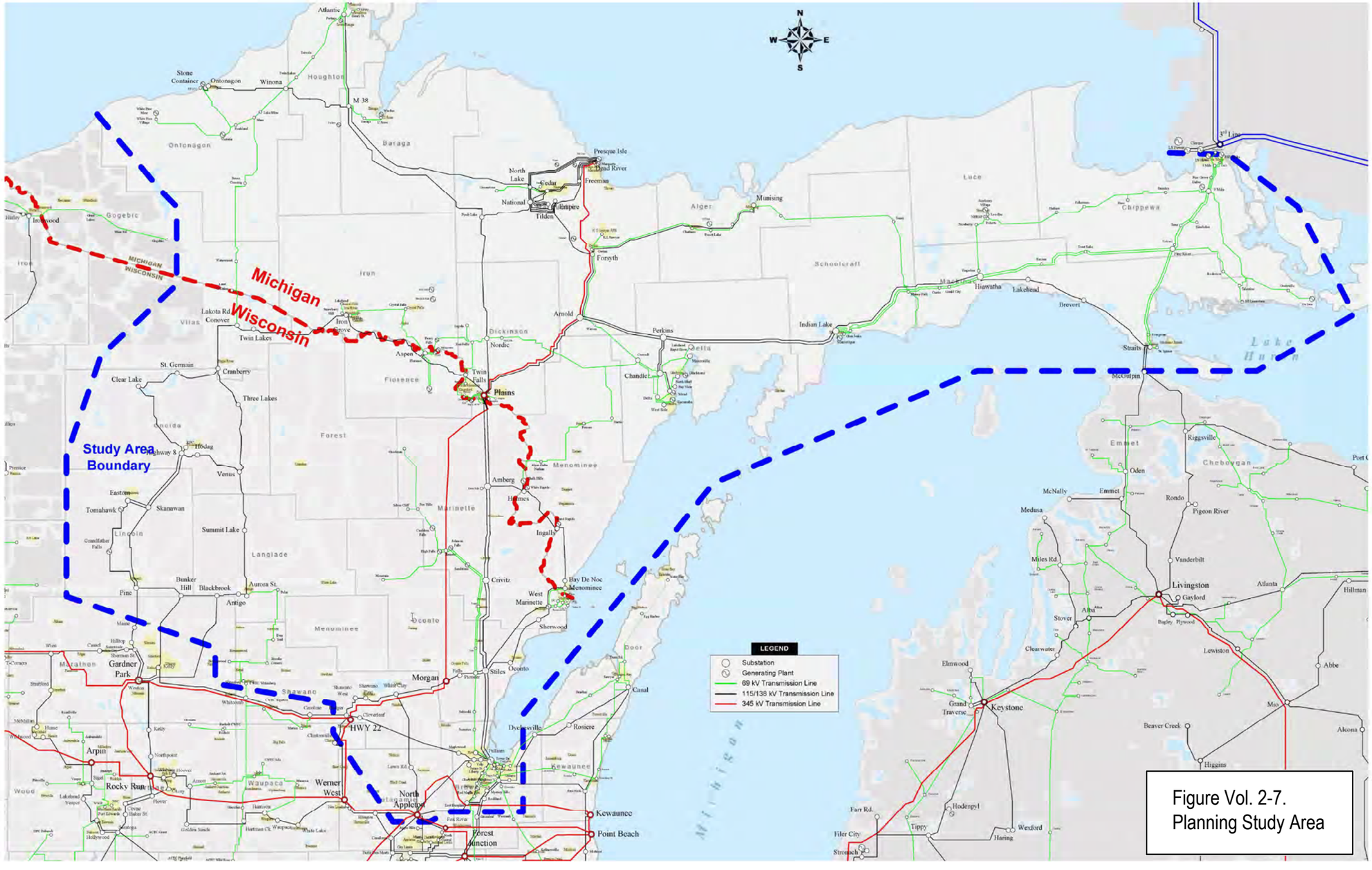


Figure Vol. 2-7.
Planning Study Area

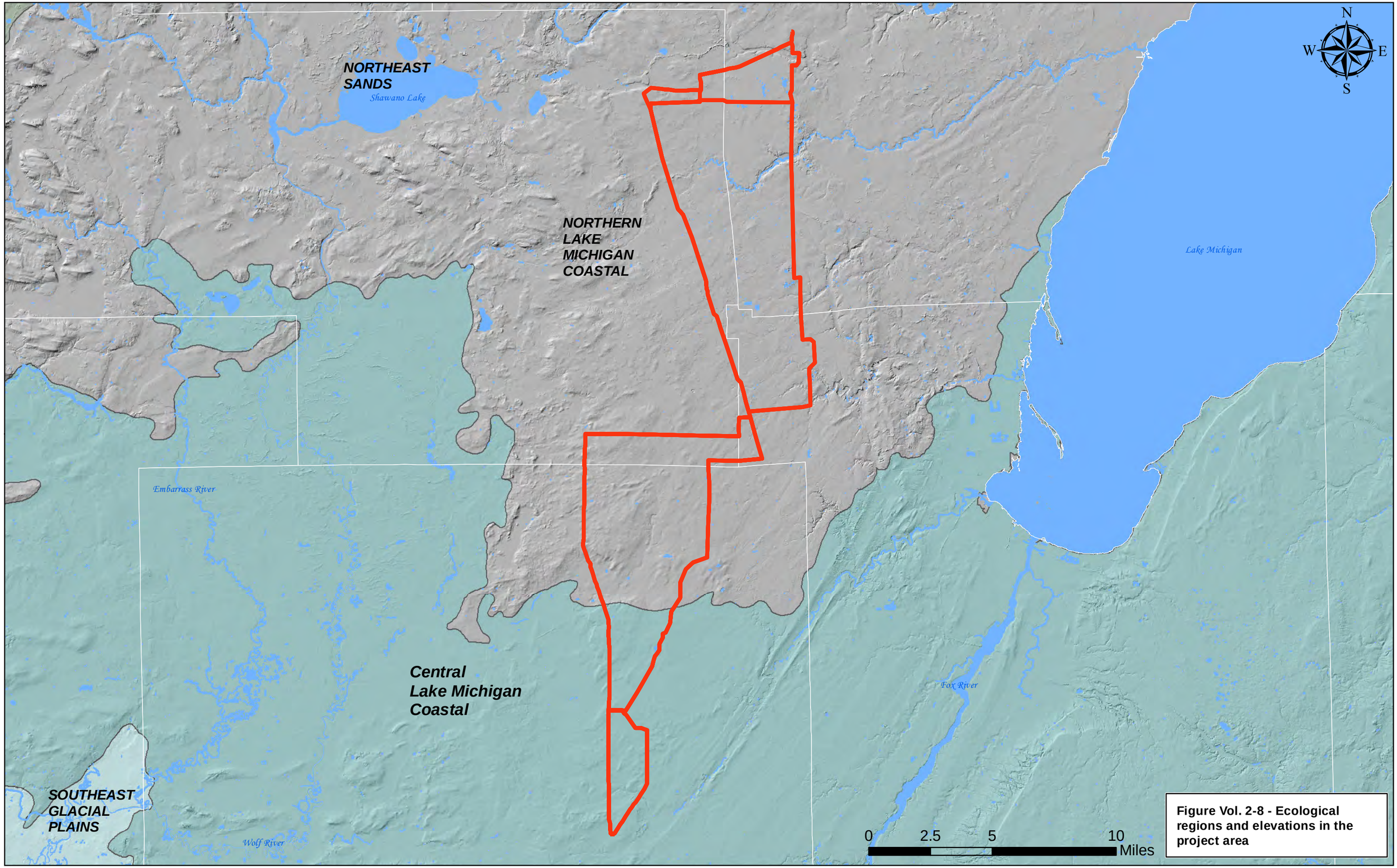


Figure Vol. 2-8 - Ecological regions and elevations in the project area

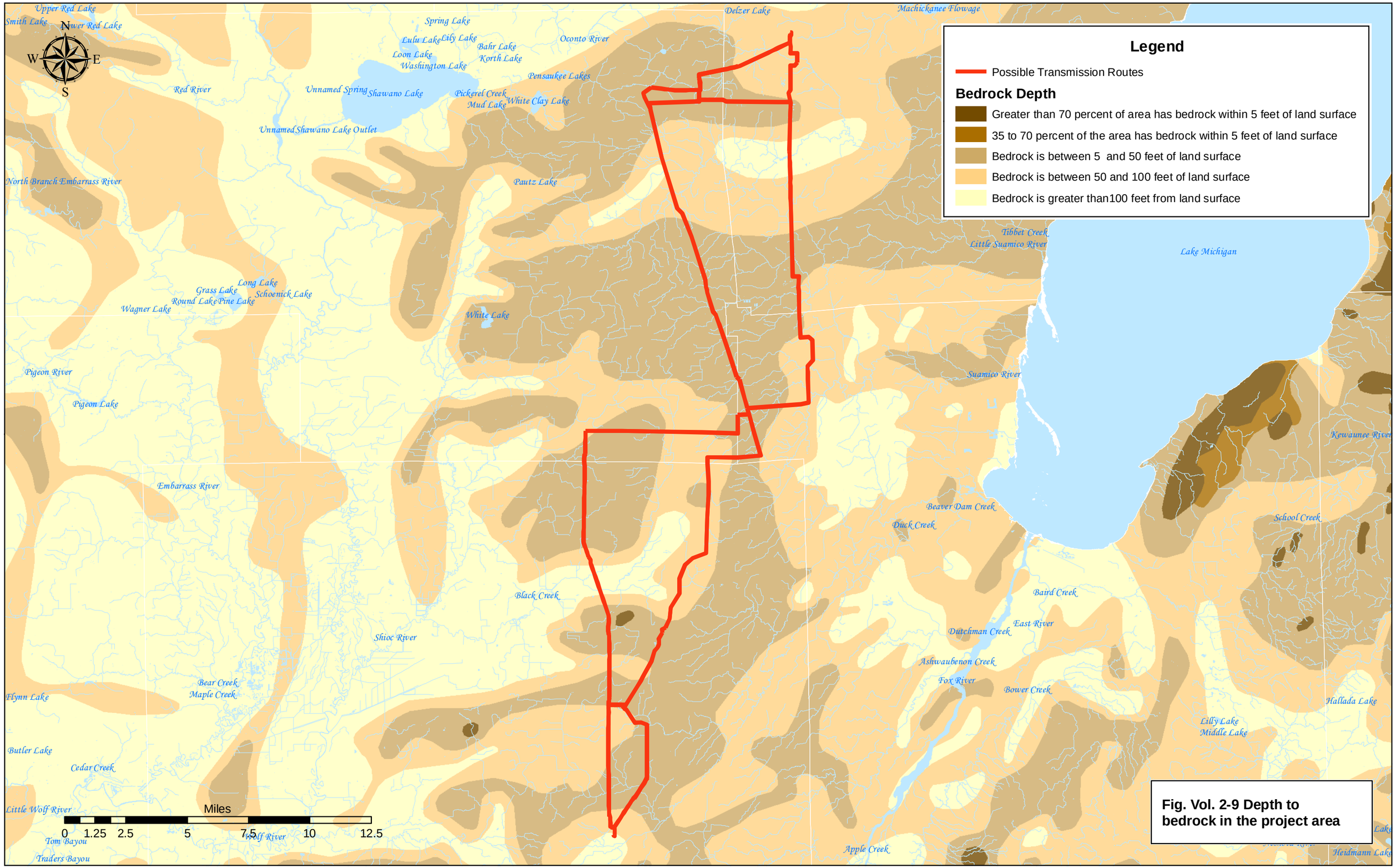


Fig. Vol. 2-9 Depth to bedrock in the project area

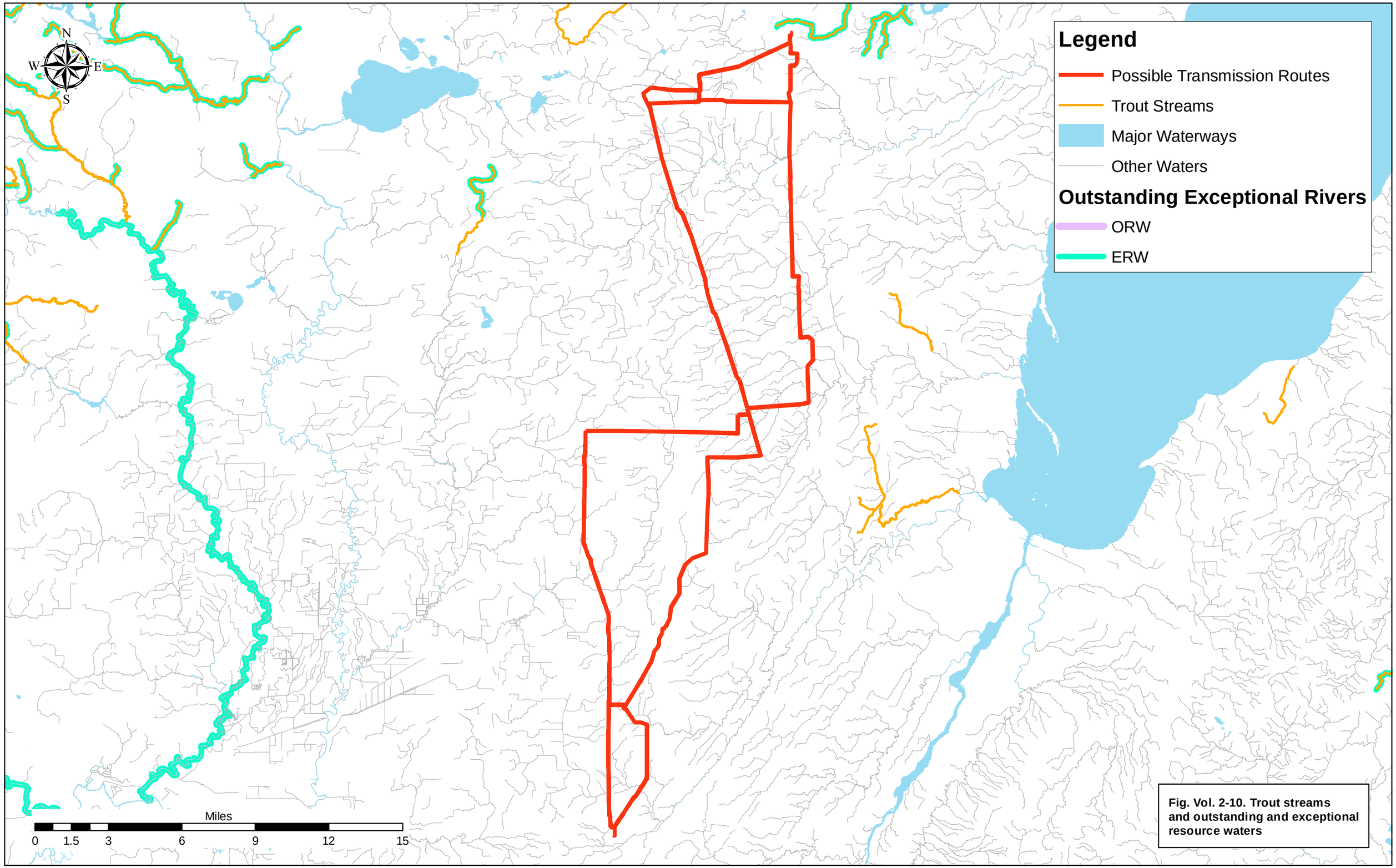


Fig. Vol. 2-10. Trout streams and outstanding and exceptional resource waters

Figure Vol. 2-11 Typical two-pole H-frame structures

Figure Vol. 2-12 Typical single-pole double circuit structures

Figure Vol. 2-13 Tree processor used for clearing – capable of cutting a standing tree, de-limbing it, and sawing it into logs

Figure Vol. 2-14 Hand-clearing along a flood channel

Figure Vol. 2-15 Chipping slash on upland ROW

Figure Vol. 2-16 Timber piled on edge of ROW

Figure Vol. 2-17 Augering a foundation excavation in dry upland soils

Figure Vol. 2-18 Structure location in wetland – matted work platform, foundation, spoil pile (to be removed), and erosion control

Figure Vol. 2-19 Augering in unconsolidated material (i.e gravel) – flooding of the excavation is necessary to prevent the sides from collapsing

Figure Vol. 2-20 Prepared blast location – topsoil stripped and stockpiled off to side prior to blast and blasting mats in place

Figure Vol. 2-21 Blasting mats and post-blast soil/rubble pile

Figure Vol. 2-22 Augering rocky subsoils

Figure Vol. 2-23 Placing foundation cage inside the excavated hole

Figure Vol. 2-24 Final rebar work in preparation for concrete pour

Figure Vol. 2-25 Pouring the concrete foundation

Figure Vol. 2-26 Completed foundation after initial cleanup

Figure Vol. 2-27 Upland ROW seeded with oats and rye grass for quick soil stabilization while native vegetation re-establishes

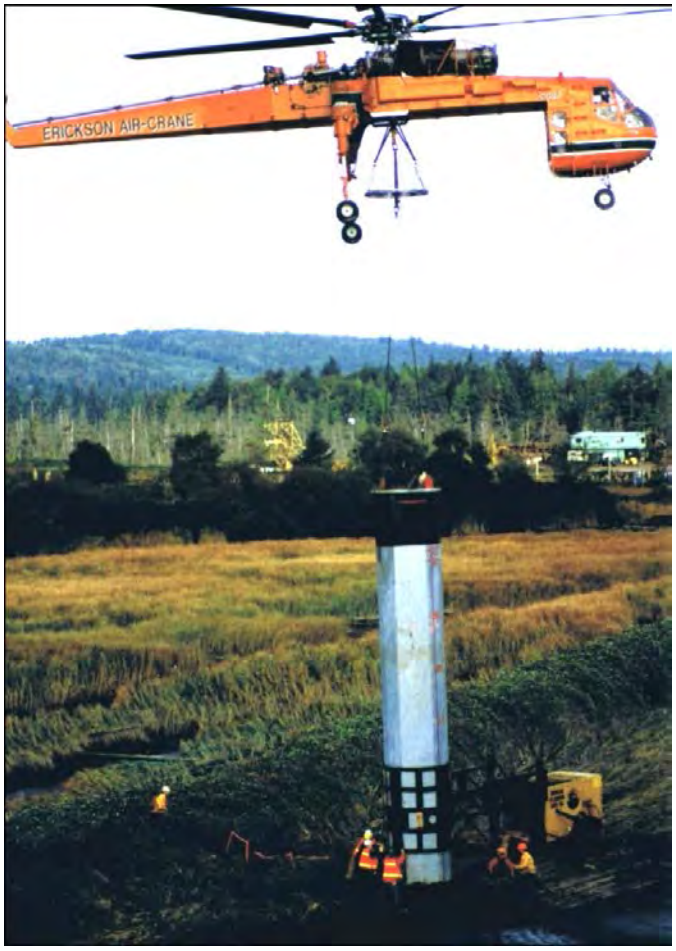


Figure Vol. 2-28 Helicopter-based vibratory caisson and hammer unit

Figure Vol. 2-29 Installation of a helical pier foundation in a wetland with a marsh buggy

Figure Vol. 2-30 Installing the top section of the tower

Figure Vol. 2-31 Bolting tower to concrete foundation

Figure Vol. 2-32 Helicopter setting tower on foundation

Figure Vol. 2-33 Pulling cable through structure arms

Figure Vol. 2-34 Wire stringing with a helicopter

Figure Vol. 2-35 Minor soil rutting in pasture land

Figure Vol. 2-36 Rutting of topsoil in cropland – no soil mixing

Figure Vol. 2-37 Ruts being smoothed with blade

Figure Vol. 2-38 Smoothing out ruts by backblading with a dozer

Figure Vol. 2-39 Turtle exclusion fence

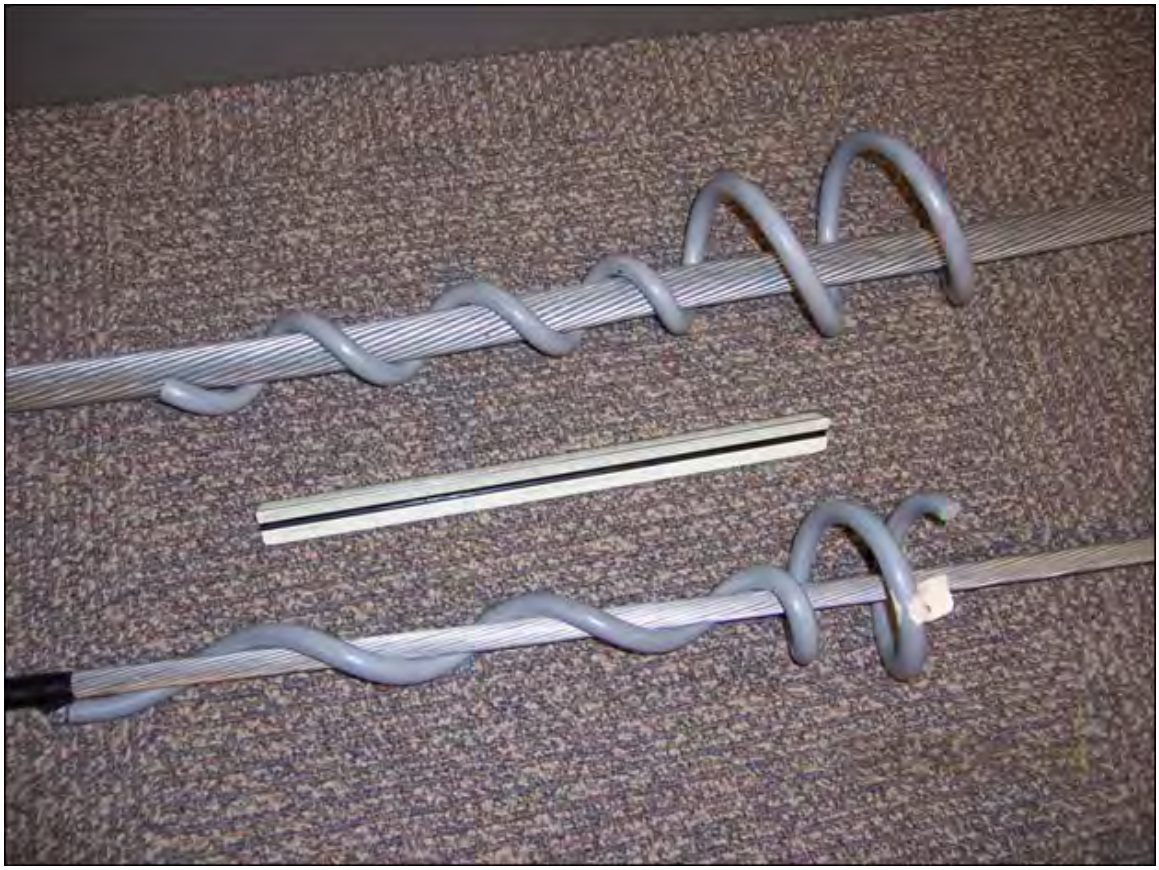


Figure Vol. 2-40 Close-up of bird flight diverters that can be placed on conductors or shield wires of a transmission line

Figure Vol. 2-41 Timber mat equipment bridge at stream crossing

Figure Vol. 2-42 Mats in wet meadow

Figure Vol. 2-43 Timber mats being placed in wooded wetland