Cardinal-Hickory Creek Transmission Line Project Alternative Crossings Analysis

ITC Midwest LLC
American Transmission Company LLC
Dairyland Power Cooperative

Cardinal-Hickory CreekTransmission Line Project

April 2016

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prepared for

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prepared by

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ABSTRACT/NOTE TO REVIEWER OR READER

This Alternatives Crossings Analysis (ACA) report was developed specifically for use in the review of the Cardinal – Hickory Creek 345 kV Transmission Line Project by federal and state agencies, including the McGregor District of the U.S. Fish & Wildlife Service, U.S. Army Corps of Engineers, the U.S. Department of Agriculture's Rural Utilities Service, the Iowa Utilities Board and the Public Service Commission of Wisconsin. The ACA is intended to provide information to these agencies to enable them to evaluate alternative Mississippi River crossing locations for the Cardinal – Hickory Creek Transmission Line Project.

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EXECUTIVE SUMMARY

ES-1 Overview

ITC Midwest LLC (ITC Midwest), along with American Transmission Company LLC by its corporate manager, ATC Management Inc., (together, ATC), and Dairyland Power Cooperative (Dairyland), a cooperative organized under the laws of Wisconsin (all collectively, the Utilities), propose to construct and own a 345 kilovolt (kV) transmission line connecting northeast Iowa and southwest Wisconsin. This Cardinal – Hickory Creek Transmission Line Project (Project) meets multiple needs:

- Addresses reliability issues on the regional bulk transmission system.
- Cost-effectively increases transfer capacity to enable additional renewable generation needed to meet state renewable portfolio standards (RPS) and support the nation's changing energy mix.
- Alleviates congestion on the transmission grid to reduce the overall cost of delivering energy.
- Responds to public policy objectives aimed at enhancing the nation's transmission system and reducing carbon dioxide emissions.

ES-2 Project Description

The Project would connect the Hickory Creek Substation in Dubuque County, Iowa, with the Cardinal Substation in the Town of Middleton, Wisconsin (near Madison, Wisconsin) with a new 345 kV transmission line, and would include construction of and a connection at a new intermediate substation near the Village of Montfort in either Grant County or Iowa County, Wisconsin. Between the Hickory Creek Substation and the Cardinal Substation, the Project must cross the Mississippi River.

This area of the Mississippi River includes the U.S. Fish and Wildlife Service (USFWS)-managed Upper Mississippi National Wildlife and Fish Refuge (Refuge), the longest linear Refuge in the United States. The Refuge was established in 1924 as a refuge for fish, wildlife, and plants and a breeding place for migratory birds. The Refuge encompasses one of the largest blocks of floodplain habitat in the lower 48 states. Bordered by steep wooded bluffs that rise 100 to 600 feet above the river valley, the Mississippi River corridor and Refuge offer scenic beauty and productive fish and wildlife habitat. The Refuge lies within the Mississippi Flyway, a migration pathway for birds. The Refuge extends north to south through Minnesota, Wisconsin, Iowa, and Illinois for approximately 260 river miles and covers just over 240,000 acres. The Refuge is designated as a Wetland of International Importance (Ramsar) and a Globally Important Bird Area (GIBA) (USFWS, 2014a).

The Cardinal – Hickory Creek Initial Study Area was designed around the necessary connection points for this Project and is shown below in Figure ES-1.

The Midcontinent Independent System Operator, Inc. (MISO), the regional transmission organization, has approved the Project. The in-service date for the Project is 2023. The Project would be approximately 125 miles long, depending on the final authorized route and the MISO estimated costs are $500 million (2023 dollars).

ES-3 Purpose and Need

The Utilities are transmission-owning members of MISO. In 2011, as part of the 2011 MISO Transmission Expansion Plan (MTEP), MISO designated the Project a Multi-Value Project (MVP) as part of a portfolio of transmission projects developed to provide economic, reliability, and public policy benefits across what was then the entire MISO footprint – all or portions of 13 states. The MISO footprint is currently comprised of all or portions of 15 states and 1 Canadian province (MISO, 2014a). MISO developed a portfolio of 17 MVPs through a comprehensive and broad stakeholder analysis and confirmed the portfolio's benefits in the 2014 *MTEP Triennial MVP Review* (Triennial MVP Review).

The MISO MVP designation for the Project is built upon years of study efforts aimed at ensuring that the regional transmission system can reliably and cost-effectively deliver renewable energy necessary to meet state renewable portfolio requirements. A 345 kV connection between eastern Iowa and the Madison, Wisconsin, area, which the Project would provide, has been under study since at least 2008, when the governors of North Dakota, South Dakota, Minnesota, Wisconsin, and Iowa established the Upper Midwest Transmission Development Initiative (UMTDI) to undertake a joint planning effort to identify regional electric transmission investment necessary to comply with their respective RPS. After two years of study, the UMTDI identified "no regrets" or "first mover" transmission lines in their states that would be cost-effective and needed under a variety of future scenarios. Among the first mover projects that were identified was a 345 kV line with endpoints near Dubuque, Iowa, and Madison, Wisconsin.

Also in 2008, MISO, in conjunction with state utility regulators and industry stakeholders, commenced a Regional Generator Outlet Study (RGOS) effort to meet renewable generation requirements within the MISO footprint. The RGOS effort evaluated multiple future transmission scenarios identifying transmission investments that would deliver renewable energy at the lowest per megawatt hour cost over the MISO territory. In 2010, the RGOS study effort culminated in a proposed portfolio of candidate projects that, like the UMTDI, included a 345 kV line between Dubuque, Iowa, and Madison, Wisconsin, in the portfolio.

As one of the MVPs, the purpose of the Project is to enhance the reliability of the regional bulk transmission system and to cost-effectively enable the delivery of renewable energy necessary to satisfy state RPS. The Project is also designed to relieve congestion on the transmission system to reduce the overall cost of delivering energy. In addition, the Project would respond to public and Executive policy objectives aimed at enhancing the nation's transmission system and reducing carbon dioxide emissions.[1]

ES-4 Alternative Crossings Analysis Study Report

Although the Cardinal – Hickory Creek Initial Study Area (Figure ES-1) includes the entire length of the Project from the Hickory Creek Substation to the Cardinal Substation, the Utilities began their route analysis for the Project by focusing on the crossing of the Mississippi River. The Mississippi River crossing location that is ultimately selected would determine the potential Project routes in both Iowa and Wisconsin. The Alternative Crossings Analysis (ACA) documents the Utilities' investigation and assessment of potential Mississippi River crossing locations for the Project and identifies the Utilities' preferred crossing alternative.

Utilities have been meeting with USFWS Refuge and ecological services staff since April 2012 to discuss potential Mississippi River crossings, including crossings of the Refuge. The National Wildlife Refuge System Improvement Act of 1997 provides that the Refuge is to be managed to "fulfill the mission of the System, as well as the specific purposes for which that refuge was established."[2] The Act grants the United States Department of Interior's Secretary the power to grant new rights-of-way (ROW) in the Refuge for power line use "whenever he determines that such uses are compatible with the purposes for which these areas are established."[3]

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[1] Public and Executive policy objectives include Presidential memoranda, *Modernizing Federal Infrastructure Review and Permitting Regulations, Policies and Procedures* (May 17, 2013); Presidential memoranda, *Transforming Our Nation's Electric Grid Through Improved Siting, Permitting and Review* (June 7, 2013); President's Executive Order, *Improving Performance of Federal Permitting and Review of Infrastructure Projects* (March 22, 2012); *President's Climate Action Plan* (June 2013); the U.S. Environmental Protection Agency's (EPA) Clean Power Plan under the Clean Air Act, Section 111(d) (released on August 3, 2015); the USFWS's policy on climate change, *Rising to the Urgent Challenge: Strategic Plan for Responding to Accelerating Climate Change* (USFWS Strategic Plan) (September 2010).
[2] National Wildlife Refuge System Improvement Act of 1997. Section 5 (Appendix H).
[3] The USFWS is an agency within the Department of Interior,

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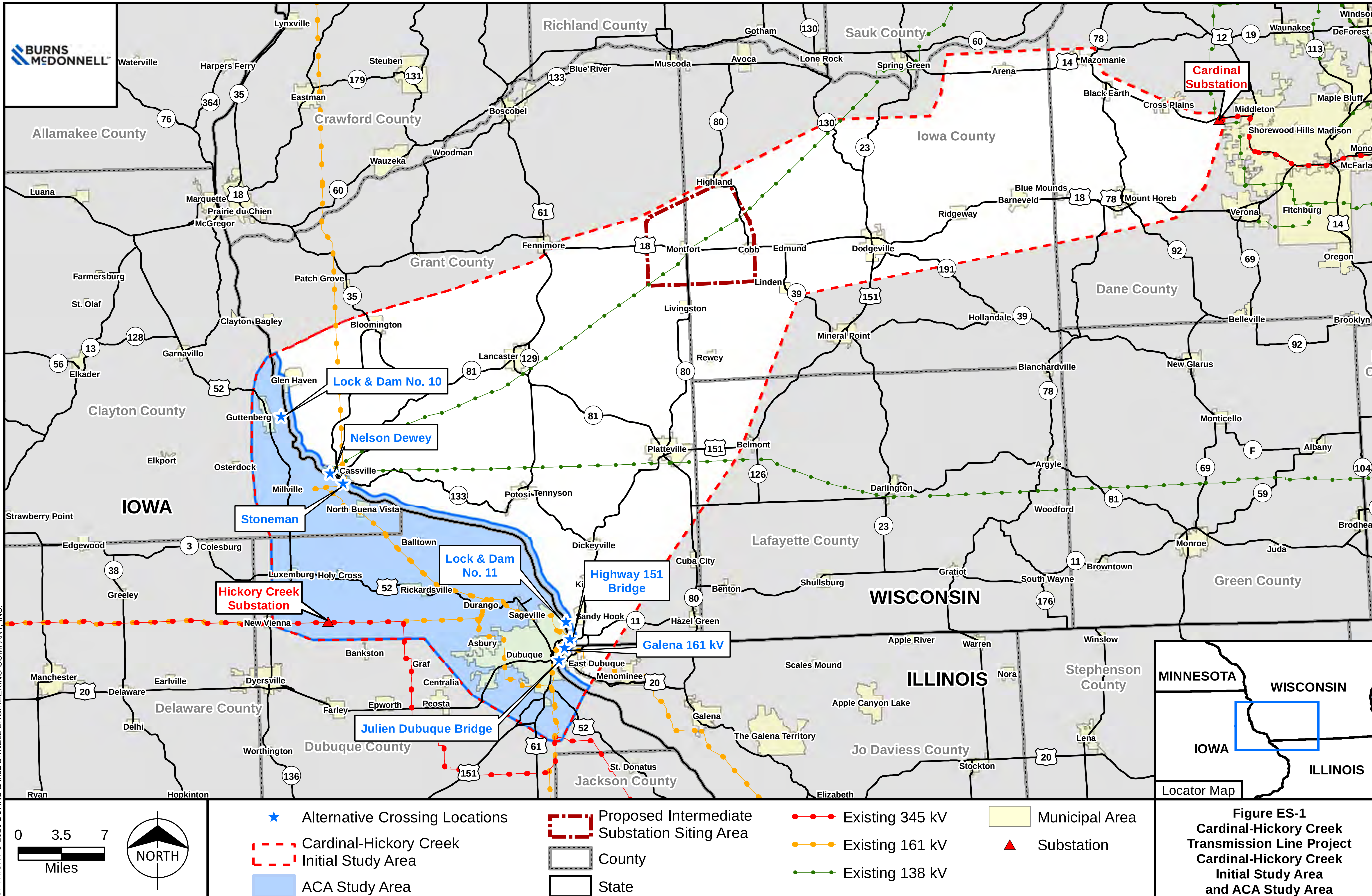

Figure ES-1
Cardinal-Hickory Creek Transmission Line Project
Cardinal-Hickory Creek Initial Study Area and ACA Study Area

Path: R:\ITC\74417_Hickory_Crk_Cassville\GIS\DataFiles\ArcDocs\ACA_Report_Figures\FigureES_1_CardinalHC_ACA_Study_Area_20160405.mxd kasamuelson 4/5/2016

Source: Energy Velocity, NTAD, UGSG; ESRI, ATC, ITC Midwest, Burns & McDonnell

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Utilities prepared this report at the request of the Refuge manager who has emphasized that, before determining whether the proposed use would be compatible and consistent with the USFWS Mitigation Policy, no transmission line crossing of the Refuge could be considered by the USFWS unless Utilities could demonstrate that non-Refuge options were infeasible. Utilities believe they have demonstrated that non-Refuge alternatives are not economically and technically feasible, and have fully documented their analysis in this report. [4] It is Utilities' understanding that the USFWS will use this report as a starting point for its evaluation of the Mississippi River crossings proposed in this ACA and, after completing its environmental review, ultimately make a determination regarding whether the proposed power line use is compatible with the Refuge and permittable.

The selection and evaluation of alternative crossing locations involved several steps. First, the Utilities identified a Mississippi River crossing study area (ACA Study Area) that would both (i) meet the Project purpose and need and (ii) include crossing locations consistent with the required Project configuration. The ACA Study Area (Figure ES-1) spans from Guttenberg, Iowa, on the north end, to Dubuque, Iowa, on the south end, and east to areas within 0.5-mile of the Mississippi River in Illinois and Wisconsin that are associated with the alternative crossing locations analyzed for this Project. The western boundary of the ACA Study Area was developed to include the Hickory Creek Substation and an adequate area to develop alternative routes to all crossing locations. These routes are referred to as "ACA routes" in this report and denote alternative routes that were developed specifically for this assessment of potential Mississippi River crossing locations.[5] This ACA provides a quantitative assessment of resources underlying each of the ACA routes; this assessment supports a comparison of the potential impacts of each alternative crossing location. In general, ACA routes developed for this analysis originate at the Hickory Creek Substation, extend across the Mississippi River, and terminate approximately 0.5 mile into Wisconsin or Illinois, depending on the specific crossing location.

Second, the Utilities inventoried existing infrastructure locations within the ACA Study Area, including existing transmission lines and roads, both of which utilized existing infrastructure and provided alternatives to avoid crossing Refuge lands. As a result of this investigation, and in consultation with the USFWS, the Utilities identified seven potential Mississippi River crossing locations. Four potential locations are outside of the Refuge, and three are located within Refuge boundaries. Figure ES-1 shows

[4] As will be discussed later, one federal agency and one Iowa municipality -- both of which have jurisdiction over this Project -- have concluded that they would not issue the required permits for certain crossing alternatives. The inability to obtain required permits renders those crossing alternatives not technically feasible.
[5] Final routes for the Project will be determined through the federal and state regulatory processes in Wisconsin and Iowa.

the ACA Study Area and the seven alternative crossing locations considered for this Project. See Section ES-5 for a complete list of alternative crossing locations.

As the third step in the evaluation of alternative crossing locations, the Utilities gathered data and information to assess the technical and economic feasibility and potential engineering, environmental, and social impacts of all seven ACA routes that extend to the alternative Mississippi River crossing locations. This evaluation included consultation with, and assessments by, federal, state, and local authorities with permitting authority for the Project across and near the Mississippi River and federal authorities with permitting authority over the Project within the Refuge.

Fourth, based on the data collected, the Utilities assessed these alternative crossing locations pursuant to the USFWS Mitigation Policy. Under this policy, an applicant for use of USFWS lands must first demonstrate that impacts to Refuge lands cannot be avoided. Once this showing has been made, USFWS must evaluate impact minimization, and then compensation/mitigation. In following this policy, the Utilities first considered whether there were feasible options to avoid the Refuge. As a result of the overall assessment contained within this ACA, the Utilities determined that the identified non-Refuge options were not feasible. In addition, Utilities concluded that one of the three Refuge crossings also was not feasible for the Project. Utilities therefore, request that USFWS evaluate the remaining two Refuge crossings, both near Cassville, Wisconsin for compatibility and permittability. Utilities believe the Nelson Dewey crossing alternative better minimizes impacts to the Refuge and for this reason, Utilities have designated it as their preferred crossing location (the Utilities' Preferred Crossing).

This ACA will support applications to multiple primary federal and state agencies, including, but not limited to, the USFWS, the U.S. Army Corps of Engineers (USACE), the U.S. Department of Agriculture's Rural Utilities Service, the Iowa Utilities Board, the Public Service Commission of Wisconsin, the Wisconsin Department of Natural Resources, and the Iowa Department of Natural Resources.

ES-5 Analysis of Identified Mississippi River Crossing Locations

The Utilities evaluated seven potential crossings of the Mississippi River that use existing infrastructure in the ACA Study Area, listed as follows from north to south (common names for each crossing are provided in parentheses after the formal crossing name):

1. Lock and Dam No. 10 in Guttenberg, Iowa (L&D 10)
2. Turkey River Substation to the Nelson Dewey Power Plant crossing in Cassville, Wisconsin (Nelson Dewey)

3. Millville to Stoneman 69 kV transmission line and Turkey River to Stoneman 161 kV line crossing (co-located) in Cassville, Wisconsin (Stoneman)
4. Lock and Dam No. 11 in Dubuque, Iowa (L&D 11)
5. Highway 61/151 crossing in Dubuque, Iowa (Highway 151 Bridge)
6. Dubuque to Galena 161 kV line crossing in Dubuque, Iowa (Galena 161 kV Line)
7. Julien Dubuque Bridge/Highway 20 crossing in Dubuque, Iowa (Julien Dubuque Bridge)

At USFWS staff's request, the Utilities assessed the engineering constraints and potential environmental and social impacts of the four non-Refuge ACA routes and of the three ACA routes through the Refuge. The analysis summarized below and presented in this ACA report of the non-Refuge ACA routes, followed by the ACA routes that extend through Refuge lands, demonstrates that the non-Refuge alternatives would have greater overall environmental and human impacts compared to the remaining feasible Refuge crossing locations. The Utilities also provided information to and sought analyses from federal, state, and local entities with permitting authority over the relevant crossing locations that showed that non-Refuge ACA routes (as well as the L&D 10 crossing location within the Refuge) presented technical engineering conflicts with existing infrastructure and human and environmental impacts that these entities determined would preclude the issuance of necessary permits. The two remaining ACA routes through the Refuge must be reviewed by the USFWS to determine if they are compatible and permittable. Detailed descriptions of these seven ACA routes are provided in Chapters 4 and 5 of this ACA report.

ES-5.1 Non-Refuge Alternative Crossing Location– L&D 11

Key characteristics, constraints, and opportunities for the L&D 11 crossing are:

- If selected, the existing 161 kV and 69 kV lines through the Refuge at Stoneman would remain in place.
- The L&D 11 crossing would be located on lands outside of Refuge boundaries.
- The crossing would require routing through urban residential development and downtown Dubuque.
- The ACA Route would cross numerous residential properties (58 homes would be within 100 feet of centerline of transmission line corridor, nine of which would be within 25 feet). All trees within the ROW would need to be removed.
- There are no existing overhead transmission corridors across the Mississippi River at or near Lock and Dam No. 11.

- The crossing presents technical challenges; it would require a 3,200-foot crossing of the Mississippi River with projected structure heights of 250 to 300 feet with permanent lighting.
- The Project would be visible from multiple viewpoint locations at Eagle Point Park.
- Lock and Dam No. 11 is a listed site on the National Register of Historic Places (NRHP); there are visual/scenic considerations related to the NRHP listing.
- Safety and technical engineering considerations prohibit construction of transmission facilities on or near Lock and Dam No. 11, per USACE review.

ES-5.2 Non-Refuge Alternative Crossing Locations – Highway 151 Bridge and Julien Dubuque Bridge

As a result of their location and similar type, key characteristics, constraints, and opportunities for the Highway 151 Bridge and Julien Dubuque Bridge crossings are comparable, and have been combined together into one discussion, below:

- If selected, the existing 161 kV and 69 kV lines through the Refuge at Stoneman would remain in place.
- Both crossings are located on lands outside the Refuge.
- The crossings require routing through urban residential development and downtown Dubuque.
- Corridors to both locations would cross numerous residential properties (58 homes would be within 100 feet of centerline of transmission line corridor, nine of which would be within 25 feet). All trees within the easement area would need to be removed.
- Iowa Department of Transportation (IDOT) would not be able to safely perform ongoing routine bridge maintenance while the transmission line is energized. As a result, the line would need to be de-energized during these maintenance activities, which would not allow for the reliable use of a transmission line at these locations and would not meet the purpose and need of the Project.
- Unresolvable engineering conflicts with bridge safety prohibit construction of transmission facilities on these bridges, per IDOT review of the Project.
- At these locations, the Project would result in shutdown or disruption of traffic flow on major bridges between Iowa and Wisconsin/Illinois during construction and maintenance of the transmission line.
- Neither bridge location has existing overhead transmission lines.

ES-5.3 Non-Refuge Alternative Crossing Location – Galena 161 kV Line

Key characteristics, constraints, and opportunities for the Galena 161 kV Line crossing are:

- If selected, the existing 161 kV and 69 kV lines through the Refuge at Stoneman would remain in place.
- The crossing would be located on lands outside the Refuge.
- The crossing requires routing through urban residential development and downtown Dubuque.
- The corridor would cross numerous residential properties (61 homes would be within 100 feet of centerline of transmission line corridor, nine of which would be within 25 feet). All trees within the easement area would need to be removed.
- Requires routing new 345 kV line through Schmitt Island and Riverview Park; the new line would cross recreational fields for which federal funds were obtained, the use of which may limit or prohibit redevelopment of these areas.
- It provides an opportunity to co-locate with an existing 161 kV overhead line.

ES-5.4 Refuge Alternative Crossing Location – L&D 10

Key characteristics, constraints, and opportunities for the L&D 10 crossing are:

- If selected, the existing 161 kV and 69 kV lines through the Refuge at Stoneman would remain in place.
- It crosses land within the Refuge managed by USFWS and USACE.[6]
- The crossing would require routing in immediate proximity of the Refuge, which includes diverse and extensive cultural resources such as villages, burial and ceremonial mounds, camp sites, rockshelters, shell middens, and lithic scatters. As with other Refuge crossing locations, any excavation or removal of archeological resources activities within the Refuge would require an Archaeological Resources Protection Act of 1979 (ARPA) permit.
- The City of Guttenberg, Iowa, has more than 350 recorded historic-aged resources including three NRHP districts and several individually-listed NRHP properties (including Lock and Dam No. 10 itself). The proposed ACA route for Lock and Dam No. 10 includes the presence of 196 historic

[6] L&D 10 crossing location (Guttenberg, Iowa) includes lands managed and operated under a 2001 cooperative agreement between the USACE and the USFWS (USFWS 2006). Although there is a 'break' in the Refuge where Lock and Dam No. 10 crosses the Mississippi River, this 'break' relates specifically to the management and operation of the lock and dam facility and does not include a gap in the overall Refuge boundaries at this location (as compared to the gap in the Refuge at Dubuque, Iowa). As a result, the Lock and Dam No. 10 is considered by the Utilities as a Refuge crossing alternative. Although L&D 11 also includes a break in Refuge lands, the L&D 11 crossing location is within the City of Dubuque at the same general location of the remaining non-Refuge locations.

structures within 1,000 feet of the proposed ACA route alignment, the highest among all ACA routes.

- No existing utility ROWs are located at or near the L&D 10 crossing or on the Wisconsin side of this crossing location; the Wisconsin side is primarily mature woodlands and agricultural fields.
- Alternative crossing locations immediately upstream and downstream of L&D 10 are limited by proximity to a private airfield to the north of L&D 10 and Goetz Island, Swift Slough, and Guttenberg Ponds Sanctuary within the Refuge to the south.
- Safety and technical engineering considerations prohibit construction of transmission facilities on or near Lock and Dam No. 10, per USACE review.
- The L&D 10 ACA route is the longest (25.6 miles) compared to all other ACA routes.

ES-5.5 Refuge Alternative Crossing Location – Stoneman

Key characteristics, constraints, and opportunities for the Stoneman crossing are:

- It crosses lands within the Refuge, which is designated as a Wetland of International Importance (Ramsar) and a GIBA.
- The crossing would require routing through Refuge lands, which include diverse and extensive cultural resources such as villages, burial and ceremonial mounds, camp sites, rockshelters, shell middens, and lithic scatters. Any excavation or removal of archeological resources within the Refuge would require an ARPA permit. The Stoneman ACA route includes one archaeological site within the Stoneman ACA route ROW and one historical resource within 1,000 feet of the Stoneman ACA route; both resources are located outside of Refuge lands.
- The crossing presents an opportunity to co-locate new 345 kV line with an existing 161 kV corridor across the Refuge.
- The existing 69 kV transmission line would be removed, reducing the current design at Stoneman from two separate transmission corridors (on the western side of the Refuge) to a single corridor (co-located with the existing 161 kV line) for the entire length through the Refuge.
- The current transmission facilties at the Stoneman crossing have three planes of conductors and an unmarked shield wire. The new consolidated facilities would use low-profile structures that place all conductors on one horizontal plane and the shield wire would be marked with avian flight diverters, which are not present on the existing line. The larger 345 kV transmission structures would provide a more visible structure for avian species; the reduced span length (500-600 feet) and use of flight diverters would limit avian interactions by increasing overall visibility of the transmission line.

- The crossing requires routing through urban/residential development in the Village of Cassville, Wisconsin. Residences (nine homes would be within 100 feet of centerline of transmission line corridor, four of which would be within 25 feet), schools, daycares, places of worship, airports, or businesses are in immediate proximity to the Stoneman crossing location in Cassville.
- Alternative alignments at the Stoneman location are limited by the presence of the Cassville Municipal Airport (the runway is located approximately 2,000 feet from the crossing location). Due to the airport and the height of the bluff immediately east of Cassville, transmission line structures located in the airport's conical surface would likely require additional design and evaluation by the Federal Aviation Administration, and may be limited in height.
- There is an existing retired power plant, a substation and municipal infrastructure located on the Wisconsin side.

ES-5.6 Refuge Alternative Crossing Location – Nelson Dewey

Key characteristics, constraints, and opportunities for the Nelson Dewey crossing are:

- It crosses lands within the Refuge, which is designated as a Wetland of International Importance (Ramsar) and a GIBA.
- The crossing provides an opportunity to relocate the existing 161 kV transmission line and ROW from the Stoneman crossing to the Nelson Dewey crossing to co-locate with the new 345 kV for this Project. The existing 69 kV transmission line would be removed. This would allow for the natural revegetation (in consultation with the USFWS) of the existing 161 kV and 69 kV transmission corridors, including both wetland and woodland habitat, present at the existing Stoneman crossing through the Refuge.
- As indicated for the Stoneman crossing, the Nelson Dewey crossing would also include the use of low-profile structures that place all conductors on a single horizontal plane and include a marked shield wire, which is not present on the existing lines through the Refuge. The larger 345 kV transmission structures would provide a more visible structure for avian species; the reduced span length (500-600 feet) and use of flight diverters would limit avian interactions by increasing overall visibility of the transmission line.
- It requires crossing fewer acres of ROW through Refuge lands compared to the Stoneman crossing location (approximately 22 acres of ROW compared to 46 acres at Stoneman).
- The Nelson Dewey crossing would require routing through Refuge lands, which includes diverse and extensive cultural resources such as villages, burial and ceremonial mounds, camp sites, rockshelters, shell middens, and lithic scatters. Any excavation or removal of archeological

resources within the Refuge would require an ARPA permit. Using the same shared segment as the Stoneman ACA route, the Nelson Dewey ACA route includes one archaeological site within the Nelson Dewey ACA route ROW and one historical resource within 1,000 feet of the Nelson Dewey ACA route; both resources are located outside of Refuge lands.

- Existing infrastructure at this location includes Oak Road within the Refuge on the Iowa side. On the Wisconsin side, there is an existing retired power plant, a substation, and access to existing 161 kV, 138 kV, and 69 kV transmission corridors.

ES-6 Undergrounding

Chapter 5 and Appendix D of the ACA report provide analyses of both overhead and underground designs at the Nelson Dewey and Stoneman crossing locations, as requested by USFWS Refuge staff. An underground alternative would require substantial construction disturbance to Refuge lands and shorelines, including emergent and forested/shrub wetlands. It would also likely require an ARPA permit for any excavation or removal of archeological resources located in the Refuge. Similar to an overhead design, an underground alternative would require a permanent cleared ROW on Refuge lands. An underground alternative would also require a new riser pole installation on Refuge lands and considerable excavation to install approximately 20 new splice vaults located within Refuge boundaries (approximately 170 cubic yards per vault). Additionally, new permanent access roads within the Refuge would need to be constructed to access the entire underground installation, and necessary monitoring and maintenance activities would require land disturbance and potential line outages to access the splice vaults. An underground design would add an estimated $80 million to $100 million (depending on the final route selected), to a total Project cost, representing an approximately 20 percent cost increase for the Project. The Evaluation of Underground Transmission Installation report is included as Appendix D of the ACA report. Overall, the Utilities believe that the substantial increase in Project cost associated with underground construction; the potential impact on Refuge lands related to underground construction; and, the regulatory challenges do not warrant further evaluation of underground construction.

ES-7 Federal, State, and Local Agency Review of ACA Routes

As part of the data collection process for the seven ACA routes and alternative crossing locations, the Utilities presented Project information, ACA routes, and design data to federal, state, and local agencies charged with permitting authority over the alternative crossing locations. With respect to the two lock and dam alternative crossing locations and the remaining crossing locations at Dubuque, this investigation included consultation with USFWS, USACE, IDOT, and the City of Dubuque.

The USFWS has been meeting with Utilities since April 2012 and has provided information regarding its Mitigation Policy and Refuge resources. The USFWS has emphasized that the Refuge was established as a refuge for fish, wildlife, and plants and as a breeding place and flyway for migratory birds. The USFWS has not yet undertaken any detailed review nor has it provided any determination regarding whether the proposed transmission line can be constructed within the Refuge. It is anticipated that the USFWS will undertake its compatibility and permittability review after receiving this ACA.

Utilities also consulted with the USACE (St. Paul and Rock Island Districts), which owns and operates Lock and Dam No. 10 (Guttenberg) and Lock and Dam No. 11 (Dubuque), respectively; the IDOT, which owns and regulates use of the two bridge crossings; and, the City of Dubuque, which must issue a permit for transmission infrastructure within its city boundaries.[7] For each of these governmental authorities from which a permit would be required to construct the Project, the Utilities requested that the respective authorities examine the crossing location(s) within their purview, evaluate the potential impacts to their facilities and the environment, and advise whether they would be able issue the necessary permit for the Project at the respective crossing location under review.

ES-7.1 Lock and Dam No. 10 and Lock and Dam No. 11

The USACE analyzed placement of the Project on both Lock and Dam No. 10 and Lock and Dam No. 11 and in proximity to these two dams, both upstream and downstream. The USACE engineering staff reviewed the transmission line proposal and concluded that the line could not be safely co-located on the dams. Based on technical considerations, the USACE determined that the transmission line could not be constructed on Lock and Dam No. 10, Lock and Dam No. 11, their respective spillways, or within 600 feet upstream or 1,200 feet downstream of either dam without adversely affecting the safe operation of the dams.[8] The USACE also identified geotechnical concerns with any subsurface activities near the lock and dams, including the excavation necessary to drill foundations for new transmission structures. USACE staff advised that the embankments hold back a significant weight and that if there were construction near the lock and dam, it could shorten seepage paths that would result in "serious integrity concerns for the lock and dams." USACE also indicated that suspended wires from the proposed transmission line near the operating lock and dam posed a safety concern. USACE further advised that construction and use of barges along the braided channel downstream of Lock and Dam No. 10 could also present concerns. See Appendix B (meeting minutes summarizing USACE's review and concerns).

[7] City of Dubuque Resolution dated June 15, 2015 (Appendix C).
[8] Final Meeting Notes, USACE and ITC Midwest dated February 17, 2015; City of Dubuque Resolution dated June 15, 2015 (Appendix B).

The City of Dubuque also evaluated an ACA route through the city to the L&D 11 alternative crossing location as well as proposed routes extending near both the Highway 151 Bridge and Galena 161 kV Line ACA routes. Utilities met with the City of Dubuque and provided information about the Project and routes over the course of nearly three years. The City of Dubuque analyzed the routes in accordance with its ordinance regulating the placement of transmission lines within the city limits. The City of Dubuque planning services manager and city engineer prepared a memo regarding the routes through the city and the potential impacts of the routes on the human and natural environment. See Appendix C (June 10, 2015 City staff memorandum and Resolution dated June 15, 2015). The planning services manager and city engineer concluded that due to the impacts of the line, the line could not be approved by the city under its siting ordinance. The Resolution, passed by the entire seven-member City Council, affirmed staff's analysis and concluded that, the Project was "not permittable and would not be permitted by the City Council, and that the filing of an application by ITC and proceeding with the process required by the City of Dubuque Code of Ordinances for such a license would not be in the public interest."[9]

ES-7.2 Dubuque-Wisconsin Bridge and Julien Dubuque Bridge

IDOT evaluated the technical feasibility of co-locating the transmission line on these two bridges. IDOT advised that both bridges have fracture-critical components that must be inspected "hands on" every two years and that a transmission line would prevent access to these components (Bradley, 2015; Appendix B). Further, IDOT advised that maintenance and repair activities would require the proposed 345 kV line to be taken out of service for extended periods of time, which would prevent the Project from meeting its purpose and need. The City of Dubuque also evaluated the potential impacts to humans and the environment and concluded that the proposed routes through the city that would be required to connect to either bridge alternative crossing location and concluded that the Project could not obtain the necessary franchise from the city.

ES-7.3 Galena 161 kV

The City of Dubuque evaluated the potential impacts to humans and the environment for the Galena 161 kV ACA route and concluded that the Project could not obtain the necessary franchise from the city.

ES-7.4 Determination of Potentially Feasible Options

The Utilities concluded that the non-Refuge options would have impacts to the human and natural environments in proximity to these locations and that the overall impacts would be greater than those of the Stoneman or Nelson Dewey crossing locations within the Refuge. Utilities also recognized that

[9] City of Dubuque Resolution dated June 15, 2015 (Appendix B).

agencies with regulatory authority over the Project, that conducted their own independent reviews, identified technical engineering and impact considerations that would preclude those entities from issuing the permits necessary to construct the Project in those locations. Utilities also concluded that one of the Refuge options, at Lock and Dam No. 10, would have extensive impacts to the human and natural environments, including possible extensive impacts to the City of Guttenberg. The USACE also evaluated this crossing and informed Utilities that it could not approve a crossing on or near the dam due to conflicts with dam operations and safety concerns, as discussed above in Section ES-7.1.

Based on the environmental review and the permitting agencies' conclusions, Utilities determined that none of the non-Refuge alternative crossing locations, nor Lock and Dam No. 10, constitutes a feasible crossing location for the Project.

ES-8 The Utilities' Preferred Crossing and Design

Based on the review and analysis contained in this ACA, the Utilities determined that eliminating the four non-Refuge crossings and Lock and Dam 10 from further consideration is consistent with USFWS's Mitigation Policy. The only two alternative crossing locations remaining for further consideration are the Stoneman and Nelson Dewey locations, which traverse Refuge lands and require USFWS approval. The Stoneman crossing utilizes a portion of an existing 161 kV and 69 kV corridor between Millville, Iowa, and Cassville, Wisconsin. Just south of the Stoneman crossing is the DTE Stoneman Station, a 40-megawatt bio-fuels plant that was retired in late 2015. The Nelson Dewey crossing is located in the vicinity of Oak Road in Iowa and the coal-fired Nelson Dewey Generating Station in Wisconsin, which also closed in late 2015.

One benefit of the Project to the Refuge is that selection of the Nelson Dewey or Stoneman crossing location would eliminate the need for the existing Millville to Stoneman 69 kV transmission line through the Refuge, as a new 69 kV source is proposed at the rebuilt Turkey River Substation. Therefore, the 69 kV line would be removed as part of the Project and as a result, the number of transmission circuits in the Refuge after construction of the Project would remain unchanged at two. Further, both locations offer the opportunity to consolidate the Project with existing transmission facilities and maintain a single transmission corridor across the Refuge.

Both the Nelson Dewey and Stoneman crossings would increase structure size and height from approximately 57 feet (existing) to approximately 75 feet (proposed) making the structures more visible to avian species. The new 345/161 kV line will also be designed such that all conductors are on the same horizontal plane and the shield wire would be marked with the use of avian flight diverters. The existing

161/69 kV line at Stoneman is not marked with avian flight diverters. The larger transmission structures would provide a more visible structure for avian species. In addition, the reduced span length (500-600 feet) and use of flight diverters would assist in decreasing avian interactions. The design presented for the Nelson Dewey ACA route would also reduce the total structures within Refuge lands from 30 structures to 10.

While the current needs are for the existing 161 kV line and the proposed 345 kV line, the Utilities are presenting in this ACA a design with 345 kV/345 kV specifications within the Refuge. The facilities would be operated at 345 kV/161 kV, but be capable of operating at 345 kV/345 kV in case future system conditions warrant it. Constructing the line in its ultimate configuration, a typical technique when crossing a refuge or major river, is a prudent and cost-effective investment to accommodate future needs in a manner that avoids future impacts to the Refuge if another 345 kV transmission line between Iowa and Wisconsin is needed. As with the other transmission features planned for the Refuge, the final design of the transmission facilities would be determined in consultation with the USFWS. For comparison, a similar quantitative analysis and structure design are provided for a 345 kV/161 kV configuration through the Refuge in Appendix G.

The Utilities are presenting a potential low-profile structure design for the co-located 345 kV/345 kV lines through the Refuge. The low-profile structures would typically be 75 feet high and have approximate spans of 500-600 feet. The low-profile structure height for the design presented for the Nelson Dewey ACA route would also be at or below the height of the mature woodlands on the north side of Oak Road.

The proposed ROW would be 260 feet wide through Refuge lands (345 kV/345 kV configuration). The Utilities would work closely with USFWS to identify the most appropriate structure design to minimize wildlife and aesthetic impacts to the Refuge.

As a result of the analyses contained in the ACA report, the Utilities conclude that the two overhead alternative crossing locations at Nelson Dewey and Stoneman are technically and economically feasible and should be reviewed by USFWS for compatibility and permittability. The Nelson Dewey crossing location is preferred over the Stoneman location for the following reasons:

- The Nelson Dewey alternative crossing location is a shorter linear distance across the Refuge and would require less transmission line ROW within the Refuge. Use of the Nelson Dewey alternative crossing location would also include fewer acres of freshwater emergent wetlands, forested/shrub wetlands, and woodlands within the ACA route ROW compared to the Stoneman alternative crossing location (see Table 5-6 and Table 5-7 in the ACA report).

- The Nelson Dewey alternative crossing location has existing associated transmission line ROW that extends through undeveloped portions of Cassville, Wisconsin, and east toward the remaining Project termination points in Wisconsin. In other words, the Nelson Dewey crossing location ties directly into existing 138 kV corridors that extend into the Project's proposed intermediate substation location. Existing transmission line corridors is the top priority for transmission line siting under Wisconsin's Siting Priorities law.
- No residences, schools, daycares, places of worship, airports, or businesses are in immediate proximity to the Nelson Dewey crossing location; the Stoneman crossing location includes all of these constraints near prospective route alignments in this area.
- Alternative route alignments at the Stoneman location are limited by the presence of the Cassville Municipal Airport (the runway is located approximately 2,000 feet from the crossing location). Due to the airport and the height of the bluff immediately east of Cassville, transmission line structures located in the airport's conical surface would likely require additional evaluation and design, and may be limited in height.
- The Nelson Dewey alternative crossing location would locate the Project farther away from known areas that support resting and feeding habitat for migratory avian species, including Wood Duck Slough and Dead Lake.

The Nelson Dewey alternative crossing location presents fewer overall constraints to Project engineering and would result in fewer overall potential impacts to the environmental and social criteria analyzed for each ACA route and alternative crossing location (Sections 5.6-5.8 and Appendix A). Therefore, the Utilities selected Nelson Dewey as the Utilities' Preferred Crossing.

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
ACA	Alternative Crossings Analysis
AMSL	above mean sea level
APLIC	Avian Powerline Interaction Committee
ATC	American Transmission Company LLC and ATC Management Inc.
BGEPA	Bald and Golden Eagle Protection Act
BMPs	best management practices
CPP	Clean Power Plan
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CPCN	Certificate of Public Convenience and Necessity
CCP	Comprehensive Conservation Plan
Dairyland	Dairyland Power Cooperative
EA/FONSI	Environmental Assessment/Finding of No Significant Impact
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FWCA	Fish and Wildlife Coordination Act

Abbreviation	Term/Phrase/Name
GHG	greenhouse gas
GIBA	Globally Important Bird Area
GIS	Geographic Information System
HDD	horizontal directional drilling
HUC	Hydrologic Unit Code
IAC	Iowa Administrative Code
ICC	Illinois Commerce Commission
IDNR	Iowa Department of Natural Resources
IDOT	Iowa Department of Transportation
INHF	Iowa Natural Heritage Foundation
ITC Midwest	ITC Midwest LLC
IUB	Iowa Utilities Board
kV	kilovolt
LWCF	Land & Water Conservation Fund
MBTA	Migratory Bird Treaty Act
MISO	Midcontinent Independent System Operator Inc.
MTEP	MISO Transmission Expansion Plan
MVPs	Multi-Value Projects
MWh	megawatt hour
MW	megawatt
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation

Abbreviation	Term/Phrase/Name
NHD	National Hydrography Dataset
NLCD	National Land Cover Dataset
NRCS	USDA Natural Resources Conservation Service (soil database)
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
NWRS	National Wildlife Refuge System
Tariff	Open Access Transmission Tariff
PADUS	Protected Areas Database of the U.S.
PSCW	Public Service Commission of Wisconsin
RGOS	Regional Generator Outlet Study
RPS	Renewable Portfolio Standards
Refuge	Upper Mississippi River National Wildlife and Fish Refuge
ROW	right-of-way
RUS	USDA Rural Utilities Service
SHPO	State Historic Preservation Office
UMTDI	Upper Midwest Transmission Development Initiative
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDNR	Wisconsin Department of Natural Resources

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1.0 INTRODUCTION

ITC Midwest LLC (ITC Midwest), along with American Transmission Company LLC by its corporate manager, ATC Management Inc., (together, ATC), and Dairyland Power Cooperative (Dairyland), a cooperative organized under the laws of Wisconsin (all collectively, the Utilities), propose to construct and own the Cardinal – Hickory Creek Transmission Line Project (Project), a 345 kilovolt (kV) transmission line connecting northeast Iowa and southwest Wisconsin.

The Project requires crossing the Mississippi River. This Alternative Crossings Analysis (ACA) report documents the Utilities' investigation and assessment of potential Mississippi River crossing locations for the Project and identifies the Utilities' preferred alternative crossing location.

1.1 Project Description

The Project proposal consists of a new transmission line and associated facilities in Iowa and Wisconsin. The Project requires transmission system connection points at the existing Hickory Creek Substation northwest of Dubuque, Iowa, a new intermediate substation near the Village of Montfort, Wisconsin, and the existing Cardinal Substation near the Town of Middleton, Wisconsin (Figure 1-1). The Project has been approved by the regional transmission organization, namely the Midcontinent Independent System Operator Inc. (MISO). The Project, which has a 2023 in-service date, will be approximately 125 miles long, depending on the final authorized route and the estimated costs are $500 million (2023 dollars). The new 345 kV transmission line and associated facilities are proposed to meet interconnection requirements:

- A new 345 kV terminal within the existing Hickory Creek Substation in Dubuque County, Iowa
- A new intermediate substation near the Village of Montfort in Grant or Iowa County, Wisconsin, to accommodate two new 345 kV line terminals
- A new 345 kV terminal for the existing Cardinal Substation in the Town of Middleton in Dane County, Wisconsin
- A new 45- to 65-mile (depending on the final route) 345 kV transmission line between the Hickory Creek Substation and the intermediate substation
- A new 45- to 60-mile (depending on the final route) 345 kV transmission line between the intermediate substation and the existing Cardinal Substation
- A short, less than one mile, 69 kV line in Iowa to enable the removal of the 69 kV line that crosses the Mississippi River at Cassville
- A rebuild of the Turkey River Substation with two 161/69 kV transformers, four 161 kV circuit breakers, and three 69 kV circuit breakers

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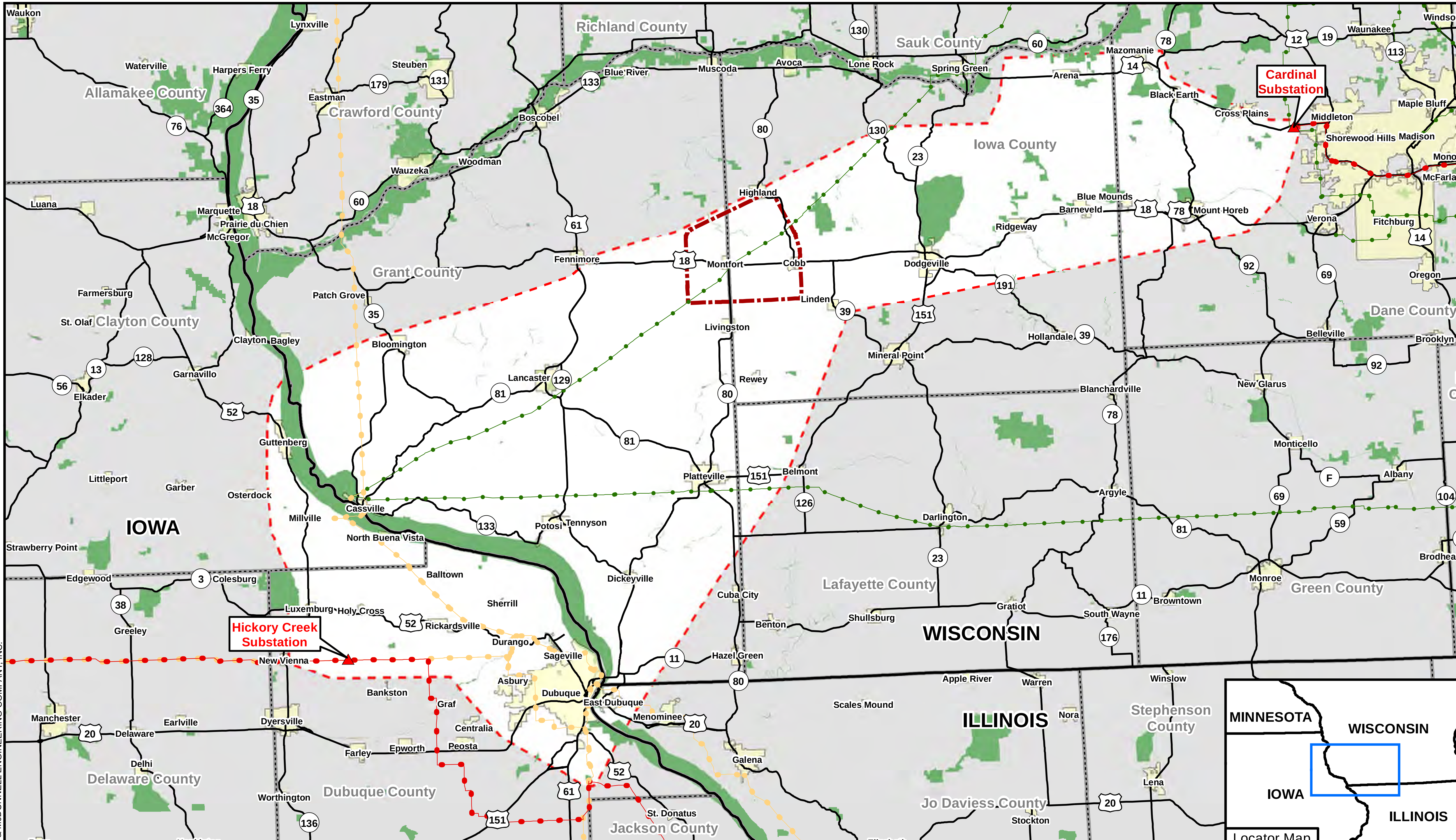

0 3.5 7
Miles
NORTH

Substation
Cardinal-Hickory Creek Initial Study Area
Proposed Intermediate Substation Siting Area
Existing 345 kV
Existing 161 kV
Existing 138 kV
Federal, State, and Local Lands
County
State
Municipal Area

BURNS & McDONNELL

Figure 1-1
Cardinal-Hickory Creek Transmission Line Project
Cardinal-Hickory Creek Initial Study Area

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Source: Energy Velocity, NTAD, UGSG; IDNR; WDNR; ESRI, ATC, ITC Midwest, Burns & McDonnell

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The connection between the Hickory Creek Substation and the intermediate substation requires a crossing of the Mississippi River at a location that includes the U.S. Fish and Wildlife Service (USFWS)-managed Upper Mississippi National Wildlife and Fish Refuge (Refuge), the longest linear refuge in the United States. The Refuge extends north to south through Minnesota, Wisconsin, Iowa, and Illinois for approximately 260 river miles (USFWS, 2006).

For the Mississippi River crossing portion of the Project (and depending on the selected crossing location), the Utilities are presenting a 345 kV/345 kV design, but would operate the lines at 345 kV/161 kV until system conditions warranted operating the facility at 345 kV/345 kV (Figure 1-2). While the current needs are for a 345 kV line and a 161 kV line, the increase in voltage capability of the second circuit is a prudent and cost-effective investment to accommodate additional transmission facilities in a manner that would avoid future impacts to the Refuge if another 345 kV transmission line between Iowa and Wisconsin were needed. Additional information regarding a potential 345 kV/161 kV design through the Refuge is provided in Appendix G.

Depending on the alternative crossing location ultimately selected for this Project, the 345 kV line would be approximately 125 miles long. The typical right-of-way (ROW) width for the Project would be 200 feet in Iowa and 150 feet in Wisconsin. In addition, unique ROW widths have been developed in certain areas to mitigate potential impacts to sensitive resources, such as avian species at the Refuge crossing locations. For most of the remainder of the ACA Study Area, the Utilities propose to utilize single-pole structures that would have a typical height of 150 feet. A diagram of a typical 345 kV structure utilized for the ACA Study Area is shown in Figure 1-3. The structures would support the new 345 kV high-voltage transmission line with three current-carrying phases made up of aluminum conductors in addition to two overhead shield wires for the purpose of lightning protection and protective relay communications. Depending on final route, the new 345 kV line may be co-located with existing transmission lines. Typical spans of the transmission line structures would range from 500 to 1,100 feet.

Figure 1-2: ITC Typical Proposed 345 kV/345 kV Structure

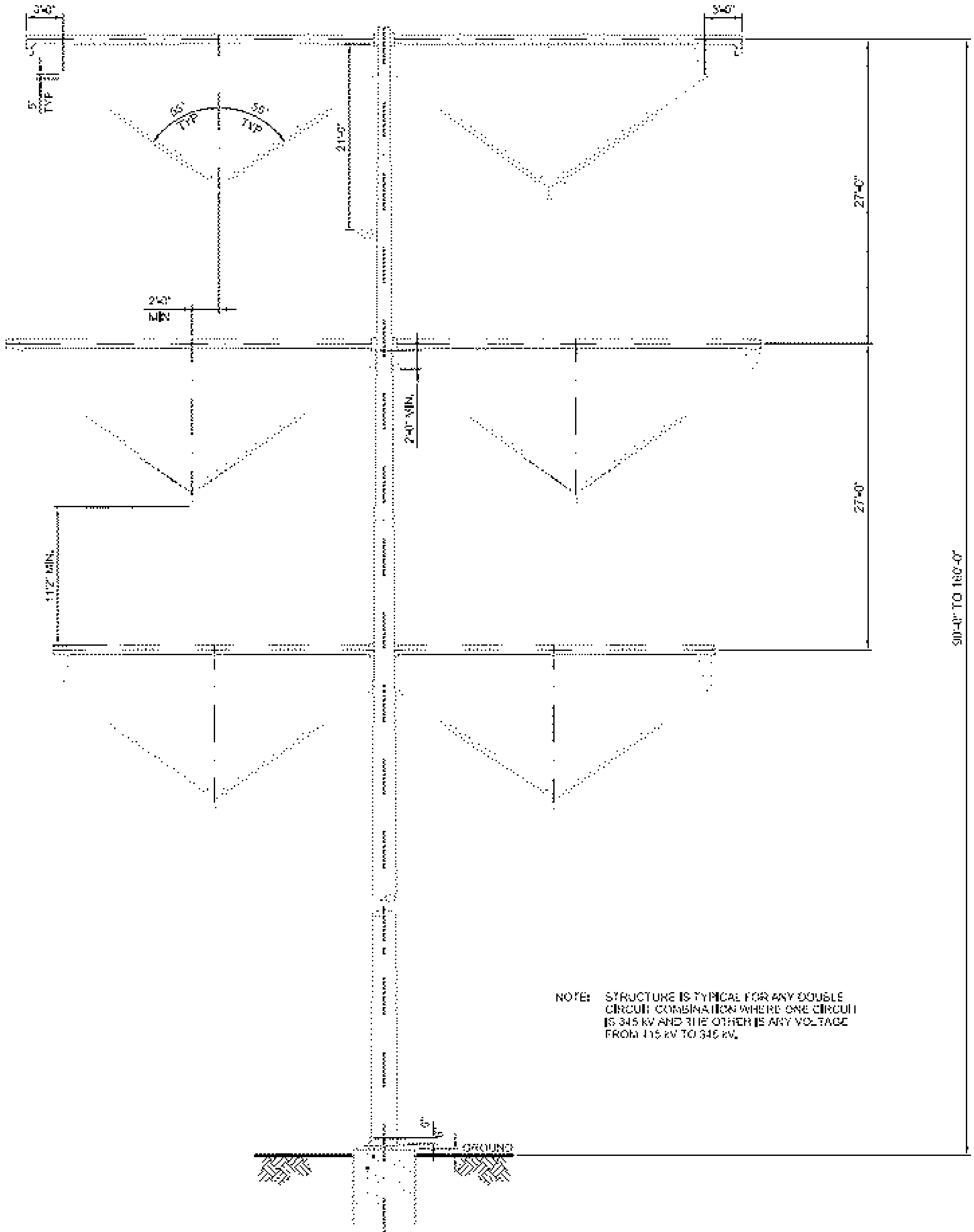
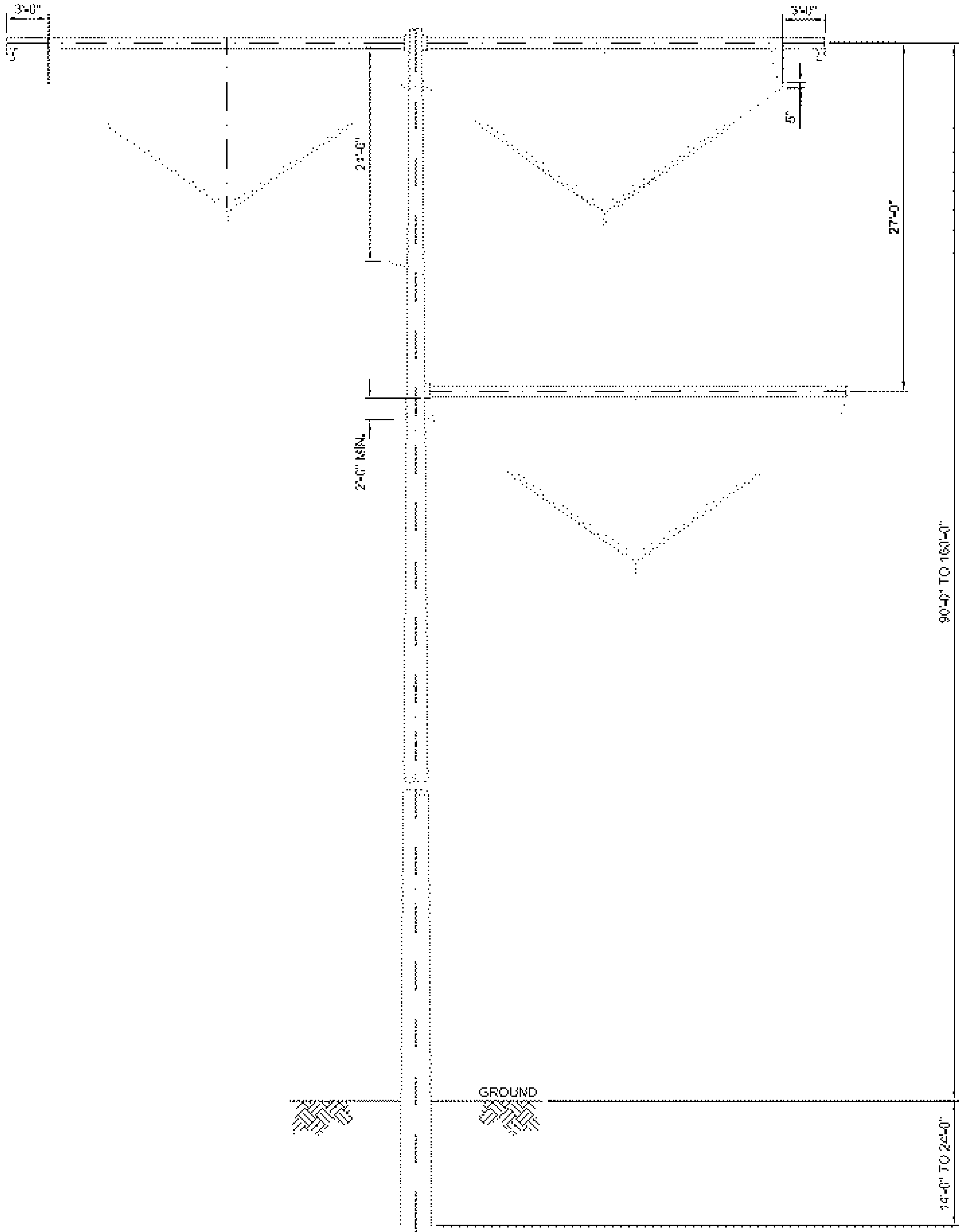


Figure 1-3: ITC Typical Proposed 345 kV Structure



Additionally, there may be locations along the route that utilize different structure designs and/or ROW for purposes of reducing potential impacts. For the portion of the ACA route within the Refuge, a preliminary low-profile structure is proposed with a design height of approximately 75 feet to reduce the likelihood of avian collisions. The low-profile structure height for the design presented for the Nelson Dewey ACA route would also be at or below the height of the mature woodlands on the north side of Oak Road. This lower, wider profile would require a 260-foot-wide ROW. The structures would be horizontal-symmetrical H-frame structures on concrete foundations with a typical span length of approximately 500 feet and would consist primarily of tubular steel H-frame structures (Figure 1-4). The crossing structures on the banks of the Mississippi River, shown in Figure 1-5, would also consist primarily of tubular steel H-frame structures and would be constructed to an approximate height of 198 feet (includes foundation reveal; the general sketch shown on Figure 1-5 includes the just the length of steel at 195 feet).

The crossing structure height would account for the required distance above the navigable river channel, as defined by U.S. Coast Guard requirements.

1.2 Owners

Three separate entities would own the Project. ITC Midwest owns the existing Hickory Creek Substation. ITC Midwest and Dairyland would jointly own the 345 kV transmission line facilities in Iowa and a portion of the line in Wisconsin, approximately from the Iowa-Wisconsin state border to the intermediate substation.[10] ATC would own the new intermediate substation and owns the Cardinal Substation. ATC and Dairyland would jointly own the 345 kV transmission line facilities from approximately the intermediate substation to the Cardinal Substation. The Utilities are transmission-owning members of MISO.

ITC Midwest is a wholly-owned subsidiary of ITC Holdings Corp., the nation's largest independent electric transmission company. ITC Midwest connects more than 700 communities with approximately 6,600 circuit miles of transmission line over roughly 54,000 square miles in Iowa, southern Minnesota, northeastern Missouri, and northwestern Illinois. ITC Midwest is headquartered in Cedar Rapids, Iowa, and maintains operating locations at Dubuque, Iowa City, and Perry, Iowa, and Albert Lea and Lakefield, Minnesota. ITC Midwest has also received a Certificate of Authority to operate as a public utility in Wisconsin.

[10] The Project owners will identify the final ownership point once construction is complete based on the final costs of the Project.

Figure 1-4: Proposed ITC Low-Profile 345 kV/345 kV Double-Circuit Structure

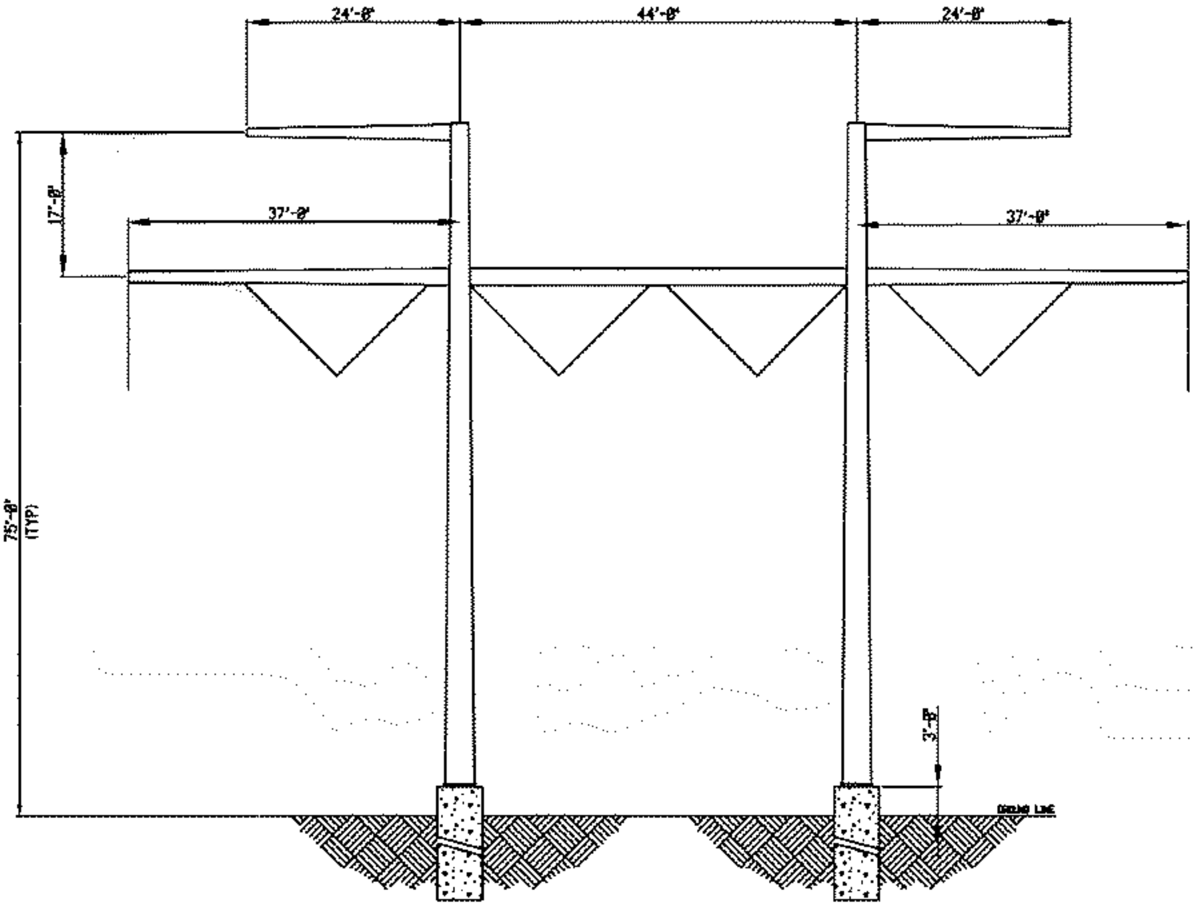
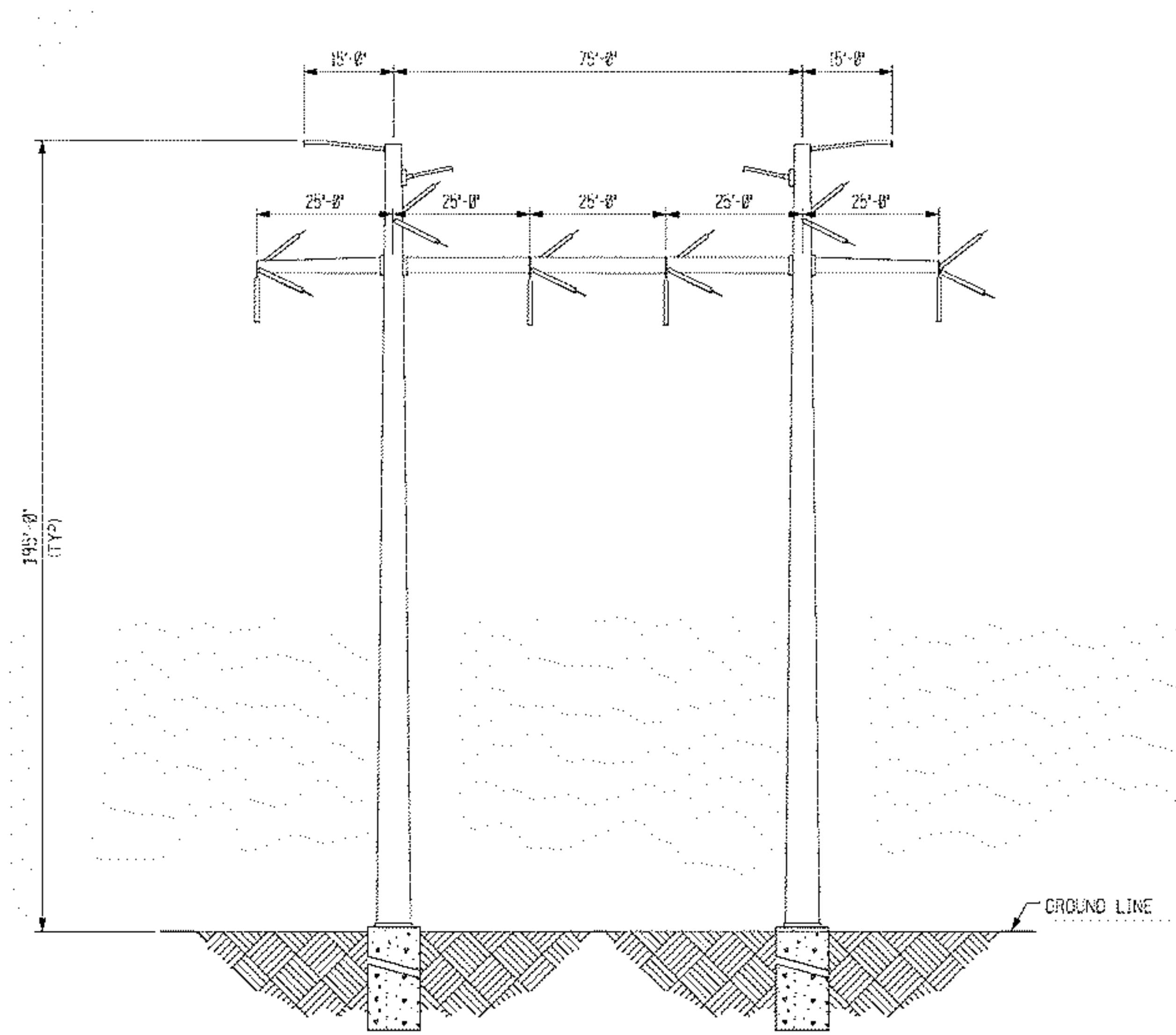


Figure 1-5: Proposed ITC Mississippi River Crossing 345 kV/345 kV Structure



ATC began operations in 2001 as the nation's first multi-state, transmission-only utility. ATC owns and operates more than 9,500 miles of high-voltage transmission lines and 530 substations in portions of Wisconsin, Michigan, Minnesota, and Illinois. Since its formation, ATC has upgraded or built more than 2,300 miles of transmission lines and 175 substations. ATC is headquartered in Pewaukee, Wisconsin, and has offices in Madison, Cottage Grove, and De Pere, Wisconsin, and Kingsford, Michigan.

Dairyland is a not-for-profit generation and transmission cooperative headquartered in La Crosse, Wisconsin. Dairyland is owned by and provides the wholesale power requirements for 25 separate distribution cooperatives in southern Minnesota, western Wisconsin, northern Iowa, and northern Illinois and 15 municipal utilities in Wisconsin, Minnesota, and Iowa. Dairyland serves a population of approximately 600,000. Dairyland owns or has under contract generating units totaling approximately 1,236 megawatts (MW) and owns approximately 3,200 miles of transmission lines ranging from 34.5 to 161 kV.

1.3 Development of Cardinal-Hickory Creek Initial Study Area and Alternative Crossing Locations

A total of seven alternative crossings locations within the Cardinal – Hickory Creek Initial Study Area were identified for review and analysis in this ACA (Figure 1-6). The siting of these seven potential crossing locations is directly related to the MISO-approved project configuration for the Cardinal-Hickory Creek Project. As further discussed in Chapter 3.0, MISO's project configuration includes a Project terminus (substation) at the Hickory Creek Substation in Dubuque County, Iowa, and the Cardinal Substation in Dane County, Wisconsin; as well as an eventual route across the Mississippi River for a new 345 kV line that would connect these two points.

Given that the location of the Mississippi River crossing would determine the potential routes in Iowa and Wisconsin, the Utilities first identified a Mississippi River crossing study area (ACA Study Area) that would both (i) meet the Project purpose and need and (ii) include existing crossing locations consistent with the intended Project configuration. Defining northern and southern boundaries for the Cardinal-Hickory Creek Initial Study Area and the ACA Study Area is discussed in greater detail in Section 3.1.

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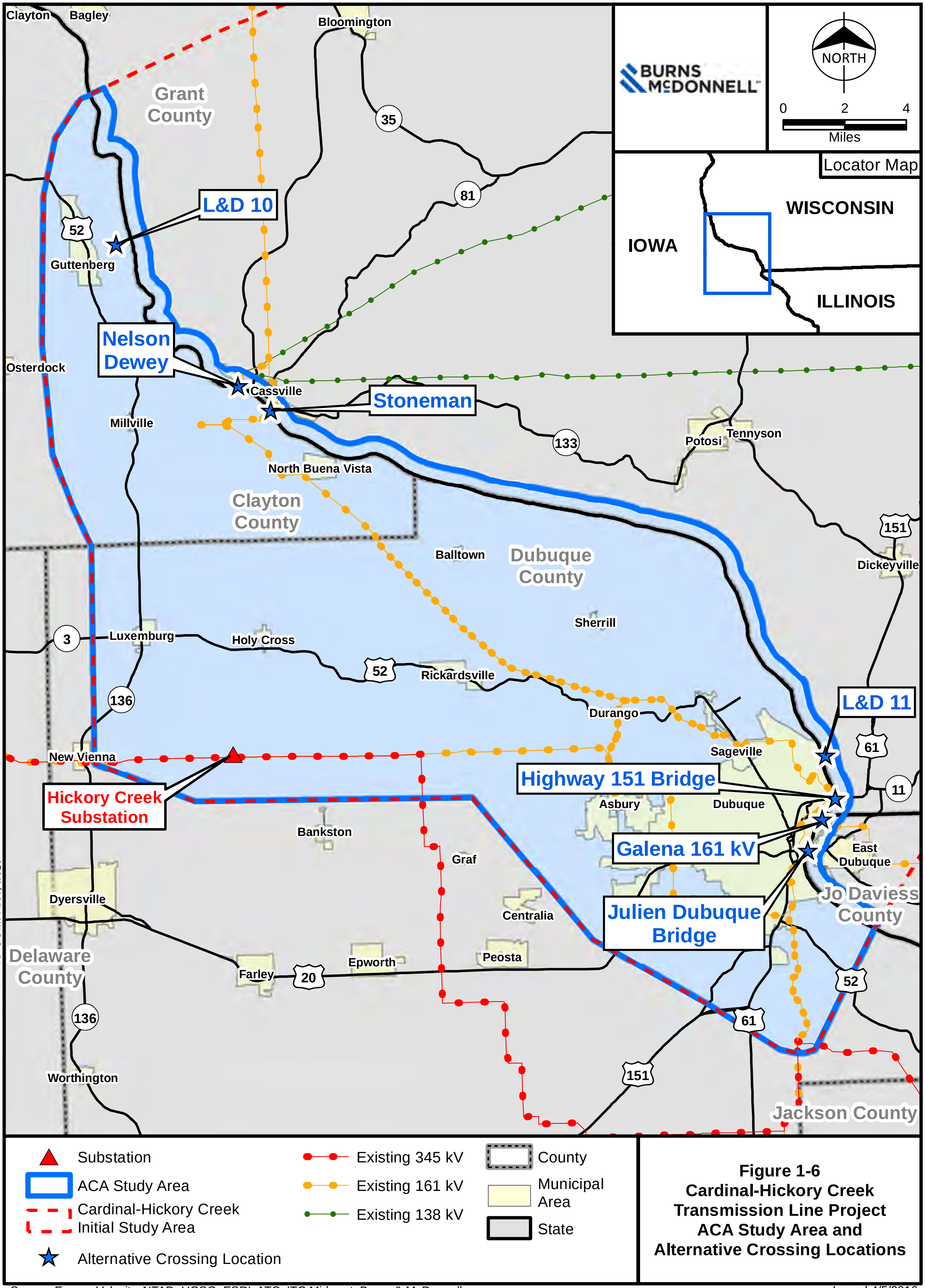

Figure 1-6
Cardinal-Hickory Creek Transmission Line Project ACA Study Area and Alternative Crossing Locations

Issued 4/5/2016

Source: Energy Velocity, NTAD, UGSG; ESRI, ATC, ITC Midwest, Burns & McDonnell

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After the northern and southern study area boundaries were set, the Utilities then investigated the alternative crossing locations of the Mississippi River and Refuge that included existing linear infrastructure, as described in Section 3.1. Locating the Project near existing linear infrastructure would reduce the need for new corridors across public and/or private ROWs and potentially reduce impacts to sensitive resources within the ACA Study Area. Through this investigation, the Utilities identified the seven alternative crossing locations of the Mississippi River and Refuge. Four alternative crossing locations are outside of the Refuge and three are within the Refuge boundaries.[11] The Utilities then evaluated those seven alternative crossings, which are listed as follows (from north to south):

1. Lock and Dam No. 10 in Guttenberg, Iowa (L&D 10)
2. Turkey River to the Nelson Dewey Power Plant crossing in Cassville, Wisconsin (Nelson Dewey)
3. Millville to Stoneman 69 kV transmission line and Turkey River to Stoneman 161 kV line crossing (co-located) in Cassville, Wisconsin (Stoneman)
4. Lock and Dam No. 11 in Dubuque, Iowa (L&D 11)
5. Highway 61/151 crossing in Dubuque, Iowa (Highway 151 Bridge)
6. Dubuque to Galena 161 kV line crossing in Dubuque, Iowa (Galena 161 kV Line)
7. Julien Dubuque Bridge/Highway 20 crossing in Dubuque, Iowa (Julien Dubuque Bridge)

The Utilities' detailed analysis of each of these crossings is described in Chapters 4.0 and 5.0.

1.4 Overview of Agency Requirements and Outreach

The analyses contained in this ACA report are intended to provide agency decision-makers with information and analyses of the potential constraints and opportunities associated with each of the seven ACA routes and alternative crossing locations within the ACA Study Area. In addition, this report identifies the known permits/approvals required to utilize these alternative crossing locations (see Chapter 6.0), and the effect of these requirements on the potential feasibility of a given alternative crossing location. This report also identifies agency and outreach efforts associated with this Project (Chapter 7.0).

[11] The L&D No. 10 crossing location (Guttenberg, Iowa) includes lands managed and operated under a 2001 cooperative agreement between the U.S. Army Corps of Engineers and the USFWS (USFWS 2006). Although there is a "break" in the Refuge where Lock and Dam No. 10 crosses the Mississippi River, this "break" relates specifically to the management and operation of the lock and dam facility and does not include a gap in the overall Refuge boundaries at this location (as compared to the gap in the Refuge at Dubuque, Iowa). As a result, Utilities classified the L&D No. 10 alternative crossing location as a Refuge crossing alternative.

1.5 Organization of This Report

This ACA is organized into the following ten chapters.

Executive Summary

Chapter 1.0: Introduction

Chapter 2.0: Purpose and Need

Chapter 3.0: Development of Cardinal-Hickory Creek Initial Study Area, Alternative Crossing Locations, and ACA Study Area

Chapter 4.0: Description of the ACA Study Area and Alternative Crossing Locations

Chapter 5.0: Analysis of ACA Routes and Alternative Crossing Locations

Chapter 6.0: Major Federal, State, and Local Permits and Approvals

Chapter 7.0: Agency Outreach

Chapter 8.0: Preferred Crossing Location for the Project

Chapter 9.0: References

Appendices of supporting documents are also provided.

Appendix A: Alternative Analysis Data

Appendix B: Agency Meeting Minutes and Other Materials

Appendix C: City of Dubuque Resolution and Materials

Appendix D: Evaluation of Underground Transmission Installation

Appendix E: MVP Triennial Review

Appendix F: State Protected Species

Appendix G: Optional Transmission Design through the Refuge

Appendix H: National Wildlife Refuge System Improvement Act of 1997

2.0 PURPOSE AND NEED

Multiple study efforts beginning in 2008 and culminating in 2011 identified the Project as a necessary facility to ensure a reliable and efficient electric grid that keeps pace with energy and policy demands. Specifically, in its 2011 MISO Transmission Expansion Plan (MTEP), MISO[12] designated a portfolio of 17 Multi-Value Projects (MVPs) designed to create a backbone system to reliably and cost-effectively deliver renewable energy, primarily from high wind resource areas in the west and Midwest, to population centers to the east. This portfolio included the Project.

The Project would address multiple needs on the regional transmission system. First, it would address reliability issues on the regional bulk transmission system; second, it would cost-effectively increase transfer capacity to enable additional renewable generation needed to meet state renewable portfolio standards (RPS) and support the nation's changing energy mix; third, it would alleviate congestion on the transmission grid to reduce the overall cost of delivering energy; and fourth, it responds to public policy objectives aimed at enhancing the nation's transmission system and reducing carbon dioxide emissions.

The following sections describe previous study efforts supporting the Project, MISO's designation of the MVP Portfolio, and the overall purpose and need for the Project.

2.1 Study Efforts Supporting the Project

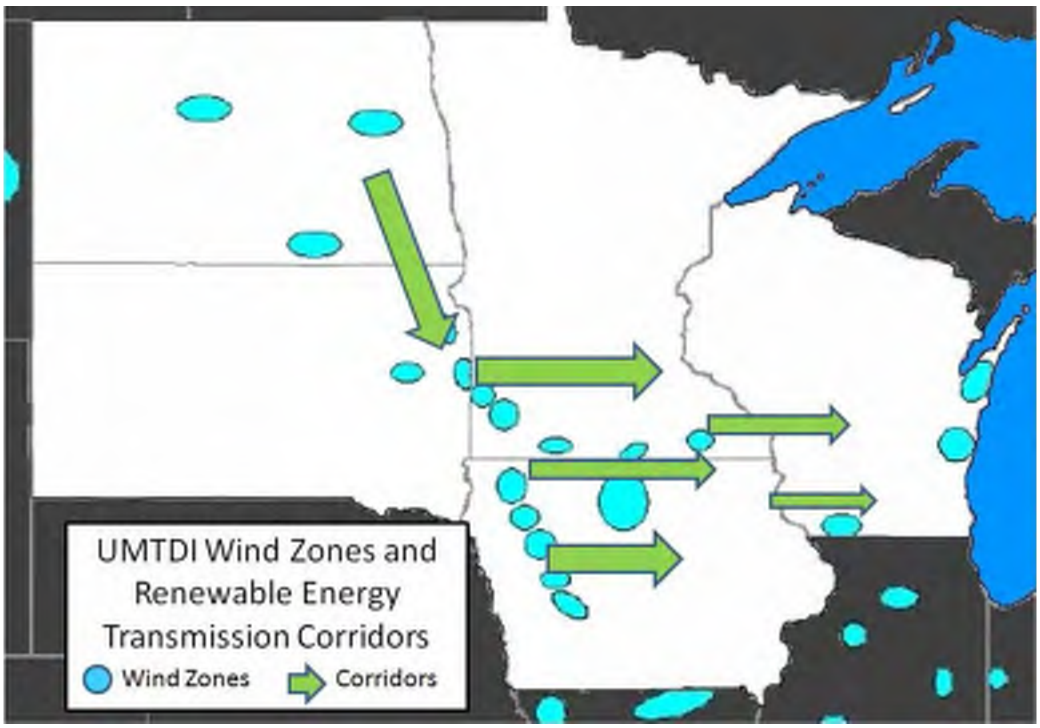
The need for additional capacity on the transmission system serving Midwest states to reliably and cost-effectively integrate renewable wind generation has been under study for more than a decade. As discussed in this and the next section, study efforts aimed at identifying solutions to address this need have focused on how to move wind-generated energy from high wind areas in Iowa, Minnesota, South Dakota, and North Dakota to load centers throughout the MISO footprint. As states have enacted Renewable Portfolio Standards (RPS) and the country shifts its energy mix to reduce carbon emissions, the need for additional renewable energy, and the ability to transfer this energy, has increased and is forecasted to continue to rise.

[12] MISO is a non-profit regional transmission organization responsible for the independent planning and operation of the transmission grid and wholesale energy market across 15 states and the province of Manitoba. *See* MISO, https://www.misoenergy.org/Pages/Home.aspx. MISO oversees and coordinates regional transmission planning and regional transmission services and manages access to the transmission grid to facilitate fair and competitive wholesale electric markets. MISO became the first regional transmission organization to be approved by the Federal Energy Regulatory Commission (FERC) in 2001, and operates under a FERC-approved open-access transmission tariff.

2.1.1 Upper Midwest Transmission Development Initiative

In 2008, the governors of Iowa, Minnesota, North Dakota, South Dakota, and Wisconsin formed the Upper Midwest Transmission Development Initiative (UMTDI) to "identify and resolve regional transmission planning and cost allocation issues" within the five-state area (UMTDI, 2010). The UMTDI effort evaluated the need for an estimated 15,000 MW of wind energy and identified wind zones where wind resources would most likely develop. Working with MISO, UMTDI also identified potential transmission corridors. The wind resource zones and the transmission corridors are shown in Figure 2-1.

Figure 2-1: UMTDI Wind Zones and Renewable Energy Transmission Corridors



On September 29, 2010, UMTDI published its Executive Committee Final Report (UMTDI Final Report) and identified five "no regrets" or "first mover" projects that would meet transmission needs under a variety of future scenarios (UMTDI, 2010). The first mover projects included connections between La Crosse, Wisconsin, to Madison, Wisconsin, and connections between Dubuque, Iowa, to Spring Green, Wisconsin, and on to Madison, Wisconsin. The La Crosse to Madison connection is referred to as the Badger Coulee Project in Wisconsin and received approval from the Wisconsin Public Service Commission in 2015. The Dubuque-Spring Green-Madison connections became the Cardinal-Hickory Creek Transmission Line Project proposed in this ACA. Subsequently, the intermediate substation location identified in the UMTDI Final Report for this Project changed from the original location of Spring Green to the Village of Montfort.

2.1.2 MISO Regional Generator Outlet Study

Also beginning in 2008, MISO, in conjunction with state utility regulators and industry stakeholders, initiated the Regional Generator Outlet Study (RGOS), a collaborative, multi-year effort to determine how to build the transmission facilities that would meet the significant renewable energy requirements within MISO at the lowest delivered per megawatt hour (MWh) cost (MISO, 2010).

Since its inception, MISO has conducted studies of the transmission system within the MISO footprint to identify and recommend construction of projects required to address network reliability issues. Pursuant to the directives in Federal Energy Regulatory Commission Order Nos. 890 and 1000, MISO's transmission planning process has broadened to identify and recommend those projects that increase system efficiency and reduce costs, as well as those projects that meet specific state and federal public policy objectives (Rauch Direct Testimony, 2014: 12r:5-10). MISO's planning process evaluates transmission system congestion that may limit access to the most efficient energy resources, and analyzes potential improvements that could be implemented to meet forecasted energy requirements (Rauch Direct Testimony, 2014: 13r:19-21). MISO reports on its recommended transmission projects in its annual MTEP.

MISO uses a "bottom up, top down" approach in its transmission expansion planning process (Rauch Direct Testimony, 2014: 13r:8). In this approach, MISO first relies on individual transmission owners to identify and report the projects that they have determined are needed for their systems (Rauch Direct Testimony, 2014: 13r:9-11). MISO then reviews the various projects in relation to one another, and the MISO system as a whole, to prioritize projects based on their ability to effectively address system reliability, reduce consumer costs, and address evolving federal and state energy policy issues (Rauch Direct Testimony, 2014: 13r:12-18).

In the RGOS effort, with input from the state regulators, planning engineers first identified areas where wind generation would likely be sited in "wind zones" (Rauch Direct Testimony, 2014: 18r:7-12). RGOS then evaluated three transmission expansion scenarios to reliably integrate wind energy from the zones. The first was a "native" voltage overlay that does not introduce new voltages, such as 765 kV, in areas where they do not already exist. The second set was a 765 kV overlay throughout the study footprint. The third set was a native transmission overlay with the addition of direct current transmission (MISO, 2010).

Consistent with the UMTDI recommendations, the RGOS set of 18 candidate projects included 345 kV lines between North La Crosse and Madison and between Dubuque and Madison (MISO, 2010). RGOS concluded: "The development of these corridors will provide for the continuation and extension of the west to east transmission path to provide more areas with greater access to the high wind areas within the Buffalo Ridge and beyond" (MISO, 2010).

2.2 MISO MVP Portfolio Development

Approximately 11 months of intensive studies were performed on the candidate RGOS portfolio, with intense review and involvement by stakeholders, including the MISO states. -MISO then selected projects for further evaluation that were common to all three RGOS scenarios and where previous reliability, economic, and generation interconnection analyses had been performed (MISO, 2010). MISO developed the final MVP Portfolio based on the following criteria taken from Attachment FF of MISO's Open Access Transmission Tariff (Tariff):

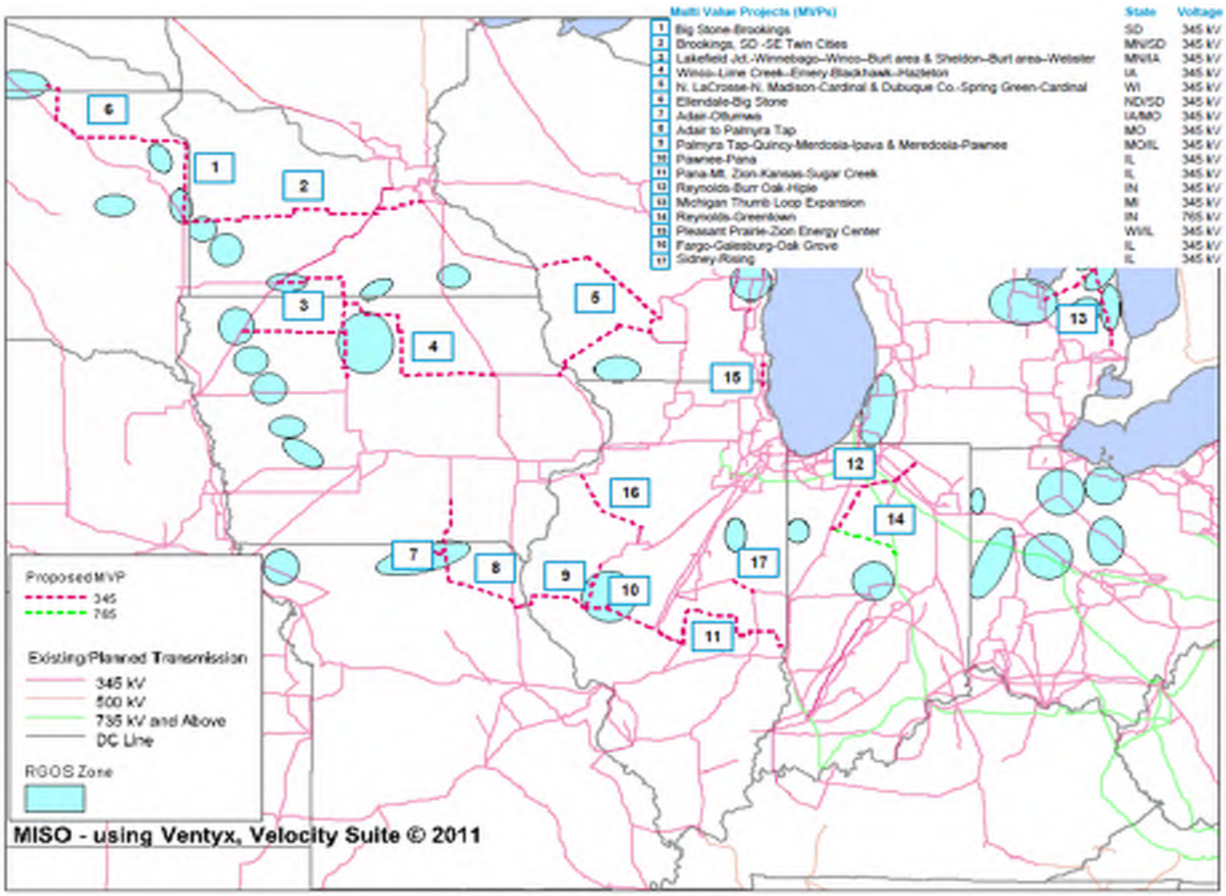
- Criterion 1: The MVP must enable the transmission system to deliver energy reliably and economically in support of documented federal or state energy policy mandates or laws.
- Criterion 2: The MVP must provide multiple types of economic value across multiple pricing zones with a total cost/benefit ratio prescribed in Attachment FF of the Tariff.
- Criterion 3: The MVP must address at least one transmission issue associated with a projected violation of a North American Electric Reliability Corporation (NERC) or Regional Entity standard and at least one economic-based transmission issue that provides economic value across multiple pricing zones (MISO, 2012).

As stated in the MTEP 11, the resulting 17-project MVP Portfolio:

> …combines reliability, economic and public policy drivers to provide a transmission solution that provides benefits in excess of its costs throughout the MISO footprint. This portfolio, when integrated into the existing and planned transmission network, resolves about 650 reliability violations for more than 6,700 system conditions, enabling the delivery of 41 million MWh of renewable energy annually to load. The portfolio also provides strong economic benefits; all zones within the MISO footprint see benefits of at least 1.6 to 2.8 times their cost (MISO, 2011).

Importantly, the MVP Portfolio creates a transmission network that is able to respond to evolving reliability and generation needs within the MISO footprint (MISO, 2011). As a result, the MVP Portfolio of projects will be able to support a variety of different generation fuel sources that support a variety of generation policies (MISO, 2011). A map showing the RGOS wind zones and the candidate MVP Portfolio of projects is shown in Figure 2-2.

Figure 2-2: RGOS Wind Zones



In 2011, MISO determined that the projects in the MVP Portfolio would reduce congestion, improve competition in wholesale markets, spread the benefits of low-cost generation, and enable the reliable delivery of renewable energy pursuant to states' RPS (Rauch Direct Testimony, 2014: 17r:13-17, 20r:17-20 & 33r:1-3). In addition, MISO found that the MVP Portfolio: (1) "enhances generation flexibility," (2) "creates a more robust regional transmission system that decreases the likelihood of future blackouts," (3) "increases the geographic diversity of wind resources that can be delivered, increasing the average wind output available at any given time," (4) "supports the creation of thousands of local jobs and billions in local investment," and (5) "reduces carbon emissions by 9 to 15 million tons annually" (MISO, 2014b). Also, in 2011, MISO determined that the MVP Portfolio of projects had a benefit-to-cost ratio ranging from 1.8 to 3.0 (MISO, 2014b). These economic benefits include (1) enabling low-cost generation to displace higher-cost generation; (2) allowing more efficient dispatch of operating reserves; (3) reducing transmission line losses; (4) reducing future planning reserve margin requirements; and (5) avoiding costs for reliability projects that would otherwise need to be constructed.

Simultaneous to these three processes (UMTDI, RGOS, and MVP Portfolio) that culminated in the identification of 17 MVP projects, MISO and the states within MISO convened two separate proceedings over 18 months to address who would pay for the MVPs. Because the portfolio of MVPs benefited every zone in MISO, most agreed that the costs for each MVP should be shared by all. So, regardless of where the MVP would be located, every utility in MISO would pay a *pro rata* share for that project based on that utility's wholesale consumption of electric energy within MISO.[13] This agreement was premised on building all of the 17 projects so that every state shared in the benefits of the portfolio.

2.2.1 Transmission System Reliability

The electric transmission system in the United States is comprised of a highly decentralized interconnected network of generating plants, high-voltage transmission lines, and distribution facilities. In many areas of the Midwest, the transmission backbone system is comprised of 345 kV lines. This Project would add a 345 kV connection between Iowa and Wisconsin that would improve the reliability of the regional transmission system, particularly in southern Wisconsin where there is a lack of connectivity to the regional 345 kV network. MISO's studies also found that construction of this Project would also reduce the need for other lower voltage transmission line upgrades in Wisconsin and Iowa that would be needed, absent this Project, to provide future reliability of the transmission system.

2.2.2 Increased Economic Benefits

The addition of a 345 kV transmission line between Iowa and Wisconsin would provide a path for lower cost renewable energy to reach market, reducing overall energy costs. In 2014, MISO conducted its tariff-required MVP Triennial Review (MISO, 2014b). The MVP Triennial Review provided updated insight into the MVP Portfolio's anticipated benefits relating to economics, reliability, public policy, and qualitative and social benefits (see Section 2.2.3, below for more information on these benefits) (MISO, 2014b). Based on the MVP Triennial Review analysis, the collective MVP Portfolio is now estimated to provide a benefit-to-cost ratio ranging from 2.6 to 3.9 and result in $13.1 billion to $49.6 billion of net benefits over the next 20 to 40 years across the MISO footprint (MISO, 2014b).

The MVP Portfolio's economic benefits analysis is contained in the MVP Triennial Review attached as Appendix E.

[13] *Ill. Commerce Comm'n v. Federal Energy Regulatory Commission,* No. 11-3421, slip op. at 7 (7th Cir. June 7, 2013).

2.2.3 Increased Transfer Capability – Reliable Renewable Energy Integration

At the time of the MTEP 11 analysis, all but one of 12 MISO states had enacted RPS mandates or goals. These mandates are state specific, but generally started in 2010 and increase with increases in energy usage. The MTEP 11 report recognized that the RPS created "a great deal of uncertainty about how these goals will be achieved, including the location of future generation and the required transmission to enable renewable integration" (MISO, 2011). However, MISO recognized that compliance will likely focus on capturing the abundant wind resources present throughout the MISO footprint.

The Project creates a tie between the 345 kV network in east-central Iowa and the 345 kV network in south-central Wisconsin. This tie between these two 345 kV networks creates an additional wind outlet path that brings power from wind rich areas in the Midwest to the MISO footprint. The Utilities estimate that the incremental increase in transfer capability created by the Project will be most significant during summer peak load when electricity demand is at its highest, and during the "shoulder months"—spring and fall—when wind generation is generally at its highest.

The collective MVP Portfolio will significantly increase transfer capability across the MISO footprint. The entire MVP Portfolio will enable delivery of 41 million MWh of wind energy. In contrast, if the MVP Portfolio were not constructed, MISO estimates that in 2023, up to 10,500 MW of potential wind generation energy would be curtailed (MISO, 2014b).

In the Triennial Review, MISO confirmed that the MVP Portfolio will support RPS. The MVP Portfolio enables 4,300 MW of wind generation beyond the amount needed to meet 2028 RPS requirements and mandates and does so in a more reliable and economic manner than without the associated transmission upgrades (MISO, 2014b).

2.2.4 National Public Policy Benefits

Access to renewable energy generation has become increasingly important as states have adopted RPS and that is one of the reasons why the MVP Portfolio was created. MISO determined in 2011 that this Project was needed for conveying wind energy. If anything, that need has increased since 2011 due to federal actions including policy directives to reduce carbon emissions. The MVP Portfolio, including the Project, will also support these other public policy objectives.

2.2.4.1 Presidential Directives

The Obama Administration has developed a wide range of initiatives that seek to reduce GHG emissions through policies that support increased renewable energy generation. In June 2013, President Obama announced the Climate Action Plan, a national plan for tackling climate change (Executive Office of the

President, 2013). The plan, which is divided into three key pillars, outlines steps to cut carbon emissions in the United States. The three key pillars are: (1) cutting carbon emissions in the United States; (2) preparing the country for the impacts of climate change; and (3) leading international efforts to address global climate change. As part of the first pillar, the President's Climate Action Plan directed the EPA to establish the first ever restrictions on carbon emissions from power plants, the largest source of unregulated carbon emissions in the United States.[14] Also, the President's Climate Action Plan fast-tracks permitting for renewable energy projects on public lands; focuses on streamlining the siting, permitting, and review process for all transmission projects; increases funding for clean energy technology and efficiency improvements; and seeks to improve efficiency standards for buildings and appliances, as well as heavy trucks.

One of the mechanisms that the Obama Administration has used to encourage greater use of renewable energy is to streamline the federal permitting process for infrastructure, such as high-voltage transmission projects, which are necessary to deliver utility-scale renewable energy.[15] On June 7, 2013, President Obama signed a Presidential Memorandum entitled *Transforming our Nation's Electric Grid Through Improved Siting, Permitting, and Review* that recognized the importance of investing in transmission infrastructure to meet the nation's energy needs:

> Our Nation's electric transmission grid is the backbone of our economy, a key factor in future economic growth, and a critical component of our energy security. Countries that harness the power of clean, renewable energy will be best positioned to thrive in the global economy while protecting the environment and increasing prosperity. In order to ensure the growth of America's clean energy economy and improve energy security, we must modernize and expand our electric transmission grid (Obama, 2013b).

The memorandum put forth initiatives to expedite the review of transmission projects on federal lands, to help develop principles for establishing energy corridors and encourage the use of such, and to improve the overall transmission siting, permitting, and review processes.

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[14] The EPA published its final rule on October 23, 2015 which is discussed in greater detail in Section 2.2.4.3.

[15] See the President's May 17, 2013 memorandum, *Modernizing Federal Infrastructure Review and Permitting Regulations, Policies and Procedures*, which recognized that "[r]eliable, safe, and resilient infrastructure is the backbone of an economy built to last. Investing in our Nation's infrastructure serves as an engine for job creation and economic growth, while bringing immediate and long-term economic benefits to communities across the country" *Id.* (Obama, 2013a). The memorandum further states that "[t]he quality of our infrastructure is critical to maintaining our Nation's competitive edge in a global economy and to securing our path to energy independence." *Id.*

2.2.4.2 Department of Interior Secretarial Orders, *e.g.*, Nos. 3285 and 3289

In 2009, the Department of Interior Secretary created the Task Force on Energy and Climate Change. That Task Force was charged with "prioritizing the permitting and appropriate environmental review of transmission ROW applications that are necessary to deliver renewable energy generation to consumers."[16] The Task Force was also charged with developing best management practices (BMPs) for transmission projects on public lands to "ensure the most environmentally responsible development and delivery of renewable energy" (Secretary of the Interior, 2009).

Four years later, the Department of Interior issued another Secretarial Order acknowledging that the Department needs to manage federal lands "to promote environmentally responsible renewable energy development" (Secretary of the Interior, 2013). The Order further identified that in light of the "dramatic effects of climate change" on the nation, "the Department must change the way it manages resources for which it is the steward" (Secretary of the Interior, 2013). To achieve this, the Order directed its Climate Change Task Force to identify ways in which the Department's existing mitigation policies and practices can be "harmonize[d]…to minimize any redundancy and maximize efficiency in the review and permitting process" (Secretary of the Interior, 2013).

2.2.4.3 Environmental Protection Agency

Demonstrating the importance of wind generation in MISO, the U.S. EPA recently estimated that an additional 24,000 to 26,000 MW of wind would need to be built nationwide between now and 2025 to allow the states to comply with an interim target within the EPA's CPP (EPA, 2015a, 2015b). As of the writing of this ACA, numerous parties—including the State of Wisconsin—have sued the EPA in the U.S. Court of Appeals for the District of Columbia Circuit and south to vacate the rule.[17] On February 9, 2016, the U.S. Supreme Court issued a stay of the CPP until the legal challenges are resolved.[18] While it is uncertain whether the CPP will be upheld by the courts, given the long lead time for transmission infrastructure it is important to examine how the rule could impact the need for additional transmission facilities.

[16] Also in 2009, nine participating federal agencies entered into a Memorandum of Understanding Regarding Coordination in Federal Agency Review of Electric Transmission Facilities on Federal Land (2009 MOU) to expedite the siting of new high voltage transmission facilities that cross federal lands by establishing roles and responsibilities for agencies and in improving coordination among the agencies in reviewing and granting authorizations for projects. The 2009 MOU is available at: https://www.whitehouse.gov/files/documents/ceq/Transmission%20Siting%20on%20Federal%20Lands%20MOU.pdf.

[17] *See* Opening Brief of Petitioners on Core Legal Issues at 6, *West Virginia v. EPA*, No. 15-1363 (D.D.C. Feb. 19, 2016).

[18] Order in Pending Case, *West Virginia v. EPA*, No.15A773, (U.S. Feb. 9, 2016).

The EPA developed the CPP to address carbon dioxide emissions from existing coal- and gas-fired power plants. The EPA issued a proposed rule in June 2014, and on October 23, 2015 published its final rule. The final rule requires states to meet state-specific carbon emissions reduction goals; however, it provides states flexibility in determining how to achieve CPP compliance (Federal Register, 2015). Under the final rule, states must submit a plan ("state plan" or "state implementation plan") by 2018, begin reducing carbon dioxide emissions by 2022, and continue emission reductions through 2030 (Federal Register, 2015).

To meet the carbon dioxide emission reduction goals set forth in the CPP, it is anticipated that additional transmission infrastructure will be required. Based on the June 2014 draft rule, NERC conducted a multi-phase reliability study focused on identifying potential reliability and resource adequacy concerns resulting from implementation of the draft CPP and confirmed the need for additional infrastructure. At the time of preparation of this document, NERC has not yet released its analysis of the EPA's final CPP rule. As to the draft CPP, NERC identified two main areas of potential reliability concerns: "(1) direct impacts to resource adequacy and electric infrastructure, and (2) impacts resulting from the changing resource mix that occur as a result of replacing retiring generation, accommodating operating characteristics of new generation, integrating new technologies, and imposing greater uncertainty in demand forecasts" (NERC, 2014). NERC concluded that more transmission resources would be required to deliver new generation resources to points of consumption (NERC, 2014). One of the necessary lines NERC identified was an additional 345 kV transmission line between Iowa and Wisconsin.

MISO also analyzed the draft CPP and identified significant coal generation retirements, which would require substantial transmission system investments. MISO is in the process of completing a four-phase analysis of potential impacts of the draft and final CPP on the MISO system. Phases I to III of the study have been completed and were based on the draft rule; Phase IV will reflect the impacts of the final rule. Phases I and II, which focused on the economic analyses of compliance costs, indicated that the most cost-effective compliance with the draft CPP would likely lead to 14,000 MW of coal generation retirements (MISO, 2014b). The Phase III study concluded that a multi-billion dollar transmission build-out would be needed to comply with the CPP scenarios studied (MISO, 2015b). MISO recently completed their Mid-Term Analysis of EPA's Final Clean Power Plan and concluded that more transmission infrastructure will be required to move renewable energy throughout the Midwest when the CPP is fully implemented. (MISO, 2016, p.18).

While NERC has not yet completed its additional analyses of CPP impacts since EPA's publication of the final rule in October 2015, the EPA has issued its own projections regarding changes in the energy resource mix and renewable generation additions. The EPA stated that, under the final rule, between 23,000 and 29,000 MW of additional coal capacity nationwide is projected to be uneconomical by 2025, increasing to as much as 38,000 MW by 2030 (EPA, 2015c). This would exacerbate already declining reserve margins in the MISO region and require substantial new generation additions. Also, EPA estimates that the final rule will result in between 54,000 and 57,000 MW of renewable energy capacity additions by 2025, and between 91,000 and 94,000 MW by 2030 (EPA, 2015c). Some of these renewable resources – especially wind – will likely require heavy investments in new transmission capacity, as well as upgrades to existing transmission infrastructure.

EPA's analysis of the final rule demonstrates that projected changes to the energy resource mix will be dramatic under the final rule, and transmission infrastructure additions and updates will be critical to the states' compliance with the final rule. These additional infrastructure needs require utilities to start planning transmission infrastructure updates now, as transmission development requires long lead times—anywhere from 7-10 years—to complete a new project.

2.2.4.4 USFWS Climate Change Policy and the Refuge's Comprehensive Conservation Plan

The Project will also support the USFWS policy on climate change. In 2010, the USFWS explicitly recognized its role in both mitigating and adapting to climate change and issued a strategic plan titled "Rising to the Urgent Challenge: Strategic Plan for Responding to Accelerating Climate Change." The USFWS Strategic Plan recognizes that "climate change threatens to exacerbate other existing pressures on the sustainability of our fish and wildlife resources." Further, USFWS must "act boldly" and "now, as if the future of fish and wildlife and people hangs in the balance—for indeed, all indications are that it does" (USFWS, 2010).

To address climate change, USFWS established seven goals, including Goal 3: "We will plan and deliver landscape conservation actions that support climate change adaptations by fish and wildlife of ecological and societal significance" (USFWS, 2010). To meet this goal, USFWS established nine objectives, including the need to address fish and wildlife needs in renewable energy development. The objectives emphasize the need for USFWS to recognize the importance of reducing carbon dioxide emissions by increasing use of renewable energy sources and facilitating the construction of renewable energy infrastructure:

> As wildlife management professionals, we believe that renewable sources of energy are a key element in mitigating emissions of greenhouse gases, which are the root cause of the climate crisis and its consequences for fish and wildlife. . . . .[W]e recognize that such development will result in impacts to fish and wildlife. . . .We will work with industry, agencies, and other stakeholders to facilitate siting, construction, operation and maintenance of renewable energy projects that explicitly evaluate and avoid or otherwise compensate for significant impacts to fish and wildlife (USFWS, 2010).

The Refuge created a Comprehensive Conservation Plan (CCP) that was signed in 2006 under the National Wildlife Refuge System (NWRS) Improvement Act of 1997 (USFWS, 2006). The Refuge's CCP (Chapter 5: Plan Implementation) recognizes that utility ROW may be necessary to address societal needs (USFWS, 2006). The MVP Portfolio, including the Project, would enable 41 million MWh of renewable energy to be used to meet the needs of electric customers in the MISO market, which would in turn displace other forms of generation, most significantly high carbon generation. Once constructed, the MVP Portfolio of projects would result in reducing carbon emissions by 9 million to 15 million tons annually (MISO, 2014b).

2.3 Conclusion

The Project is needed to enhance regional reliability, cost-effectively increase transfer capacity to support state RPS, alleviate transmission congestion to reduce energy costs, and respond to essential public policy objectives to enhance the nation's transmission system and reduce carbon emissions. The purpose of the Project is to meet these reliability, transfer capability, congestion relief, and public policy needs.

3.0 DEVELOPMENT OF CARDINAL-HICKORY CREEK INITIAL STUDY AREA, ALTERNATIVE CROSSING LOCATIONS, AND ACA STUDY AREA

In defining the Initial Study Area for the Cardinal-Hickory Creek Transmission Project, the Utilities evaluated the electrical requirements; human and environmental resources; engineering constraints; and cost considerations of the Project.

3.1 Development of Initial Study Area and Crossing Locations

MISO developed the initial MVP 5 project through an extensive multi-year regional planning process, involving transmission owners, renewable energy developers, market participants, state regulators, and other stakeholders. The MISO-approved design for the Project connects the Hickory Creek Substation in Dubuque County, Iowa, to a proposed intermediate substation near the Village of Montfort in either Grant or Iowa County, Wisconsin; and on to the existing Cardinal Substation in the Town of Middleton in Dane County, just west of Madison, Wisconsin. As discussed in more detail in Chapter 2.0 of this report, the Project would create a new connection between the 345 kV networks in Iowa and Wisconsin that would improve reliability issues on the regional transmission system; cost-effectively increase transfer capacity of the transmission system to enable additional renewable generation needed to meet state RPS and the nation's changing energy mix; alleviate congestion on the transmission grid to reduce the overall cost of delivering energy; and, respond to public policy objectives aimed at enhancing the nation's transmission system and reducing carbon emissions.

The identified Project configuration that MISO approved is the primary driver for the development of the Cardinal – Hickory Creek Initial Study Area. Based on the system interconnections in Iowa and Wisconsin, the Utilities identified two key routing constraints: the Mississippi River and the Refuge. The Refuge spans approximately 260 river miles from Minnesota to Illinois. Because the Mississippi River crossing location that is ultimately selected will direct the Project routes in both Iowa and Wisconsin, the Utilities began their route analysis for the Project by focusing on the Mississippi River crossing. Thus, the first step in the Utilities' analysis was to define the study area for the ACA.

To define the north and south boundaries of the ACA Study Area along the Mississippi River, the Utilities, along with input from USFWS staff, used the following criteria:

- Meet the Project's purpose and need.
- Provide multiple opportunities on the Iowa side to follow lines of land division, roadways, or active railroad ROWs in accordance with the state's routing requirements, Iowa Code § 478.18(2) and 199 Iowa Administrative Code [IAC] 11.1(7)).
- Provide multiple opportunities on the Wisconsin and Illinois side to follow existing transmission line corridors, highways, railroads, gas pipelines, and recreational trails in accordance with the state's routing priorities, Wis. Stat. § 1.12(6); Ill. Stat. 220 ILCS 5/8-406.1.
- Allow adequate area for routing ACA routes to avoid municipalities, where possible.
- Allow adequate area for routing ACA routes to avoid conservation areas and sensitive habitats, where possible.
- Allow for an adequate number of crossing locations of the Mississippi River with existing linear infrastructure present.
- Provide opportunities to limit impacts to densely populated areas.

Based on these and other criteria, the Utilities identified the northern boundary of the ACA Study Area as Guttenberg and the southern boundary as Dubuque. Within this area, the Utilities identified seven alternative crossing locations, all at existing infrastructure crossings of the Mississippi River (Figure 1-6) for evaluation in this ACA. Two locations, L&D 10 and L&D 11, cross at existing lock and dam locations. Two additional crossing locations, Highway 151 Bridge and Julien Dubuque Bridge, cross at existing bridges in Dubuque, Iowa.

Within the entire ACA Study Area, there are only three existing transmission line crossings of the Mississippi River. One of these crossings is located at the existing Stoneman crossing location at Cassville, Wisconsin, and includes both an existing 161 kV and an existing 69 kV line. The other two crossings are located in Dubuque and include the Galena 161 crossing location (161 kV) and a nearby 69 kV transmission line located immediately south of the existing 161 kV line. Lastly, the Nelson Dewey ACA route represents an alternative to the existing transmission route at Stoneman; the Nelson Dewey ACA route utilizes open areas within the Refuge near Oak Road and existing transmission corridors in Iowa and Wisconsin near the Turkey River and Nelson Dewey Substations, respectively.

West of the Mississippi River, the ACA Study Area follows the same boundary as the Cardinal-Hickory Creek Initial Study Area. East of the Mississippi River, it extends one-half mile into Wisconsin and Illinois and includes a portion of each respective ACA route and potential impacts on the eastern side of the Mississippi River. By including a one-half mile area on the eastern side of the river, the potential constraints or opportunities associated with a specific alternative crossing location may be more clearly defined and analyzed. For example, a specific ACA route may have limited routing constraints leading up to the western shores of the Mississippi River crossing, but greater or wholly different constraints/opportunities on the other side of the river. Including and analyzing a portion of the area (and the associated resources within this area) on the eastern side of the alternative crossing locations provides a more comprehensive review of the overall feasibility of each specific ACA route and alternative crossing location.

3.2 ACA Study Area Boundary

The Utilities concluded that the ACA Study Area was appropriate for the necessary in-depth analysis of the Mississippi River crossing. The ACA Study Area was sufficient to allow evaluation of areas with differing environmental, engineering, and regulatory constraints. It was large enough to include multiple crossing locations that met the Project purpose and need.

Expanding the ACA Study Area farther to the east or west would not be beneficial because such expansion would extend far beyond the Mississippi River. Expanding the ACA Study Area to the north or south would result in additional potential human, environmental, and cost impacts associated with extending an ACA route’s length to areas farther away from the intended Project configuration, including the two primary termini in Iowa and Wisconsin. The closest crossing location outside the ACA Study Area that utilizes existing infrastructure is the U.S. Highway 18 bridge located at Prairie du Chien, Wisconsin, approximately 17 miles north of the L&D 10 crossing location at Guttenberg, Iowa (the most northern alternative crossing location in the ACA Study Area). Accessing this alternative crossing location would add approximately 34 total miles of length beyond the most northern alternative crossing location analyzed for this Project and would likely have increased environmental impacts as a result of this additional length. The additional length would also increase Project costs.

The nearest additional crossing location south of the ACA Study Area would be at Bellevue, Iowa, approximately 20 miles south of Dubuque, Iowa. This location would add approximately 40 miles to the potential transmission line length from extending south and back north toward the intermediate substation location near the Village of Montfort, Wisconsin. Additionally, a potential crossing at Bellevue, Iowa, would encounter another lock and dam on the Mississippi River (Lock and Dam No. 12) as well as U.S. Department of Defense lands related to the Savanna Army Depot at this location. This distant crossing location would also likely have increased environmental impacts as a result of the additional length required by the Project. The additional length required to utilize these crossing locations would also increase associated costs.

Based on all of these factors, the Utilities concluded that extending the boundaries of the ACA Study Area was not appropriate for the Project. Also, the increase in costs associated with 34 or 40 miles of additional 345 kV line could potentially require additional review by MISO.

3.3 USFWS Mitigation Policy and Refuge Lands

After identifying potential Mississippi River crossing locations within the ACA Study Area, the Utilities analyzed available non-Refuge locations to determine if a suitable Mississippi River crossing location could be found outside of Refuge lands. This is consistent with USFWS's Mitigation Policy.

USFWS's Mitigation Policy adopted the definition of mitigation used in the Council on Environmental Quality's (CEQ) National Environmental Policy Act (NEPA) regulations (40 Code of Federal Regulations [CFR] 1508.20). That definition consists of five sequential steps:

1. Avoiding the impact altogether by not taking a certain action or parts of an action
2. Minimizing impacts by limiting the degree or magnitude of the action
3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment
4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action
5. Compensating for the impact by replacing or providing substitute resources or environments

As steps 2, 3, and 4 are very similar and hard to differentiate, the USFWS usually groups them under one step – "minimize" (Federal Register, 1981). The analysis performed first sought to "avoid" the Refuge and associated potential impacts by evaluating ACA routes and alternative crossing locations outside of the Refuge.

3.3.1 USFWS Authority to Grant Right-of-Way for Power Line Use

The National Wildlife Refuge Improvement Act of 1997 provides that the Refuge is to be managed to "fulfill the mission of the System, as well as the specific purposes for which that refuge was established."[19] The Act also expressly recognizes that new electric uses may be approved within the Refuge. The USFWS is authorized to grant new ROW for power line use. Specifically, the United States Department of Interior Secretary is authorized to:

[19] 16 U.S.C. § 688DD(a)(3)(a).

> (B) permit the use of, or grant easements in, over, across, upon, through, or under any areas within the System for purposes such as but not necessarily limited to, powerlines, telephone lines, canals, ditches, pipelines, and roads, including the construction, operation, and maintenance thereof, whenever he determines that such uses are compatible with the purposes for which these areas are established.[20]

The "term 'compatible use' means a wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Director, <u>will not materially interfere</u> with or detract from the fulfillment of the mission of the System or the purposes of the refuge."[21]

USFWS guidance provides that "The refuge manager will not initiate or permit a new use of a national wildlife refuge or expand, renew, or extend an existing use of a national wildlife refuge unless the refuge manager has determined that the use is a compatible use."[22] The guidance also provides factors for consideration in making its determination of compatibility for a proposed use:

> **(1)** When completing compatibility determinations, refuge managers use sound professional judgment to determine if a use will materially interfere with or detract from the fulfillment of the System mission or the purpose(s) of the refuge. Inherent in fulfilling the System mission is not degrading the ecological integrity of the refuge. Compatibility, therefore, is a threshold issue, and the proponent(s) of any use or combination of uses must demonstrate to the satisfaction of the refuge manager that the proposed use(s) pass this threshold test. The burden of proof is on the proponent to show that they pass; not on the refuge manager to show that they surpass. Some uses, like a proposed construction project on or across a refuge that affects the flow of water through a refuge, may exceed the threshold immediately, while other uses, such as boat fishing in a small lake with a colonial nesting bird rookery may be of little concern if it involves few boats, but of increasing concern with growing numbers of boats. Likewise, when considered separately, a use may not exceed the compatibility threshold, but when considered cumulatively in conjunction with other existing or planned uses, a use may exceed the compatibility threshold.
>
> **(2)** While refuge managers should be looking for tangible impacts, the fact that a use will result in a tangible adverse effect, or a lingering or continuing adverse effect is not necessarily the overriding concern regarding "materially interfere with or detract from." These types of effects should be taken into consideration but the primary aspect is how does the use and any impacts from the use affect our ability to fulfill the System mission and the refuge purposes. For example, the removal of a number of individual animals from a refuge through regulated hunting, trapping or fishing would, in many instances, help the refuge manager manage to improve the health of wildlife populations. However, the take of even one individual of a threatened or endangered species could significantly impact the refuge's ability to manage for and perpetuate that species. Likewise, wildlife disturbance that is very limited in scope or duration may not result in interference with fulfilling the System mission or refuge purposes. However, even unintentional

[20] 16 U.S.C. § 688DD(d)(1)(B). USFWS regulations further define the requirements for an "electric power transmission line rights-of-way" within national wildlife refuges. See 50 C.F.R. § 29.21-8.
[21] 16 U.S.C. § 668EE(1) (emphasis added).
[22] Compatibility, 603 FW 2 (Nov. 17, 2000) (Appendix H)

minor harassment or disturbance during critical biological times, in critical locations, or repeated over time may exceed the compatibility threshold.

(3) The refuge manager must consider not only the direct impacts of a use but also the indirect impacts associated with the use and the cumulative impacts of the use when conducted in conjunction with other existing or planned uses of the refuge, and uses of adjacent lands or waters that may exacerbate the effects of a refuge use.

A copy of the USFWS guidance is included in Appendix H.

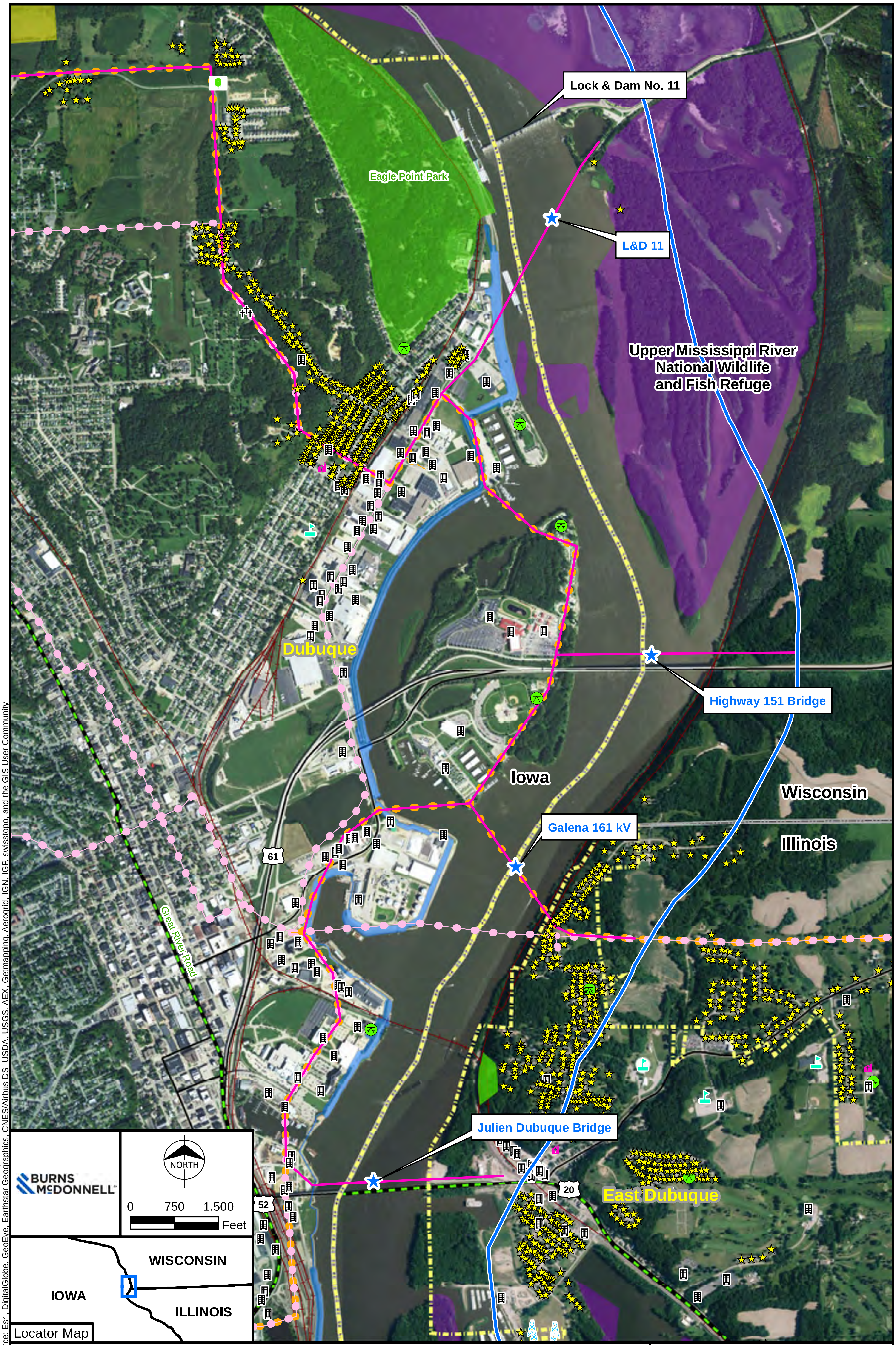
Lastly, the statute specific to this Refuge lists a number of prohibited uses, and notably, transmission lines are not prohibited in this Refuge.[23]

3.3.2 Non-Refuge Alternative Crossing Locations

Though the Refuge is approximately 260 river miles long, breaks in the Refuge boundaries in some locations allow for the presence, operation, and management of infrastructure, including locks and dams, bridges, and municipalities such as Dubuque. Four alternative crossing locations (and associated ACA routes) were identified at such breaks. Specifically, four alternative crossing locations (Figure 3-1) were identified in the Dubuque area that do not extend directly through Refuge land: L&D 11, the Highway 151 Bridge and the Julien Dubuque Bridge, and the existing Galena 161 kV double-circuit line. All four ACA routes and alternative crossings in the Dubuque area would be subject to approval from the City of Dubuque because a city in Iowa must give approval for a new transmission line within its boundaries (Iowa Code § 364.2(4)(a)).

In addition to the existing Turkey River-Stoneman 161 kV and the Millville to Stoneman 69 kV lines at the Stoneman alternative crossing location, the Galena 161 kV location includes the only other existing transmission line crossing within the ACA Study Area. Although there is an existing 69 kV line immediately south of the Galena 161 kV line that also crosses the Mississippi River, this southern 69 kV line is adjacent to the Galena161 kV line on the Iowa side and extends across the Mississippi River to the same general location as the Galena 161 kV line. As a result of this “shared”' location, the Galena 161 kV and this nearby 69 kV line are considered a single crossing of the Mississippi River.

[23] 16 U.S.C. § 726.



ACA Study Area
ACA Routes*
Alternative Crossing Location
USACE Restricted Area
Existing 161 kV
Existing 69 kV
FWS
INHF Land
State and Local Lands
Rail
School
Home
Business/Commercial
Church
Water Tower
Cemetery
Park
Tower
Highway
Scenic Byway
Municipal Area
County

*ACA Routes are for conceptual purposes only

Figure 3-1
Cardinal-Hickory Creek Transmission Line Project
Non-Refuge ACA Routes
L&D 11, Highway 151 Bridge, Galena 161 kV, and Julien Dubuque Bridge
Dubuque, Iowa

Source: NTAD, IDNR, USFWS, FHWA, WDNR, Energy Velocity, City of Dubuque, ESRI, ITC, Burns & McDonnell

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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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3.3.3 Refuge Alternatives

Three of the potential alternative crossing locations extend directly over Refuge lands. The northernmost crossing location is at Guttenberg, Iowa, at L&D 10 (Figure 3-2, Page 1). The two other Refuge crossing locations occur near Cassville, Wisconsin, in Pool 11 of the Mississippi River (Figure 3-2, Page 2). The northernmost crossing location analyzed in detail was at Lock and Dam No. 10, managed and operated by the U.S. Army Corps of Engineers (USACE) (Figure 3-2, page 1).

As identified in its Upper Mississippi Land Use Allocation Plan (USACE, 2011), a 2001 cooperative agreement between USACE and USFWS indicates the USACE:

> …grants to the Service the rights to manage fish and wildlife and its habitat on those lands acquired by the Corps of Engineers. These lands are managed by the Service as a part of the Refuge and the National Wildlife Refuge System. The Corps of Engineers retained the rights to manage as needed for the navigation project, forestry, and Corps of Engineers managed recreation areas, and all other rights not specifically granted to the Service. (Page 9.)

Additional detail on Lock and Dam No. 10 can be found in Subsection 4.4.1, below.

The Nelson Dewey ACA route utilizes open areas within the Refuge near Oak Road and crosses near the Cassville Car Ferry landing in Iowa to the existing Nelson Dewey Substation near the retired Nelson Dewey Power Plant in Wisconsin. Stoneman, the other southern Refuge ACA route, follows where the existing Millville-Stoneman 69 kV line and Turkey River-Stoneman 161 kV double-circuit transmission line currently crosses Refuge lands to connect to the existing Stoneman Substation at Cassville, Wisconsin.

The 345 kV line is not planned to connect at either the Nelson Dewey or Stoneman substation. If the Project is constructed using the Nelson Dewey or Stoneman crossing, the existing Millville-Stoneman 69 kV transmission line (owned by Dairyland) would be removed from its current location and would terminate at the rebuilt Turkey River Substation in Iowa. The new 345 kV line would be co-located with the existing 161 kV line depending on the final configuration of the Project through the Refuge, resulting in one single corridor through the Refuge. Thus, the number of transmission lines crossing the Mississippi River in Cassville would remain the same.

3.4 Major Stakeholders

The major stakeholders in the ACA Study Area include municipalities located within the ACA Study Area, federal and state agencies that own or manage lands within this area, and Native American tribes with cultural and historical interests in the ACA Study Area (additional detail on the municipalities within the ACA Study Area is provided in Chapter 4.0).

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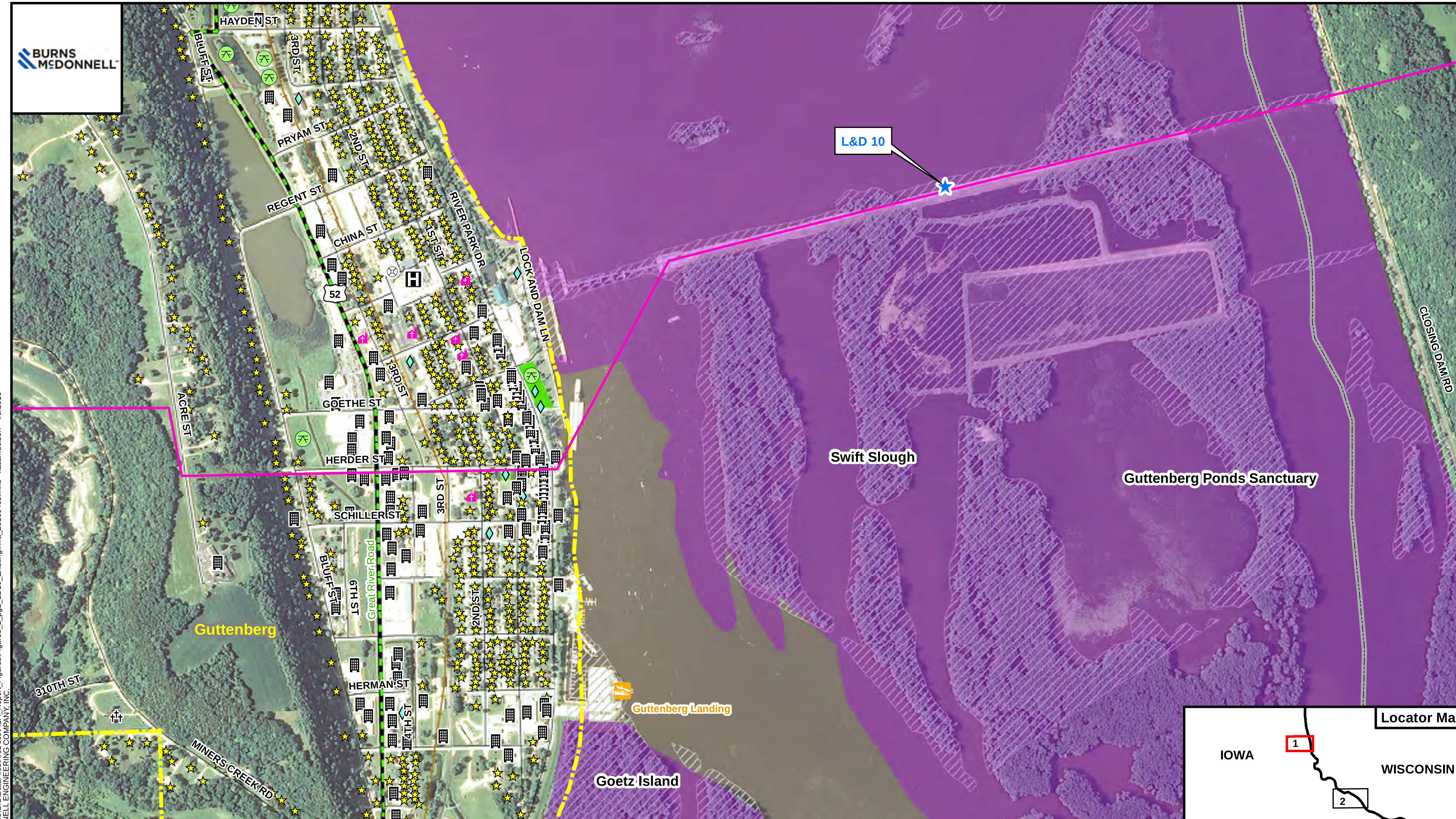

0 375 750
Feet

NORTH

L&D 10 ACA Route*	FWS	Rail	Cemetery	House	Municipal Area
Alternative Crossing Location	State and Local Lands	Helipad	Church	Park	County
Substation	Scenic Byway	Airport	Hospital	Public Facility	
USACE	Boat Launch or Ferry Landing	Business/Commercial			

*ACA Routes are for conceptual purposes only

Figure 3-2, Page 1
Cardinal-Hickory Creek Transmission Line Project
Refuge ACA Routes
Lock and Dam No. 10
Guttenberg, Iowa

Source: IDNR, Corps Land Use Allocation Plan 2011, USDA Clayton County NAIP 2013, Energy Velocity, NED, IDOT, INHF, WDNR, Clayton County, FHWA, ESRI, ITC Midwest, Burns & McDonnell

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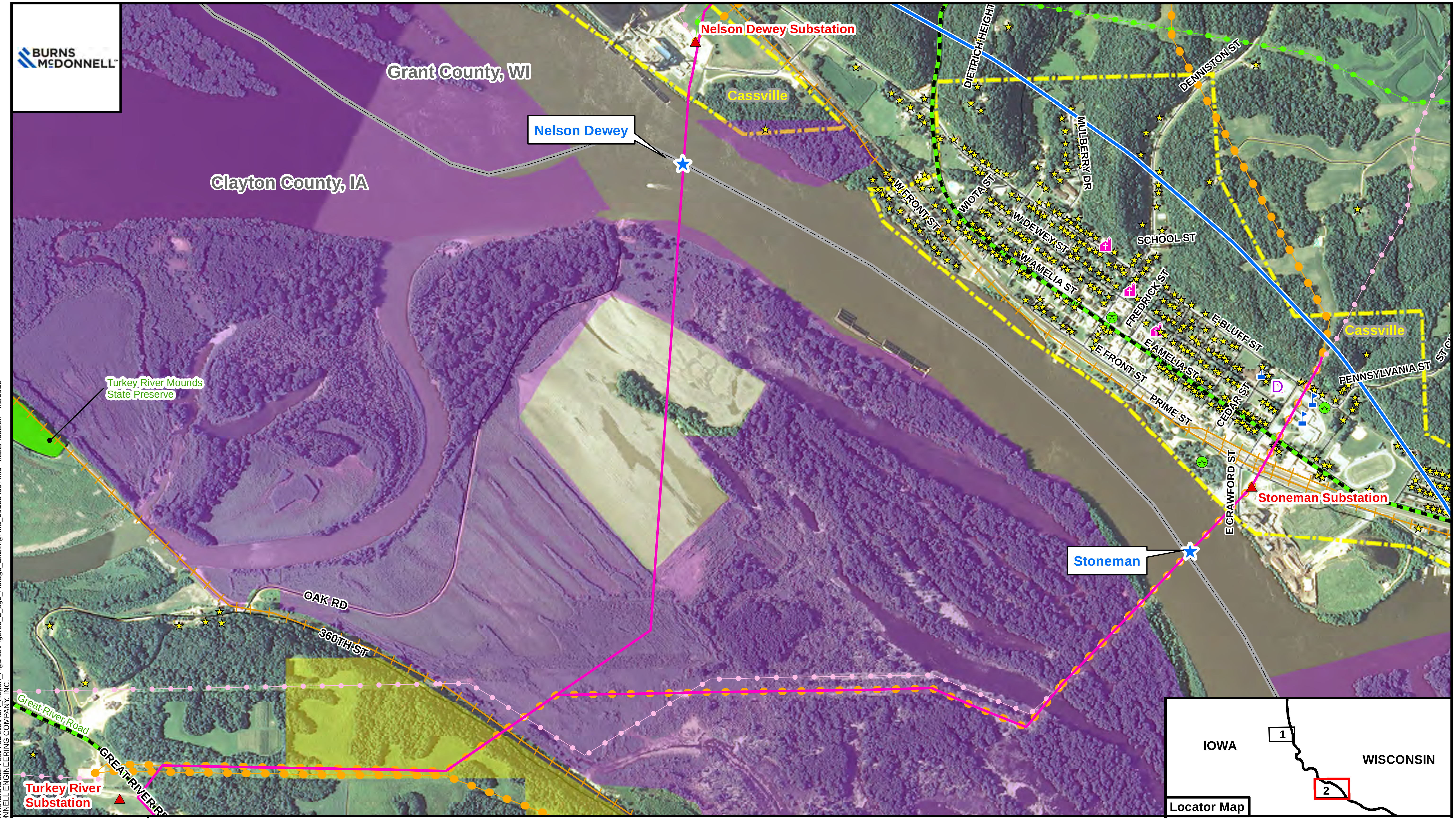

ACA Study Area	Existing 161 kV	FWS	Business/ Commercial	Airport	Rail	
ACA Routes*	Existing 138 kV	INHF Land	Cemetery	Daycare	County	
Alternative Crossing Location	Existing 69 kV	State Land	Church	Park	Municipal Area	
Substation	Scenic Byway	House	School	Tower		

NORTH

0 500 1,000
Feet

*ACA Routes are for conceptual purposes only

Figure 3-2, Page 2
Cardinal-Hickory Creek Transmission Line Project
Refuge ACA Routes
Nelson Dewey and Stoneman
Cassville, Wisconsin

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Source: IDNR, USDA Clayton County NAIP 2013, Energy Velocity, IDOT, INHF, WDNR, Clayton County, FHWA, ESRI, ATC, ITC Midwest, Burns & McDonnell

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3.4.1 Federal Agencies

The three federal agencies with primary jurisdiction over the Project are the USFWS, USACE, and U.S. Department of Agriculture's (USDA) Rural Utilities Service (RUS). The USFWS owns property within the ACA Study Area and manages the Refuge, which is included in parts of three of the ACA routes and alternative crossing locations. The mission of USFWS is "working with others to conserve, protect, and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people." One of the responsibilities of USFWS is to manage the NWRS. The NWRS is a system of public lands and waters set aside to conserve America's fish, wildlife, and plants. The National Refuge System includes more than 560 national wildlife refuges and other smaller units of the Refuge System, plus 38 wetland management districts encompassing more than 150 million acres.

Additionally, the USFWS has jurisdiction over species and habitats in the U.S. designated as protected by the Fish and Wildlife Coordination Act (FWCA) (16 U.S.C. 661), the Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.), the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668), and the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703).

USACE is a U.S. federal agency under the Department of Defense that owns land and operates lock and dams within the ACA Study Area (Lock and Dam No. 10 and Lock and Dam No. 11), including those within Refuge boundaries. The USACE also owns a portion of the lands that cross the two Refuge alternative crossing locations near Cassville, Wisconsin. The USACE's mission is to "deliver vital public and military engineering services; partnering in peace and war to strengthen our Nation's security, energize the economy and reduce risks from disasters." As part of this mission, the USACE plans, designs, builds, and operates the nation's locks and dams and also designs, manages, and constructs flood protection systems.

RUS is the agency that administers the USDA Rural Development Utilities Programs. RUS administers programs that assist in the development of infrastructure or infrastructure improvements to rural communities. Dairyland anticipates applying for financing assistance from RUS for its ownership interest in the Project.

3.4.2 State Agencies

The Iowa Utilities Board (IUB) has authority to grant approval of a franchise for the Project in Iowa for any portion of the line outside of municipal boundaries. A franchise from the IUB must be obtained for each county traversed by the proposed transmission line. The IUB must expressly find that the proposed line is necessary to serve a public use and represents a reasonable relationship to an overall plan of transmitting electricity in the public interest. Transmission line routes must comply with Iowa Code § 478.18(2) and 199 IAC 11.1(7), which set forth the requirements for the selection of a route for an electric transmission line based on routing priorities. The franchise would provide the petitioner the right of eminent domain outside of an Iowa municipality if requested in the petition and granted by the IUB to the extent it is found necessary for public use (Iowa Code §§ 478).

The Public Service Commission of Wisconsin (PSCW) and the Wisconsin Department of Natural Resources (WDNR) work together to review and either approve or deny the required state required approvals for the proposed transmission projects in Wisconsin. The PSCW has jurisdiction over the Certificate of Public Convenience and Necessity (CPCN) that must be obtained by a utility prior to constructing a transmission line that is 345 kV or greater in the state of Wisconsin. The WDNR issues other permits for transmission line projects requiring a CPCN. Each agency has its own requirements for permit issuance, and their reviews of a particular transmission project interrelate. Part 1 of the Utility Permit application is submitted to the WDNR prior to the filing of the CPCN application. The CPCN application is submitted to both the PSCW and the WDNR, and includes part 2 of the WDNR application. The PSCW and WDNR work together to complete the regulatory and environmental review for transmission line projects within the state.

3.4.3 Native American Tribes and Nations

The following Native American tribes and nations have been identified as potential stakeholders on this Project; additional Native American tribes and nations may be added following initial outreach activities:

- Ho Chunk / Winnebago
- Winnebago Tribe of Nebraska
- Meskwakie Nation - Sac and Fox Tribe of the Mississippi in Iowa
- Sa ki wa ki - Sak and Fox Nation of Oklahoma
- Ne ma ha ha ki - Sak and Fox Nation of Missouri (in Kansas and Nebraska)
- Bah Kho-je - Iowas of Oklahoma
- The Iowa Tribe of Kansas and Nebraska
- Bad River Band of Lake Superior Chippewa Indians of Wisconsin
- Forest County Potawatomi Community of Wisconsin
- Lac Vieux Desert Band of Lake Superior Chippewa Indians
- Menominee Indian Tribe of Wisconsin
- Prairie Band Potawatomi Nation

- The Citizen Potawatomi Nation
- Red Cliff Band of Lake Superior Chippewa Indians of Wisconsin
- Miami Tribe of Oklahoma
- The Peoria Tribe of Oklahoma

The Utilities understand that the federal government would complete its Section 106 Consultation with the appropriate tribes and nations, which is independent from the Utilities' outreach.

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4.0 DESCRIPTION OF THE ACA STUDY AREA AND ALTERNATIVE CROSSING LOCATIONS

This chapter discusses the existing conditions in the ACA Study Area as a whole, at specific local jurisdictions that would be potentially affected by the Project, and at each of the seven alternative crossing locations and in proximity to the ACA routes developed to these locations.

4.1 Existing Conditions in ACA Study Area

A broad overview and general discussion of existing resources in the ACA Study Area is provided in Subsections 4.1.1 to 4.1.6. They provide a base of information related to the existing conditions in the ACA Study Area. Existing resources are defined according to the appropriate geographical and/or political boundaries of the resource being assessed.

4.1.1 Physiographic Setting

The ACA Study Area lies within the Central Lowland physiographic province. Physiographic regions are broad divisions of land based on terrain, rock type, and geologic formations and history. The Central Lowland physiographic province is a part of the Interior Plains division and is divided into several different sections in Iowa, Illinois, Minnesota, and Wisconsin. The area includes several areas that contain known algific talus slopes. This landform, also known as a cold air slope, is very rare and is only found in the "Driftless Area" of Iowa, Illinois, Minnesota, and Wisconsin. In Iowa, this area occurs in the extreme northeast portion of the state. This unique habitat is home to a number of unique species found nowhere else in Iowa (Iowa Natural Heritage Foundation [INHF], 2014).

The ACA routes and alternative crossing locations are located within the Wisconsin Driftless Area, also known as the Paleozoic Plateau. The Wisconsin Driftless Area was unglaciated, which resulted in areas of rough, steep terrain. These areas are dissected by tributaries of the Mississippi River, creating substantial vertical relief in some areas along its banks. The landscape has karst topography due to the soluble bedrock underlying the depressions, sinkholes, caves, and underground drainage ways that can be found throughout the area (Fenneman and Johnson, 1946; Driftless Area Initiative, 2013).

4.1.2 Hydrology

The ACA routes and alternative crossing locations are all located within the Upper Mississippi Region (Hydrologic Unit Code [HUC]-07). The drainage of the Mississippi River delineates this region. The region includes portions of Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, South Dakota, and

Wisconsin. The crossing locations are within the Upper Mississippi-Maquoketa-Plum Basin (HUC-070600) in the Grant-Little Maquoketa and Apple-Plum Subbasins.

As shown on Figure 4-1, the crossing locations are within several watersheds:

- Sinnisawa River-Mississippi River Watershed (L&D 11, Highway 151 Bridge, Galena 161 kV, and Julien Dubuque Bridge)
- Little Maquoketa River Watershed (L&D 11, Highway 151 Bridge, Galena 161 kV, and Julien Dubuque Bridge)
- Headwaters North Maquoketa River Watershed (L&D 10, Nelson Dewey, and Stoneman)
- Turkey River Watershed (L&D 10, Nelson Dewey, and Stoneman)
- Sny Magill Creek-Mississippi River Watershed (L&D 10, Nelson Dewey, and Stoneman)

The crossing locations also cross portions of 13 subwatersheds (U.S. Geological Survey [USGS], 2014). Major surface water bodies and streams within the ACA Study Area are shown on Figure 4-2.

4.1.3 Transportation

Located along the Mississippi River, the ACA routes extend through Clayton and Dubuque Counties, Iowa; Grant County, Wisconsin; and Jo Daviess County, Illinois. Major highways in the area include Highway 52, a portion of which is also known as the Great River Road Scenic Byway in Iowa and stretches from Guttenberg down through the crossing locations at Dubuque. Highway 20 and Highway 61/151 both extend through the Dubuque area. Highway 20 crosses the Mississippi River at the Julien Dubuque Bridge into Illinois. Highway 61/151 crosses the Mississippi River into Wisconsin north of Schmitt Island. Both bridges in Dubuque were evaluated as potential crossing locations for the Project.

Several airports and heliports are in the ACA Study Area, including the Dubuque Regional Airport, the Cassville Municipal Airport, and several heliports at hospitals in major municipalities in the area.

Two railroads extend along the east and west side of the Mississippi River through the area, including through the Refuge lands near the Nelson Dewey and Stoneman alternative crossing locations. The railroad on the west side of the Mississippi River is owned by Canadian Pacific Railway. The railroad on the east side is owned by BNSF Railway. Two Canadian National Railway lines extend west to east into Dubuque. A well-utilized rail yard is south of the Julien Dubuque Bridge in Dubuque and supports multiple trains in operation.

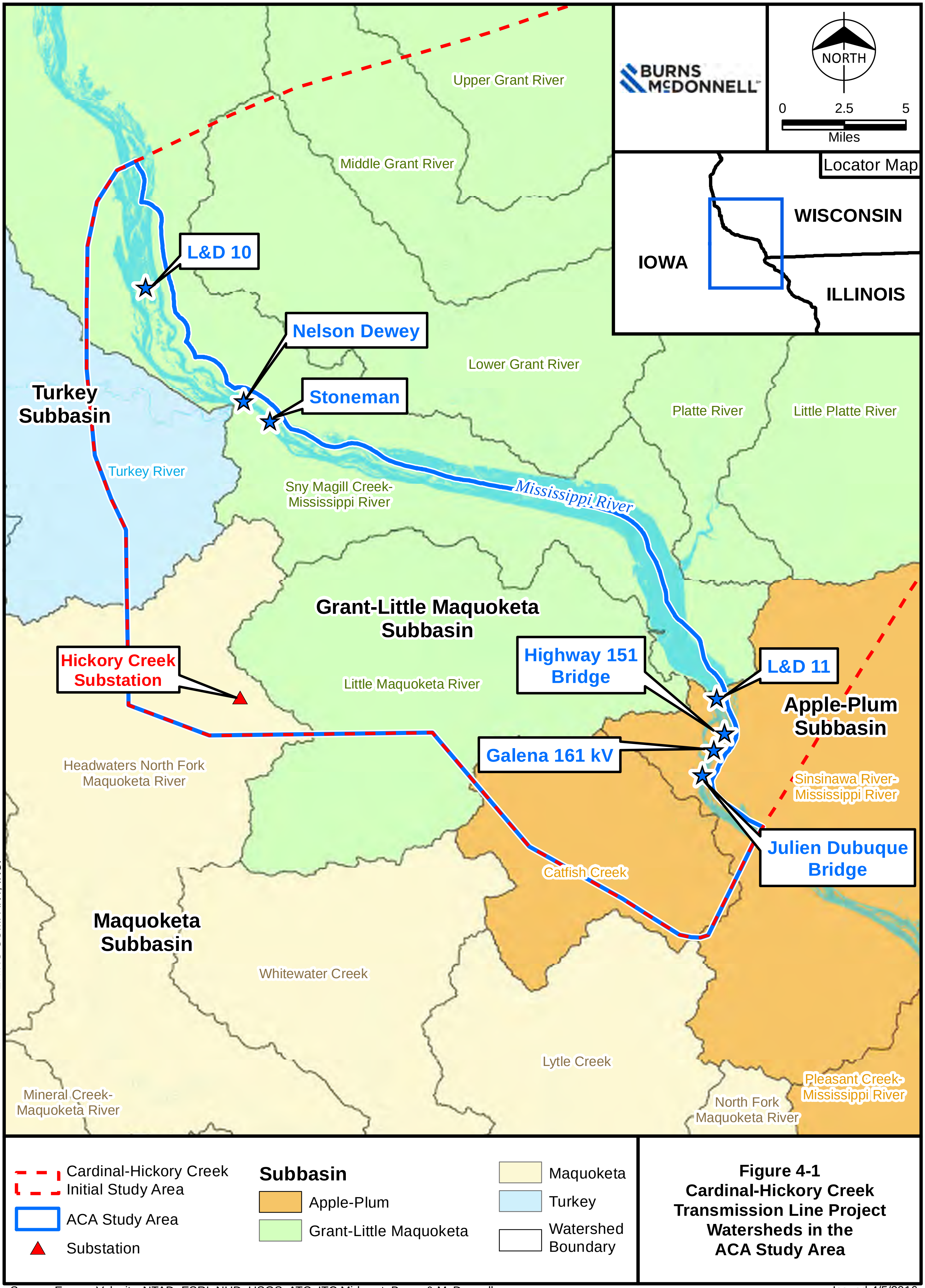

Figure 4-1
Cardinal-Hickory Creek Transmission Line Project
Watersheds in the ACA Study Area

Source: Energy Velocity, NTAD, ESRI, NHD, USGS, ATC, ITC Midwest, Burns & McDonnell

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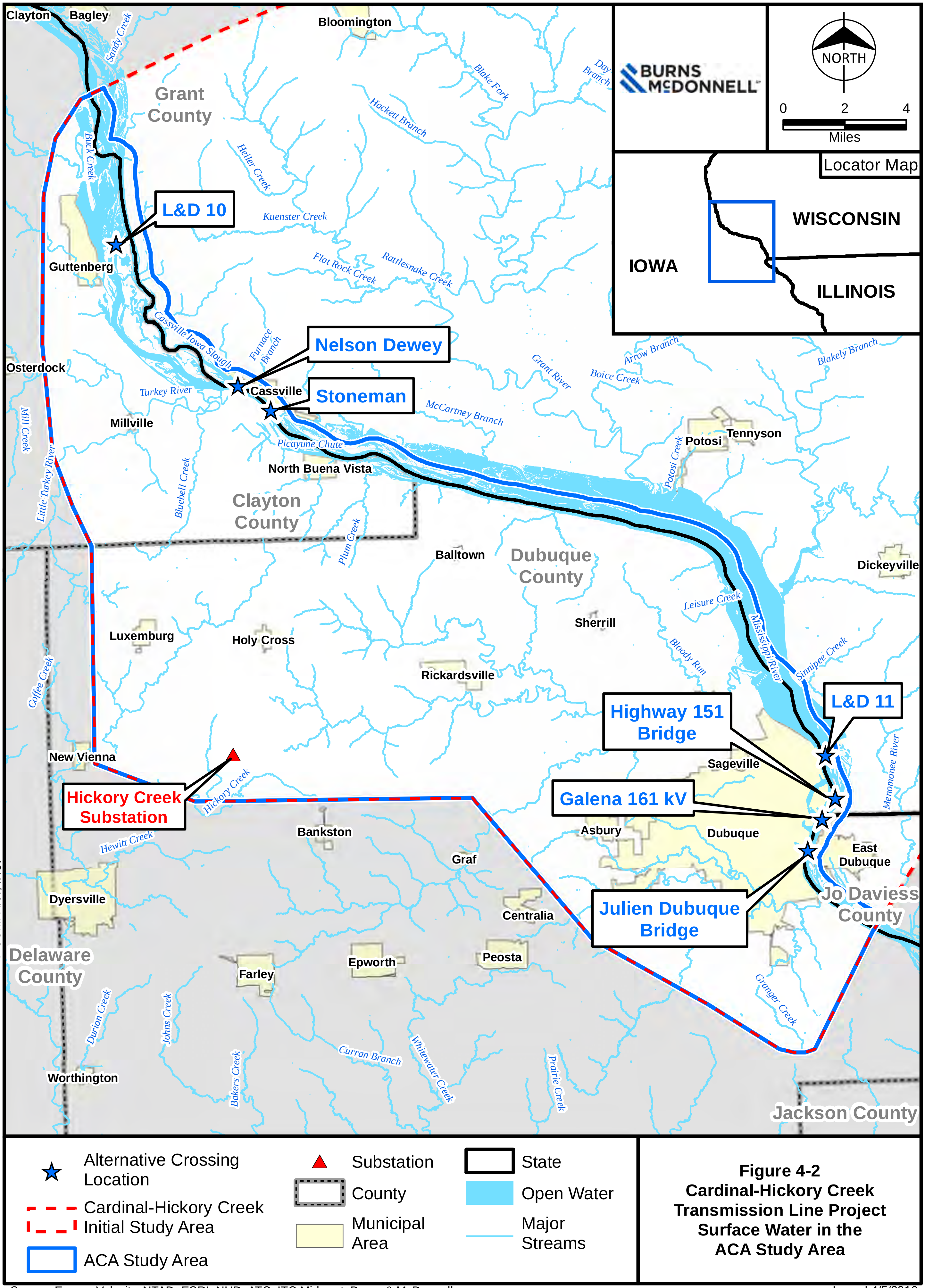

Figure 4-2
Cardinal-Hickory Creek Transmission Line Project
Surface Water in the ACA Study Area

Source: Energy Velocity, NTAD, ESRI, NHD, ATC, ITC Midwest, Burns & McDonnell

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One car ferry in operation at Cassville, Wisconsin, is within the ACA Study Area. The Cassville Car Ferry connects the Village of Cassville, Wisconsin, on the east side of the Mississippi River, with Iowa, the Refuge, and Oak Road on the west side of the Mississippi River. The Nelson Dewey ACA route is located just east of Oak Road and crosses the Mississippi River adjacent to the Cassville Car Ferry. The ferry served early settlement in the region as early as 1833, and it continues today, making roughly the same trip back and forth across the Mississippi River. It is the oldest operating ferry service in the state of Wisconsin and is the only operational ferry crossing the Mississippi River north of St. Louis, Missouri (Wisconsin Department of Tourism, 2015; Village of Cassville, 2015b).

4.1.4 Population and Housing

Several primary municipal areas are near the crossing locations and within the ACA Study Area. From north to south, these municipalities include Guttenberg, Iowa; Cassville, Wisconsin; Dubuque, Iowa; and East Dubuque, Illinois. Dubuque is the largest municipal area near the alternative crossing locations (Table 4-1) (see Section 4.2 for additional discussion of these municipalities within the ACA Study Area).

Table 4-1: Total Population in Cities Near ACA Routes

Location	Population, Actual (2010)	Population, Estimated (2013)	Percent Change (2010-2013)
Guttenberg, IA	1,919	1,761	-8.2
Cassville, WI	947	829	-12.5
Dubuque, IA	57,637	57,826	0.3
East Dubuque, IL	1,704	1,769	3.8

Source: U.S. Census Bureau 2010; 2009-2013 5-Year American Community Survey

Guttenberg and Cassville have both experienced decreasing population over the past few years while Dubuque and East Dubuque have slightly increased populations. Cassville has experienced the largest decrease in population over the past three years, decreasing 12.5 percent. East Dubuque’s population grew the most in the past three years, increasing by 3.8 percent.

General population and housing characteristics are shown in Table 4-2. According to U.S. Census data, the populations near the ACA routes and alternative crossing locations are primarily White and primarily not Hispanic/Latino. Dubuque has the most diversity with 8.1 percent of its population reported as one or more non-White race. Dubuque has the lowest homeownership rate (64.3 percent) while Guttenberg has the highest homeownership rate (79.4 percent). Dubuque has 30.7 percent of its housing units in multi-unit structures, which is the highest of the four cities near the ACA routes and alternative crossing locations. Cassville and Dubuque has the largest average household size of an owner-occupied unit (2.36

persons), and Dubuque had the largest average household size of a renter-occupied unit (2.04 persons). Median household income is greatest in Dubuque ($44,599) and lowest in Guttenberg ($36,028). The federal median household income is $53,046 (U.S. Census Bureau, 2013). Dubuque also had the highest percent of persons living below poverty level (14.0 percent). By comparison, the federal percent below poverty level is 15.4 percent (U.S. Census Bureau, 2013).

Table 4-2: Population and Housing Data in Affected Counties

Population/Housing Characteristics	Guttenberg, IA	Cassville, WI	Dubuque, IA	East Dubuque, IL
Median age	50.1	49.4	38.4	41.1
One race (%)	98.7	99.4	95.8	99.3
Two or more races (%)	1.3	0.6	4.2	0.7
White, one race (%)	98.6	99.4	91.9	98.1
Black or African American, one race (%)	0.0	0.0	2.1	0.6
Asian, one race (%)	0.0	0.0	1.3	0.6
Hispanic/Latino (of any race) (%)	1.1	0.6	2.1	2.1
Home ownership rate (%)	79.4	72.9	64.3	71.9
Housing units in multi-unit structures (%)	19.3	17.3	30.7	22.8
Average household size of owner-occupied unit	2.10	2.36	2.36	2.30
Average household size of renter-occupied unit	1.85	1.83	2.04	1.93
Median household income	$36,028	$38,681	$44,599	$38,704
Persons below poverty level (%)	13.2	13.3	14.0	11.2

Source: U.S. Census Bureau 2009-2013 5-Year American Community Survey

Table 4-3 shows employment data in the region as of 2013. Cassville has the highest unemployment rate at 9.9 percent. East Dubuque has the lowest unemployment rate (3.8 percent). By comparison, the federal unemployment rate is 9.7 percent (U.S. Census Bureau, 2013). Sales and office occupations are the top occupations in Cassville and East Dubuque. Management, business, science, and arts occupations are the top occupations for Guttenberg and Dubuque. Educational services, health care, and social assistance are the top industries in Guttenberg, Cassville, and Dubuque. Retail trade is the top industry in East Dubuque.

Table 4-3: Employment Data

Employment Data	Guttenberg, IA	Cassville, WI	Dubuque, IA	East Dubuque, IL
Population 16 years and over	1,524	677	47,229	1,333
In labor force	865	383	32,016	867
Employed	803	345	30,006	834
Unemployed	62	38	1,992	33
Not in labor force	659	294	15,213	466
Percent unemployed	7.2	9.9	6.2	3.8
Top occupation	Management, business, science, and arts occupations	Sales and office occupations	Management, business, science, and arts occupations	Sales and office occupations
Top industry	Educational services, and health care and social assistance	Educational services, and health care and social assistance	Educational services, and health care and social assistance	Retail trade

Source: U.S. Census Bureau 2009-2013 5-Year American Community Survey

4.1.5 Threatened and Endangered Species

The ESA affords legal protection to those species and their habitats determined to meet the specified criteria for listing by the federal government as either threatened or endangered. The ESA defines a federally endangered species as “any species which is in danger of extinction throughout all or a significant portion of its range.” The ESA defines federally threatened species as “any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.”

There are a total of 13 species that are federally listed as threatened or endangered in the potentially affected counties in the ACA Study Area (Table 4-4); eight are animal species and five are plant species. In addition, the bald eagle, which has been removed from protection under the ESA, remains protected under the MBTA and the BGEPA. Historic and known nest locations were provided to the Utilities by USFWS and were used in the routing process to avoid sensitive bald eagle habitat in and around the Refuge on both the Iowa and Wisconsin sides.

A full list of state protected species is provided in Appendix F. A total of 337 species are protected at the state-level for the four counties in the ACA Study Area: 107 in Clayton County, Iowa; 80 in Dubuque County, Iowa; 61 in Jo Daviess County, Illinois; and 190 in Grant County, Wisconsin.

Table 4-4: Federal and State Protected Species Known or Likely to Occur in ACA Study Area

Common Name	Scientific Name	Habitat	Counties of Occurrence	Federal Status
Vertebrate Animal Species				
Northern long-eared bat	*Myotis septentrionalis*	Underneath bark, in cavities, or in crevices of both live and dead trees. Also roost in cooler places like caves and mines. Hibernate in caves and mines.	Clayton, Dubuque, Jo Daviess, Grant	Threatened
Indiana bat	*Myotis sodalis*	Females and young roost under loose bark. Prefer drainage areas that flow into slow moving rivers for drinking and insects	Jo Daviess	Endangered
Bald eagle	*Haliaeetus leucocephalus*	Nests in mature trees near perennial waterbodies	Clayton, Dubuque, Jo Daviess, Grant	BGEPA
Whooping crane	*Grus americanus*	Wetlands and other habitats, including marshes, estuaries, lakes, ponds, wet meadows and river, and agricultural fields	Grant	Endangered and Experimental Population, Non-Essential
Invertebrate Animal Species				
Sheepnose mussel (fresh water mussel)	*Plethobasus cyphyus*	Medium to large rivers in riffles, gravel/cobble substrates and other benthic communities	Clayton, Jo Daviess, Grant	Endangered
Higgins eye pearlymussel (fresh water mussel)	*Lampsilis higginsii*	Larger rivers with deep water and moderate currents	Clayton, Dubuque, Jo Daviess, Grant	Endangered
Iowa Pleistocene snail	*Discus macclintocki*	Algific talus slopes	Clayton, Dubuque, Jo Daviess	Endangered
Hine's emerald dragonfly	*Somatochlora hineana*	Calcareous streams and associated wetlands overlying dolomite bedrock	Grant	Endangered

Common Name	Scientific Name	Habitat	Counties of Occurrence	Federal Status
Plant Species				
Prairie bush clover	*Lespedeza leptostachya*	Dry to mesic prairies with gravelly soil	Clayton, Dubuque, Jo Daviess, Grant	Threatened
Northern wild monkshood	*Aconitum noveboracense*	Algific talus slopes, shaded or partially shaded cliffs	Clayton, Dubuque, Grant	Threatened
Western prairie fringed orchid	*Platanthera praeclara*	Unplowed, calcareous prairies and sedge meadows	Clayton, Dubuque	Threatened
Eastern prairie fringed orchid	*Platanthera leucophaea*	Mesic to wet prairies	Jo Daviess	Threatened
Mead's milkweed	*Asclepias meadii*	Upland tallgrass prairie or glade/barren habitat	Grant	Threatened

Source: USFWS, 2015 IPaC; NatureServe Explorer, 2015

Avoidance of habitat utilized by threatened and endangered species listed in Table 4-4 was recommended by the Iowa Department of Natural Resources (IDNR) to reduce the likelihood of potential impacts to these species. IDNR indicated that its records search was not supported by detailed field surveys and that if listed or rare communities or species are found during the course of the Project, additional studies may be required. Once the federal and state agencies identify the routes and alternative crossing locations that would be evaluated under their respective environmental procedure acts, the Utilities would conduct additional analyses on potential impacts to threatened and endangered species in consultation with those agencies with jurisdiction, including, but not limited to, the USFWS and both the IDNR and WDNR.

4.1.6 Conservation Areas/Natural Resources

In addition to the Refuge, there are numerous conservation areas and public lands throughout the ACA Study Area. These areas were assessed for their proximity to the Project and any potential adverse impacts to these resources as a result.

4.1.6.1 Upper Mississippi National Wildlife and Fish Refuge

One of the most notable conservation areas in the Midwest is the Refuge (Figure 4-3). The Refuge was established by an Act of Congress on June 7, 1924, as a refuge and breeding place for migratory birds, fish, other wildlife, and plants (USFWS, 2014a). The Refuge is approximately 260 river miles long, stretching from the confluence of the Chippewa River in Minnesota to Rock Island, Illinois (USFWS, 2014a). The Refuge has 240,000 acres of Mississippi River floodplain throughout four states: Minnesota, Wisconsin, Iowa, and Illinois. It is an important habitat for migratory birds, fish, and other wildlife, as well as many species of plants. More than 306 species of birds visit the Refuge for its habitat, and 119 species of fish and 42 species of mussels live in the waters of the Refuge. In addition to these species, 51 species of mammals have been observed on the Refuge as well as hundreds of species of plants (USFWS, 2006).

The Refuge is headquartered in Winona, Minnesota, and has four administrative districts: Winona District, La Crosse District, McGregor District, and Savanna District. Eleven locks and dams are within the Refuge, and the districts are divided by river pools that are created by the locks and dams. As of 2006, the Refuge had 37 permanent employees and an annual base budget of $3.1 million. The headquarters also coordinate the Trempealeau and Driftless Area National Wildlife Refuges (USFWS, 2006).

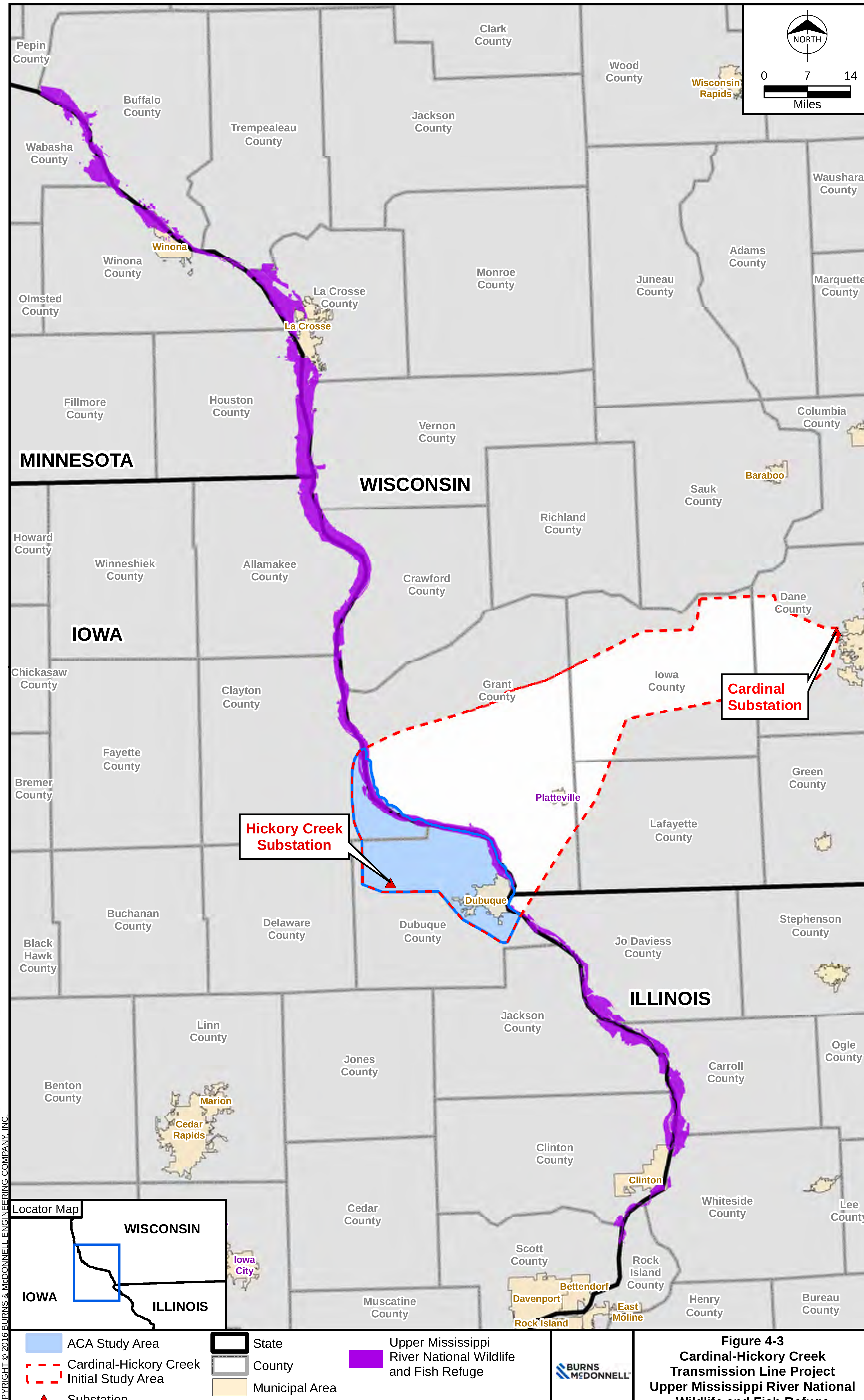

Figure 4-3
Cardinal-Hickory Creek Transmission Line Project
Upper Mississippi River National Wildlife and Fish Refuge

Source: FWS; USGS; IDNR; WDNR; ESRI; ITC Midwest; Burns & McDonnell.

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In 2006, the Refuge published a CCP to set goals for the next 15 years after publication. The plan was drafted under the NWRS Improvement Act of 1997. The NWRS Improvement Act states wildlife conservation is the priority for the NWRS lands and that Secretary of the Interior shall ensure that the biological integrity, diversity, and environmental health of refuge lands are maintained. Each refuge must be managed to fulfill the specific purposes for which the refuge was established and the NWRS mission. The plan created for the Refuge delineated 43 objectives and strategies created to “help the Refuge achieve its purposes and contribute to the mission and policies of the NWRS, while being sensitive to the needs of partner states and agencies, conservation organizations, communities, and the general public” (USFWS, 2006).

The Refuge was designated a “Globally Important Bird Area” (GIBA) by the American Bird Conservancy in 1997 due to its national and international importance for migratory birds (USFWS, 2006). As much as 40 percent of North American waterfowl utilize the Mississippi River during annual migration. Some species in particular are more reliant on the Refuge. For example, approximately 50 percent of all canvasback ducks stop in the Refuge during their migration. Tundra swans are also common visitors to the Refuge, with approximately 20 percent of the eastern United States population using the Refuge every year. Bald eagles are common during certain months as well. According the Refuge's CCP, there have been 167 active eagle nests in recent years, and approximately 2,700 bald eagles visit the Refuge during their spring migration (USFWS, 2006)

The Refuge is also an important area for tourists. The area receives nearly 3.7 million annual visits (USFWS, 2006). These visitors enjoy the scenic river overlooks from 500-foot-high bluffs, as well as explore the river, its backwaters, and its islands. Tourists also have views from the National Scenic Byways on either side of the Refuge. The portion of the Refuge that includes parts of both the Nelson Dewey and Stoneman ACA routes and alternative crossing locations also includes an area listed as an “auto tour route” at the Turkey River Delta (located just north of Oak Road) (USFWS, 2006). The auto tour route is accessed from Oak Road within the Refuge boundaries. The CCP for the Refuge lists this route at 1.5 miles long, but field observations at the Refuge in 2014 do not show evidence or signage regarding this recreational resource.

4.1.6.2 Mississippi Flyway

In an effort to study and better manage waterfowl and migratory bird corridors in North America, wildlife managers have historically divided the continent into flyways. In the U.S., the primary biological flyways are the Pacific, Central, Mississippi, and Atlantic Flyways (USFWS, 2014a). Administration of the Mississippi Flyway is composed of state representatives of Alabama, Arkansas, Indiana, Illinois, Iowa, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Ohio, Tennessee, and Wisconsin, and the Canadian provinces of Saskatchewan, Manitoba, and Ontario (USFWS, 2014a). All alternative crossing locations analyzed in this document are located within the Mississippi Flyway.

The Mississippi Flyway Council was organized in 1952 and contains representatives (usually agency administrators) from state agencies (and often provincial representatives from Saskatchewan, Manitoba, and Ontario, Canada) that have management responsibility for migratory bird resources in the Flyway (2015). Both the IDNR and WDNR are standing members in the Mississippi Flyway Council. Recommendations that are adopted by the Flyway Councils are presented to the USFWS's Regulations Committee for consideration in the setting of waterfowl hunting regulations and management programs. Approximately 40 percent of the continent's migratory waterfowl migrate through the Mississippi Flyway and it is a critical migration corridor for 10 species including tundra swans, ring-necked duck, and hooded merganser (USFWS, 2006). Another seven species are also on the USFWS's Region 3 Resource Conservation Priority List; the species are: lesser snow geese, Canada geese, wood duck, mallard, blue-winged teal, canvasback, and lesser scaup. The corridor is also important for an additional eight species of waterfowl (USFWS, 2006). Recent migratory waterfowl studies conducted at the Refuge are combined in an annual report by the USFWS. The *Waterfowl Population Status (2014)* includes information on ducks and geese that utilize the Mississippi Flyway. In the report, the American black duck midwinter index in 2014 was 19,700, which was slightly below the 10-year flyway average of 20,300 (USFWS, 2014b). Of the Canada goose populations that migrate to the Mississippi Flyway, predicted production was above-average for the Eastern Prairie Population, but below-average for the Mississippi Valley and the Southern James Bay Populations, the latter for the second year in a row (USFWS, 2014b).

4.1.6.3 State Lands

Several state-owned and/or managed parcels are within the ACA Study Area (Figure 4-4). Two of these state lands are in close proximity to ACA routes. Nelson Dewey State Park, just north of Cassville, Wisconsin, is located immediately northwest of the Nelson Dewey Substation and power plant. As currently proposed, the Nelson Dewey ACA route would extend northeast utilizing an existing transmission line corridor in Wisconsin near the southern border of the state park. The ACA route would extend from the Cassville Car Ferry landing in Iowa to the Nelson Dewey Substation area, a portion of which would be visible from certain locations at Nelson Dewey State Park.

Both the Stoneman and Nelson Dewey ACA routes would extend along an existing transmission line through an INHF parcel east of the Turkey River Substation.

The second state-owned property in proximity to a crossing location is the Mines of Spain State Recreation Area near Dubuque, Iowa. The Julien Dubuque Bridge ACA route would be approximately 1.2 miles north of the park at the Mississippi River crossing location.

All ACA routes that extend through Dubuque would be approximately 560 feet south of another INHF property, the Bertsch Farm Conservation Easement (where the state holds an easement, but does not own the property). Other state-owned properties in the ACA Study Area include White Pine Hollow State Forest, the Guttenberg Fish Hatchery, Merritt Forest State Preserve, Catfish Creek State Preserve, Turkey River Mounds State Preserve, and the Little Maquoketa Mounds State Preserve.

4.1.6.4 County/Local Lands and Parks

Several county and local lands and parks are near the ACA routes. The L&D 10 ACA route would pass through a small portion of Clayton County land near Millville, Iowa, and would also pass through Ingleside Park near Lock and Dam No. 10. Multiple county and local lands in the Dubuque area sit in proximity to the ACA routes; most notably, the L&D 10 ACA route through Dubuque would extend just south of Eagle Point Park. The Nelson Dewey and Stoneman ACA routes would be in close proximity to Riverside Park in Cassville, Wisconsin. Lastly, the Julien Dubuque ACA route and the Galena 161 kV ACA route would extend near Gramercy Park in East Dubuque, Illinois (Figure 4-4).

4.2 Existing Conditions in Municipalities

Guttenberg and Dubuque, Iowa; Cassville, Wisconsin; and, East Dubuque in Illinois are key local jurisdictions associated with one or more of the seven alternative crossing locations. Sections 4.3 and 4.4 provide additional detail in regard to the location of ACA routes near and within the key local jurisdictions.

4.2.1 Guttenberg, Iowa

The City of Guttenberg has a population of 1,761 (U.S. Census Bureau, 2013). The area served as a seasonal settlement for the Sauk and Mesquakie tribes prior to Euro-American settlement in the 1800s. The area was first called Prairie la Porte and was the Clayton County seat for a short time. The area is bounded on the east by the Mississippi River and on the north, west, and south by limestone bluffs. The Western Settlement Society of Cincinnati was created to help German immigrants settle in the Midwest and purchase land in and around Prairie la Porte. The first German families aided by the Western Settlement Society arrived in 1845. By 1856, the city had more than 1,500 inhabitants, most of them German, and the city was renamed Guttenberg.

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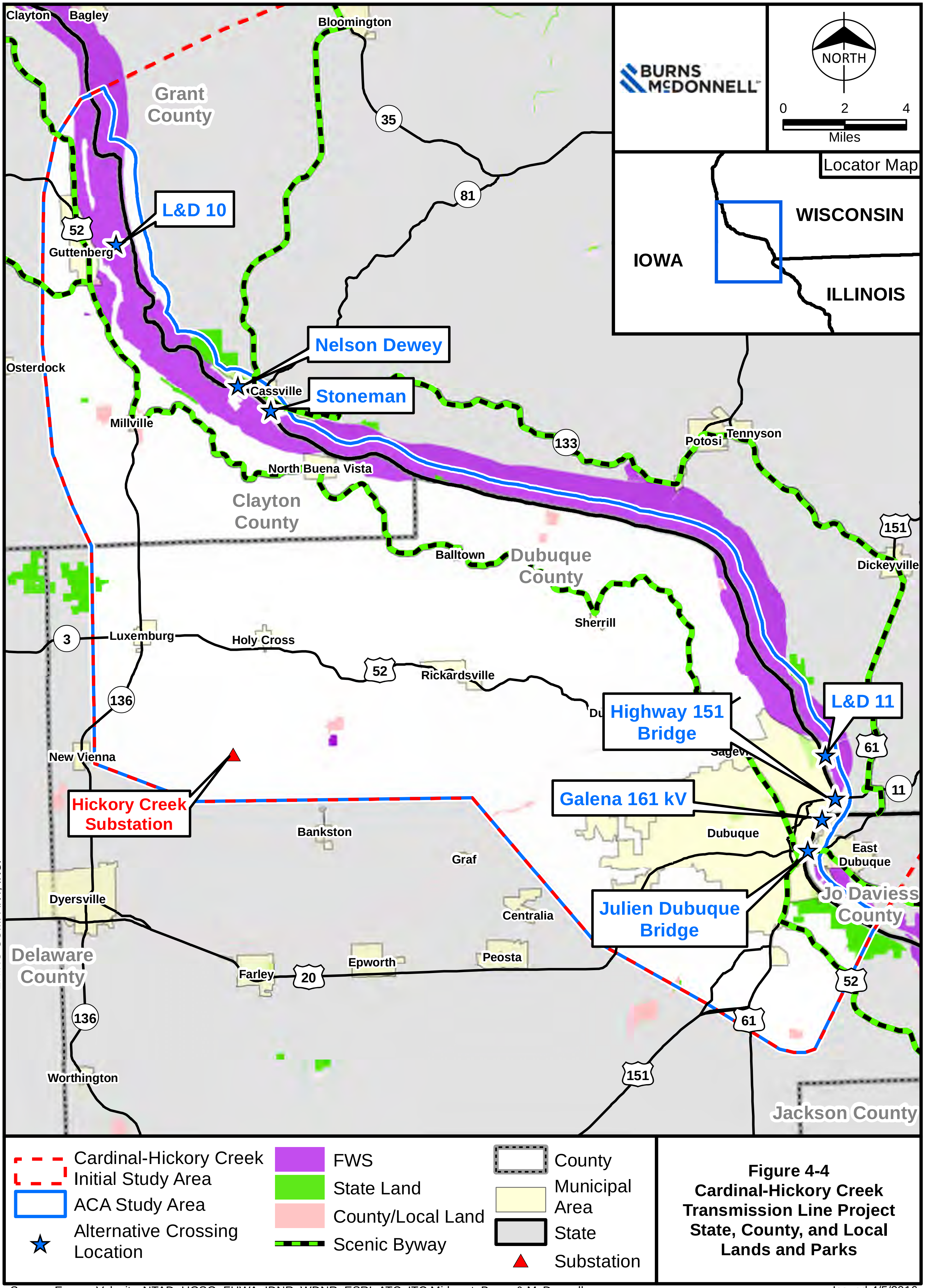

Figure 4-4
Cardinal-Hickory Creek Transmission Line Project
State, County, and Local Lands and Parks

Source: Energy Velocity, NTAD, UGSG; FHWA; IDNR; WDNR; ESRI, ATC, ITC Midwest, Burns & McDonnell

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Recently, the City of Guttenberg is known as a recreation and tourism destination on the banks of the Mississippi River. The city is recognized as an important archeological and historical destination in eastern Iowa; the city has multiple historic districts and individual listings on the National Register of Historic Places (NRHP), including Lock and Dam No. 10. Guttenberg has more than 2 miles of park and picnic area located along the banks of the Mississippi River, including Ingleside Park and Big Springs Nature Park. Ingleside Park features a 2-mile walking trail along the river. The Upper Mississippi Bottomland Forest Interpretive Trail features a short loop through a natural wetland and is a recognized site for bird watching (Guttenberg, 2014). The National Scenic Byways Great River Road and the River Bluffs Scenic Byway run through Guttenberg, and the area is well-known for scenic vistas of the Mississippi River and shoreline, including bird watching and photography (Guttenberg, 2013).

4.2.2 Cassville, Wisconsin

The Village of Cassville has a population of 829 (U.S. Census Bureau, 2013). Originally, Wisconsin was part of the Northwest Ordinance of 1787 and was part of the Indiana, Illinois, and Michigan Territories. Cassville was settled in the 1820s and was named after Lewis B. Cass, governor of the Michigan Territory. As original territories started to become states, Wisconsin, as well as parts of Iowa, Minnesota, and the eastern Dakotas, became the Wisconsin Territory. In 1836, Nelson Dewey arrived in Cassville when Grant County was formed; Dewey became the register of deeds and served in the territorial legislature. Dewey became the governor of Wisconsin in 1848 when it became a state. Dewey returned to Cassville and invested in its infrastructure, renovating the hotel and organizing land titles to encourage settlement. Dewey moved around the country until he purchased 2,000 acres outside Cassville for a farm he would call Stonefield. He built a home on the property, but a fire destroyed much of the house in 1873. In the 1930s, a portion of Dewey’s estate was converted to a state park. The Wisconsin Historical Society also recreated a turn-of-the-century village and named it Stonefield. The site hosts the State Agricultural Museum now managed by the State Historical Society of Wisconsin (Village of Cassville, 2015a).

The Mississippi River helped Cassville’s continued development. The ferry service that is still in operation today began in 1836; it transported both passengers and agricultural produce between Iowa and Wisconsin. Fishing, clam digging, and ice harvesting industries were also made possible by Cassville’s location on the river. The development of railroads brought passengers and goods to and from the area. More recently, Cassville has supported the Great River Road designation of Highway 133, encouraging tourism in the area. Also, Dairyland (one of the Project owners) and Wisconsin Power & Light Company established electric power generation services in the area and helped provide tax revenue for Cassville (Village of Cassville, 2015a).

The Village of Cassville includes two ACA routes under consideration in this ACA report: Nelson Dewey and the Stoneman crossing locations. Both crossing locations would extend through the Village of Cassville; Nelson Dewey would cross at the soon-to-be-retired Nelson Dewey Power Plant and would connect with existing utility corridors in an undeveloped portion on the northwest end of Cassville. The Stoneman crossing location would occur at the existing 161 kV/69 kV Mississippi River/Refuge transmission crossing, adjacent to Riverside Park and extend through residential, commercial, and industrial areas.

4.2.3 Dubuque, Iowa/East Dubuque, Illinois

The City of Dubuque has a population of 57,826 in 2013 (U.S. Census Bureau, 2013). Four of the seven alternative crossing locations include ACA routes that would extend through the City of Dubuque: L&D 11, Highway 151 and Julien Dubuque bridges, and the existing transmission line crossing at the Galena 161 kV location.

The City of Dubuque, known as the "Masterpiece on the Mississippi," is the oldest city in Iowa. Chartered in 1837, the city was named after Julien Dubuque, the first permanent settler in the area. Dubuque developed relationships with the Mesquakie (Fox) Native Americans upon settling in the area, eventually leading to the signing of the Black Hawk Purchase Treaty in 1837. After the treaty was signed, Dubuque became a city and opened the area up to mining, which allowed the population of Dubuque to grow substantially as it became a major river city (City of Dubuque, 2014a). However, by the 1980s, the city's riverfront was experiencing environmental degradation, low property values, and industrial businesses adjacent to the downtown area. In the late 1990s, the "American's River Project" was created and became a $400 million revival of the riverfront. The Port of Dubuque Master Plan proposed six phases of redevelopment. Phases I to IV concentrated on the North Port area to transform 90 acres of brownfield property into a "campus capturing the historical, environmental, educational and recreational majesty of the Mississippi River" (University of Iowa, 2013; City of Dubuque, 2014a). The project included the construction of the Mississippi Riverwalk, the National Mississippi River Museum and Aquarium, the Grand River Center, the Grand Harbor Resort, and the Star Brewery. All five of these projects are located along the riverfront property in what is now known as the "Port of Dubuque," which attracts many visitors to the area each year.

The "America's River Project" is currently in Phases V and VI, which focus on the South Port area and include a plan for redevelopment of this area into a green space and mixed-use development (Figure 4-5). The South Port is approximately 33 acres and is bisected by the historic Julien Dubuque Bridge. It is bordered by the Mississippi River on the east, Ice Harbor on the north, and railroad track and U.S. 151/61 on the west. As part of a 2002 Master Plan, the city proposed a mixed-use redevelopment of the area. The majority of the site would be designated to allow a wide range of uses, including space for offices, commercial/retail operations, entertainment venues, hospitality services, and restaurants. Some portions of the site could also include residential areas. Other proposed uses for the site include open space, the existing U.S. Coast Guard site, and a new marina area (City of Dubuque, 2012).

Figure 4-5: South Port Redevelopment Rendering

Source: University of Iowa, 2013

Additional land use development planning for the Southport continued to occur; a study to determine future possibilities for the South Port was conducted by students at the University of Iowa School of Urban and Regional Planning from August 2012 to May 2013. The study assessed the state of the South Port and re-examined the vision for this portion of Dubuque. The study concluded that low density mixed use including open space and recreational opportunities would be a better use for the area. The study also stated that the South Port would be best suited as a “green gateway to Dubuque” to better align with the city’s sustainability goals (University of Iowa, 2013).

East Dubuque, Illinois, is located in Jo Daviess County immediately east of Dubuque and the Mississippi River. The town has a population just over 1,700 people, and is connected to Dubuque via the Julien Dubuque Bridge. East Dubuque is close to the Illinois-Wisconsin state border as well, with Highway 35 serving as a connection to Grant County, Wisconsin. Sinsinawa Avenue is north of Highway 20 in the town and has many shops and restaurants, and the public library. North of Sinsinawa Avenue is Gramercy Park. North of Gramercy Park is residential development spanning past the Wisconsin state line. This housing area has scenic views of downtown Dubuque as well as the bluffs west of Dubuque.

4.3 Existing Conditions in Non-Refuge Crossing Locations

The four non-Refuge alternative crossing locations are L&D 11, Highway 151 and Julien Dubuque Bridges, and the existing transmission line crossing at the Galena 161 kV location.

4.3.1 L&D 11

Lock and Dam No. 11 is located northeast of Dubuque, Iowa, on the Mississippi River (Figure 3-2). The dam forms the division between Pool 11 and Pool 12 of the Mississippi River. The dam was placed in operation in 1937 and is listed on the NRHP. Historically, the lock has had between 12 million and 22 million tons of cargo pass through the lock every year (USACE, 2015b). The site has an observation deck and a picnic area, and walking tours of the lock and dam are given on Sundays. Eagle Point Park, a city park, is located west of the lock and dam. As a result of the topography and increased elevation at Eagle Point Park, the park has several scenic overlooks of the Mississippi River, the lock and dam, and the surrounding landscape. Eagle Point Road provides access to Sunfish Lake Landing, a boat ramp located just east of the Lock and Dam No. 11 facility. To the east of the lock and dam is O'Leary Lake Recreation area, which is managed by WDNR.

4.3.2 Highway 151 Bridge

The Highway 151 Bridge is a steel arch suspended deck bridge that connects Dubuque, Iowa, to Wisconsin (Figure 3-2). The bridge was opened in 1982. It is a four-lane highway and is the second largest arch bridge on the Mississippi River. The bridge extends through Schmitt Island before crossing the Mississippi River channel (Weeks, 2014). Schmitt Island has multiple uses along the highway. The Mystique Casino is located north of the highway and has a Hilton Garden Inn located adjacent to the casino property. North of the casino is Riverview Park, which has several trails and a camping area. South of the highway on Schmitt Island is the McAleece Park and Recreation Complex, which has four baseball fields, a skate park, and parking areas. The Mystique Community Ice Center is located just west of the McAleece Park and Recreation Complex. On the southern end of the island is the American Marine-Dubuque Yacht Basin and a local restaurant.

4.3.3 Galena 161 kV

The Galena 161 kV is an existing 161 kV transmission line that extends from Dubuque, Iowa, to East Dubuque, Illinois. The line is owned by ITC Midwest. The Mississippi River crossing begins at the Dubuque Yacht Basin and extends to the bluffs of East Dubuque, over Hiawatha Drive to the East Dubuque Substation. The length of the Mississippi River crossing at this location is approximately 2,000 feet. Located just 2,000 feet south of the existing Galena 161 kV line (on the Iowa side) is a 69 kV line that crosses near the existing 161 kV line on the Iowa side and extends across the river to the Wisconsin side where it meets the 161 kV line location (Figure 3-2). As a result of the similar location of these lines, only one crossing location was included for this particular area. As noted earlier, the Galena 161 kV line is one of only three transmission line crossings of the Mississippi River within the ACA Study Area, the others being the 161 kV and 69 kV line crossing at Stoneman and the 69 kV transmission line crossing near the Galena 161 kV line at Dubuque. The Galena 161 kV line extends through the residential community on the bluffs in East Dubuque that has scenic views of downtown Dubuque and the bluffs west of downtown.

4.3.4 Julien Dubuque Bridge

The Julien Dubuque Bridge is a steel arch truss bridge with a suspended deck. It extends between Dubuque, Iowa, and East Dubuque, Illinois, over the Mississippi River (Figure 3-2). The bridge is 5,760 feet long and is the second longest over the Mississippi River, the fourth longest in the U.S., and the eighth longest in the world (Iowa Department of Transportation [IDOT], nd.). The bridge was built in 1943. Due to congestion, IDOT has developed plans to build a second bridge parallel to the existing Julien Dubuque Bridge; the rebuild is dependent on receipt of necessary state and federal funds.

4.4 Existing Conditions in Refuge Crossing Locations

The three Refuge alternative crossing locations include L&D 10, Nelson Dewey, and Stoneman.

4.4.1 L&D 10

Lock and Dam No. 10 is located immediately east of the City of Guttenberg, Iowa, at mile 615.0 of the Mississippi River (Figure 3-2, Page 1). The dam forms the dividing line between Pool 10 and Pool 11 of the Mississippi River and has a lock chamber size that is 110 feet wide by 600 feet long, with a vertical lift of 8 feet. The dam was placed in operation in 1937. Between 11 million and 22 million tons of cargo passes through the lock every year, with farm products as the major commodity (USACE, 2015a). The dam registers approximately 4,000 to 5,000 boat lockages per year.

The dam is located immediately adjacent to downtown Guttenberg, the Lock and Dam Observation Deck/Lock Master House Museum, and the IDNR Aquarium. South of the L&D No. 10 crossing are additional public lands including Goetz Island, Swift Slough, and Guttenberg Ponds Sanctuary. These recreational areas have hunting and fishing access restrictions (a portion of Goetz Island is listed by the USFWS as a no-hunting/no-fishing zone), depending on the season and specific area being accessed.

4.4.2 Nelson Dewey

The Nelson Dewey ACA route extends across the Mississippi River and past the Nelson Dewey Substation (Figure 3.3, Page 2). The Nelson Dewey Substation is located immediately adjacent to the Nelson Dewey Power Plant. The area surrounding the plant is wooded, developed open space, or low intensity development such as the substation and associated transmission structures. County Highway VV and a BNSF railroad are immediately north of the Nelson Dewey Substation area and extend southeast into Cassville, Wisconsin. A communication tower is on the bluff approximately 1,500 feet northeast of the substation. Northwest of the substation is the coal yard for the recently-retired power plant. Also, a small pond is northwest of Nelson Dewey Substation location.

4.4.3 Stoneman

The Stoneman alternative crossing location includes the existing Turkey River-Stoneman 161 kV line and the Millville-Stoneman 69 kV line as well as the portion of the 161 kV line through the Village of Cassville (Figure 3.3, Page 2). The Stoneman Substation is located immediately adjacent to the DTE Energy Services bio-fuels plant in southern Cassville, Wisconsin which ceased operation in 2015. The area surrounding the substation includes Riverside Park, the Cassville public access boat launch, a BNSF railroad, and Highway 133, which is part of the Great River Road of Wisconsin. Cassville Elementary School, Cassville Middle School, and Cassville High School are located north of the substation area. Several homes, a place of worship, a daycare, and multiple outbuildings are also located north of the Stoneman Substation. The Cassville Municipal Airport is located approximately 2,200 feet east-southeast of the Stoneman Substation area.

5.0 ANALYSIS OF ACA ROUTES AND ALTERNATIVE CROSSING LOCATIONS

This chapter provides an analysis of all seven ACA routes and alternative crossing locations considered for the Project. The analyses performed include a review of the sensitive resources and constraints as well as the unique attributes of each ACA route and alternative crossing location. In addition, the Utilities consulted with federal, state, and municipal entities with permitting jurisdiction over each crossing location to assess whether the identified crossings were feasible. As previously noted, Utilities analyzed the alternative crossing locations and ACA routes consistent with the USFWS Mitigation Policy, which generally states that no transmission line crossing of the Refuge could be considered by USFWS unless the Utilities could demonstrate that non-Refuge options were infeasible.

Although the complete Cardinal – Hickory Creek Initial Study Area (Figure 1-1) includes the entire Project from the Hickory Creek Substation to the Cardinal Substation, the Utilities began their analysis for the Project by focusing on the Mississippi River crossings and the Refuge. This was chosen as the initial step in the analysis of the alternative crossing locations because the selected Mississippi River crossing location would direct future alternative routes for the Project in both Iowa and Wisconsin.

The selection of alternative crossing locations began with the identification of the ACA Study Area that would both meet the Project purpose and need and include potential existing infrastructure crossings of the Mississippi River consistent with the intended Project configuration. The Utilities then inventoried existing infrastructure at these potential alternative crossing locations, including existing transmission lines and roads, and identified alternatives to avoid crossing Refuge lands, pursuant to USFWS Mitigation Policy. In consultation with USFWS staff, the Utilities identified seven alternative crossing locations within the ACA Study Area. Four of the alternative crossing locations are located outside the Refuge, and three are within the Refuge boundaries. The seven alternative crossing locations are listed as follows (from north to south):

1. Lock and Dam No. 10 in Guttenberg, Iowa (L&D 10)
2. Turkey River Substation to the Nelson Dewey Power Plant crossing in Cassville, Wisconsin (Nelson Dewey)
3. Millville to Stoneman 69 kV transmission line and Turkey River to Stoneman 161 kV line crossing (co-located) in Cassville, Wisconsin (Stoneman)
4. Lock and Dam No. 11 in Dubuque, Iowa (L&D 11)
5. Highway 61/151 crossing in Dubuque, Iowa (Highway 151 Bridge)
6. Dubuque to Galena 161 kV line crossing in Dubuque, Iowa (Galena 161 kV Line)

7. Julien Dubuque Bridge/Highway 20 crossing in Dubuque, Iowa (Julien Dubuque Bridge)

5.1 Overview of Methodology

Once the alternative crossing locations were identified, Geographic Information System (GIS) data, field reconnaissance, and other constraint data and information related to the technical/economic feasibility and potential engineering, environmental, and social impacts were then gathered for the ACA Study Area. The Utilities visited the ACA Study Area to conduct a field review to confirm data and aerial photography features, as well as to identify any additional constraints or potential impacts. The Utilities also met with and/or consulted representatives from the various municipalities and state and federal agencies within the ACA Study Area. This included agencies with either permitting jurisdiction or operational control over existing infrastructure located at specific alternative crossing locations.

To calculate potential impacts to the sensitive resources within the ACA Study Area, preliminary routes (ACA routes) were developed from the Hickory Creek Substation in Dubuque County, Iowa to all seven of the alternative crossing locations. All of these ACA routes originate at the Hickory Creek Substation and then extend generally east to their respective alternative crossing location, extending 0.5 mile east of the Mississippi River into Illinois or Wisconsin (depending on the specific ACA route).

All ACA routes in Iowa outside of municipalities satisfy the requirements of Iowa Code § 478.18(2) and 199 IAC 11.1(7), which require route planning to begin with segments that are located near and parallel to roads, ROW of active railroads, or division lines of land. Although route planning for the portions of the ACA routes through the Refuge began in accordance with Iowa Code § 478.18(2) and 199 IAC 11.1(7), these routes across the Refuge were not practical or reasonable based on USFWS feedback. The Wisconsin portions of the ACA routes comply with Wisconsin Siting Priorities law which requires, to the greatest extent feasible, following corridors in this order: existing utility corridors, highway and railroad 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, and then new corridors. The Illinois Commerce Commission (ICC) has siting authority for transmission lines in Illinois and must grant a CPCN (220 ILCS 5/8-406.1). Routing analysis also takes into account economic and engineering considerations, electric system reliability, and consideration of environmental resources.

ACA routes were studied only within the ACA Study Area and for the primary purpose of completing a comparative analysis of the alternative crossing locations. The development of the ACA routes was necessary to provide a quantitative analysis of the resources and land uses underlying the alternative crossing locations and the preliminary routes that would be required for each crossing.

While this ACA includes routes for purposes of evaluating the alternative crossing locations, Utilities are currently evaluating potential corridors that extend end-to-end for the Project. Data collected as part of this ACA will be used in the development of those corridors.

An analysis was conducted for each of the ACA routes based on 38 criteria developed specifically for the Project and related to engineering considerations, environmental issues, and potential social impacts (Appendix A). No single ACA route was found to be "least impacting" for all of the 38 measured criteria. For example, although a particular ACA route may have been the shortest, it may have had greater impacts in other important criteria, such as the presence of wetlands. With the level of complexity resulting from the differences in the ACA routes, their respective lengths, the evaluation criteria, and various units of criteria measurement, a detailed route-by-route comparison of all seven ACA routes against all 38 criteria developed for this Project was not conducted. Instead, the routing team analyzed each ACA route separately to determine constraints, opportunities, and potential impacts. Key considerations from each ACA route and alternative crossing location were compared against other ACA routes and alternative crossing locations to provide an overall sense of the type and extent of the potential impacts that may be encountered from utilizing a specific alternative crossing location. The results of these comparisons were also assessed in conjunction with a review of applicable agency and municipality determinations regarding the permittability of the specific alternative crossing location.

In addition, the unique aspects of each specific alternative crossing location and ACA route were also assessed. These unique aspects included factors such as the nature of the land uses near the alternative crossing location and/or ACA route; specific resources, such as the Mississippi Flyway or state parks; the extent of residential and commercial proximity to the ACA routes; and, importantly, the impact and engineering analyses undertaken by the agencies or municipalities with jurisdiction and their ability to issue the necessary permits for a specific alternative crossing location.

Using results from field reconnaissance, output of the criteria analysis, and agency consultation regarding permittability, the Utilities assessed the relevant portions of the ACA routes for potential impacts to Refuge lands pursuant to the USFWS Mitigation Policy, which requires an examination of options to avoid impacts to Refuge lands, followed by impact minimization, and, lastly, compensation/mitigation. In following this policy, the Utilities first considered whether there were feasible options to avoid the Refuge, followed by an analysis of the remaining ACA routes and alternative crossing locations within the Refuge.

5.2 NEPA and the Analysis of Alternative Crossing Locations

For the Refuge and Mississippi River crossing, the Project must obtain approvals from multiple federal agencies that must complete environmental reviews under NEPA. As a result of this, the Utilities considered NEPA requirements as part of the alternatives analysis contained in this ACA report. Among other requirements, NEPA requires that alternatives to the proposed action be developed, and that the Project "rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated" (40 CFR 1520.14 (a)).

In addition, to avoid the development of inadequate Project alternatives, alternatives may be eliminated from detailed study when they would not address a "project's purpose and need, would have unacceptable environmental impacts, or would pose engineering obstacles."[24] The elimination of a technically feasible alternative may also be appropriate where the implementation would be prohibitively expensive.

"An alternative is 'reasonable' if it is objectively feasible as well as 'reasonable in light of [the agency's] objectives.'"[25] The USFWS specifies that "[r]easonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant."[26]

Furthermore, courts have held that an alternative can be found infeasible because a non-federal agency or non-federal regulation would not allow the alternative to be constructed, or where other agency approval would be required before construction but that other agency has refused to approve the construction.[27] The decision by a federal agency not to select an alternative has also been upheld where the alternative had a "lack of practicality" due to cost and a state agency would not approve that alternative.[28] Specifically, the court concluded that the requirement that an alternatives analysis include alternatives outside the agency's

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[24] *Coalition to Preserve McIntire Park v. Mendez*, 862 F. Supp.2d 499, 531 (W.D. Va. 2012).

[25] *Theodore Roosevelt Conservation P'ship v. Salazar*, 661 F.3d 66, 72 (D.C. Cir. 2011) (quoting *City of Alexandria, Va. v. Slater*, 198 F.3d 862, 867 (D.C. Cir. 1999)).

[26] The CEQ's Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act ("hereinafter NEPA FAQs), 46 FR 18026, 1827, Q. 2a (Mar. 23, 1981).

[27] *Natural Res. Def. Council, Inc. v. F.A.A.*, 564 F.3d 549 (2d Cir. 2009) (Federal Aviation Administration [FAA] did not abuse its discretion in declining to consider alternatives that the Florida Department of Environmental Protection [Florida DEP] would likely not approve); *WildEarth Guardians v. National Park Svc.*, 703 F.3d 1178, 1184-85 (10th Cir. 2013) *Latin Ams. For Social & Econ. Devel. V. Admin. of Fed. Hwy. Admin.*, 756 F.3d 447, 470 (6th Cir. 2014) (FHWA appropriately declined further consideration of an alternative that would have required Canada's agreement before construction and Canada firmly stated its objection to that alternative during the NEPA review).

[28] *WildEarth Guardians v. National Park Svc.*, 703 F.3d 1178, 1184-85 (10th Cir. 2013).

jurisdiction "is not meant to force an agency to consider alternatives rendered infeasible by the actions of another agency."[29] Consistent with the above guidance, the Utilities investigated the technical and economic feasibility of each of the seven ACA routes and alternative crossing locations.

5.3 Site Reconnaissance and GIS Analysis

Once existing infrastructure crossing locations were identified, the Utilities collected resource data related to existing conditions in the ACA Study Area, performed a field review of the ACA Study Area, and developed each ACA route. Resource data included ArcGIS data, information from various federal, state and local agencies or groups, and data obtained from field review. The field reviews were done to field-verify GIS data as well as obtain information on recent developments and/or resources that were not in the GIS data. GIS data included, but was not limited to:

- Existing transmission infrastructure
- National Land Cover Dataset (NLCD)
- National Wetland Inventory (NWI)
- National Hydrography Dataset (NHD)
- Federal Emergency Management Agency (FEMA) floodplain data
- Conservation easements, parks, and wildlife management areas
- Scenic Byway data
- National Elevation Dataset
- Existing structures (such as residences, businesses, agricultural buildings)
- National Agriculture Imagery Program aerial photography

Environmental and land use data was collected for the ACA Study Area, and a desktop analysis using ArcGIS software was performed. The data was also used to guide development of the ACA routes to all seven alternative crossing locations.

The ACA study team performed field reviews on several dates. The team visited the area between the Hickory Creek Substation and Cassville, Wisconsin, from August 19 through 21, 2013. The team visited the area again on August 13 through 15, 2014. The study team visited the Dubuque and East Dubuque area from October 21 to 23, 2014.

[29] *Id.*

5.4 Evaluation Criteria for ACA Routes

The resources observed during the field review were used in conjunction with the information provided by agencies, environmental groups, and city and county representatives to determine evaluation criteria to be analyzed for each ACA route. The evaluation criteria included a total of 38 criteria divided into three categories. These categories include engineering, environmental, and social considerations. Evaluation criteria are quantifiable characteristics that can be used to compare the potential impacts of one ACA route to another ACA route, providing an indication of the comparative potential impacts among all seven alternative crossing locations. The Utilities also evaluated the alternative crossing locations for feasibility as a separate consideration. Descriptions of each of the criteria are provided below, in detail. The broad range of criteria developed for this Project reflects the differences and variety of existing conditions for each alternative crossing location and ACA route. For example, in Iowa, the ACA routes through Dubuque extend through densely developed municipal areas, whereas the other ACA routes cross primarily agricultural or undeveloped land. The broad range of criteria enabled the Utilities to review and analyze the overall potential impacts for each alternative crossing location and ACA route.

5.4.1 Engineering

The engineering evaluation criteria are:

1. **Total length (miles):** Total length indicates the overall extent of the route and its presence in the landscape, and generally reflects potential material and construction costs.
2. **Angles greater than 30 degrees (number):** Angles exceeding 30 degrees require a larger, more costly structure that will increase the area of land disturbance.
3. **Length not along existing transmission lines (miles):** The purpose of this criterion was to determine the length of transmission line that would need to be built along new ROW, creating a new transmission line ROW rather than confining the route to areas of existing transmission line ROW.
4. **Length of Mississippi River crossing (miles):** Total length at each potential ACA route from the western bank of the Mississippi River to the eastern bank.
5. **Airport, airstrip, or heliport within 1 mile (number):** Air facilities within 1 mile of an ACA route. Air facilities in close proximity to an alternative may restrict the height of transmission line structures or otherwise impact potential design.
6. **Water towers within 300 feet (number):** Water towers, existing and planned, within 300 feet of an ACA route.
7. **Communication facilities within 1,000 feet (number):** Communication towers within 1,000 feet of an ACA route were identified; in addition to the facility itself, communication facilities can

include the use of guy wires that expand the facilities potential footprint in relation to the presence of overhead transmission lines.

8. **Length through USACE Restricted Areas (miles):** Length through areas near lock and dam infrastructure that are designated by the USACE as restricted areas (City of Dubuque, 2014b).
9. **Length through floodplain (miles):** Length through FEMA-designated floodplain areas.
10. **Topographical relief (miles):** The purpose of this criterion was to determine the length of transmission line that would need to be built through terrain with steep slope. Segment lengths through slopes greater than 30 percent were quantified.

5.4.2 Environmental and Land Use

The environmental and land use evaluation criteria are:

1. **Total wetland acres within the ROW (acres):** Indicates the acreage of wetlands that would be potentially affected along the transmission line ROW. Wetlands were measured from NWI maps produced by the USFWS. Areas of open water associated with stream, river, or lake crossings were included in wetland totals.
2. **Forested/shrub wetland acres within the ROW (acres):** Indicates the acreage of wooded wetlands that would be potentially affected along the transmission line ROW. Wetlands were measured from NWI maps produced by the USFWS.
3. **Emergent wetland areas within the ROW (acres):** Indicates the acreage of freshwater emergent wetlands that would be potentially affected along the transmission line ROW. Wetlands were measured from NWI maps produced by the USFWS.
4. **Woodland within the ROW (acres):** Indicates the ROW acreage for each segment that is woodland and would need to be cleared. Woodland was measured using the NLCD.
5. **Streams/waterways crossed (number):** Quantifies the number of perennial or intermittent river, stream, or creek crossings for each proposed segment. Stream crossings also indicate potentially rough or uneven terrain, which could increase construction complexity and cost. The data used was part of the NHD and was provided by the USGS.
6. **Length through state or local public lands (miles):** Indicates total length through state and local public lands that would be potentially affected by the Project. State and local public lands were mapped using state and county-level data.
7. **Length through private conservation easements (miles):** Indicates total length through private conservation lands that would be potentially affected by the Project. Private conservation easements were mapped using the National Conservation Easement Database, the Protected Areas

Database of the U.S. (PADUS), and various maps from state environmental agencies and local environmental groups.

8. **Length through USFWS Refuge (feet):** Indicates total length through USFWS Refuge lands that would be potentially affected by the Project. Refuge lands were mapped using USFWS maps and GIS data, as well as using PADUS.
9. **USFWS Refuge Land within ROW (acres):** Indicates the acreage of Refuge land that would be potentially affected along the transmission line ROW. Refuge lands were mapped using USFWS maps and GIS data, as well as using PADUS.
10. **Parks within 1,000 feet (number):** Indicates total parks that would be within 1,000 feet of an ACA route and may potentially be affected by the Project. Park lands were mapped using Environmental Systems Research Institute data, PADUS, IDNR GIS data, WDNR GIS data, and municipal data.

5.4.3 Social Issues

The social evaluation criteria are:

1. **Residences within 0-25 feet (number):** Residences between 0 and 25 feet of the centerline of the proposed ACA route.
2. **Residences within 26-50 feet (number):** Residences between 26 and 50 feet of the centerline of the proposed ACA route.
3. **Residences within 51-100 feet (number):** Residences between 51 and 100 feet of the centerline of the proposed ACA route.
4. **Residences within 101-300 feet (number):** Residences between 101 and 300 feet of the centerline of the proposed ACA route.
5. **Schools within 300 feet (number):** Schools within 300 feet of the centerline of the proposed ACA route.
6. **Daycare facilities within 300 feet (number):** Daycare and childcare facilities within 300 feet of the centerline of the proposed ACA route.
7. **Hospitals within 300 feet (number):** Hospital facilities within 300 feet of the centerline of the proposed ACA route.
8. **Places of worship within 300 feet (number):** Places of worship within 300 feet of the centerline of the proposed ACA route.
9. **Business/commercial structure within 300 feet (number):** Business or commercial structures and buildings within 300 feet of the centerline of the proposed ACA route.

10. **Public facilities within 300 feet (number):** Quantifies the number of public facilities between 0 and 300 feet of the ACA route. Public facilities included, but were not limited to, structures such as fire stations, museums, libraries, and public swimming pools.
11. **Cemeteries within 300 feet (number):** Cemeteries within 300 feet of the centerline of the proposed ACA route.
12. **Archaeological sites within ROW (number):** Quantifies the number of known, recorded archaeological sites within the proposed ROW for each ACA route. The sites investigated include archaeological sites listed on the NRHP as well as other recorded sites. Data was obtained from the Iowa State Historic Preservation Office (SHPO), the Wisconsin Historical Society, and the Illinois Historic Preservation Agency.
13. **Historical resources within 1,000 feet (number):** Quantifies the number of known, recorded historical sites or districts within 1,000 feet of each ACA route. These sites include historic sites listed on the NRHP, as well as other recorded sites. Data was obtained from the Iowa SHPO, the Wisconsin Historical Society, and the Illinois Historic Preservation Agency.
14. **Length not along actual or apparent fence row or property line (miles):** This criterion calculated the length of each ACA route that is not along or adjacent to field lines or property lines. This data was determined by reviewing aerial photography for the presence of field lines and parcel data obtained from Clayton, Dubuque, Jo Daviess, and Grant Counties for property lines.
15. **Length through developed space (miles):** Indicates total length through developed lands that would be potentially affected along each ACA route. Developed lands were mapped using NLCD GIS data. Developed lands include developed open space, low intensity development, medium intensity development, and high intensity development.
16. **Length through cultivated crops (miles):** Indicates total length through cultivated cropland that would be potentially affected along each ACA route. Cultivated croplands were mapped using NLCD GIS data.
17. **Length through pasture/hay land (miles):** Indicates total length through pasture/hay land that would be potentially affected along each ACA route. Pasture and hayland areas were mapped using NLCD GIS data.
18. **Length through prime farmland (miles):** Indicates the total length of each ACA route that is designated by the USDA Natural Resources Conservation Service (NRCS) as prime farmland. The prime farmland data is obtained from the USDA NRCS Soil Survey Geographic data.

5.4.4 Feasibility

For each of the ACA routes and alternative crossing locations, the Utilities conducted an analysis to determine if it was technically and economically feasible.[30] The Utilities used NEPA guidance and case law to make a feasibility determination. The analysis included an assessment of whether necessary approvals could be obtained from local, state, and federal authorities.

5.5 Overview of the Alternative Crossing Evaluation Process

A total of seven ACA routes and alternative crossing locations were analyzed as part of the ACA. The ACA routes developed for this Mississippi River crossing analysis satisfy the respective siting requirements in Iowa and Wisconsin. Iowa Code § 478.18(2) and 199 IAC 11.1(7) require segments to be located near and parallel to roads, ROW of active railroads, or division lines of land. In Wisconsin, preliminary corridors follow the priorities set forth in the Wisconsin Siting Priorities Law. Wisconsin's Siting Priorities Law requires to the greatest extent feasible—that is, consistent with economic and engineering considerations, reliability of the electric system, and protection of the environment—that Utilities site transmission lines according to the following prioritized order: existing utility corridors; highway and railroad 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; and then new corridors.

The overall analysis contained in this ACA involved four primary steps: 1) developing an ACA Study Area that would both meet the Project purpose and need and include existing crossing locations consistent with the intended Project configuration; 2) inventorying the existing infrastructure locations within the ACA Study Area; 3) gathering data and information on the technical and economic feasibility (as well as permittability by authorities with jurisdiction over a crossing location) and potential engineering, environmental, and social impacts of the ACA routes and alternative crossing locations, and 4) comparing the pertinent portions of the ACA routes and alternative crossing locations pursuant to the USFWS Mitigation Policy to identify a recommended crossing location for the Project. Chapter 3 detailed the development of the ACA Study area, and Chapter 4 presented the inventory results of the existing resources within the ACA Study Area. Chapter 5 provides the results of the data and information gathered

[30] "Technical feasibility" includes the ability to obtain permits from any entity with jurisdiction, such as the ACOE and the City of Dubuque. If a jurisdictional entity refuses to issue permits required for an alternative, then that alternative is not technically feasible.

in Step 3, and provides a comparison of all seven ACA routes and alternative crossing locations, according to the USFWS Mitigation Policy (avoid, minimize, mitigate).

As such, the following sections provide the following general order of alternative assessment:

1. Identification and review of ACA route characteristics
2. Presentation of constraint data from 38 criteria developed to assess potential impacts of each ACA route
3. Review of the unique characteristics of each alternative crossing location and ACA route, including the required permits from agencies or municipalities with jurisdiction
4. Conclusion and assessment of each alternative crossing location and ACA route developed for this Project

An analysis of the potential impacts associated with the non-Refuge locations is presented first, followed by assessment of the three Refuge alternative crossing locations.

5.6 Non-Refuge ACA Routes and Alternative Crossing Locations

As a result of ongoing discussions with USFWS staff and pursuant to the USFWS Mitigation Policy, the Utilities first reviewed and assessed the four non-Refuge ACA routes and alternative crossing locations (L&D 11, Highway 151 and Julien Dubuque Bridges, and Galena 161 kV) to determine if a feasible crossing location outside of the Refuge could be utilized for this Project (Figure 5-1).

As a result of the similar location of the four non-Refuge ACA routes and alternative crossing locations in the Dubuque, Iowa area, the ACA routes developed for these locations share the vast majority of their length (ranging from 84 to 96 percent, depending on the specific ACA route selected) with the other ACA routes that extend through Dubuque, Iowa (Figure 5-1). As a result, all four ACA routes at Dubuque have similar types of potential impacts when evaluated using the criteria developed for the Project.

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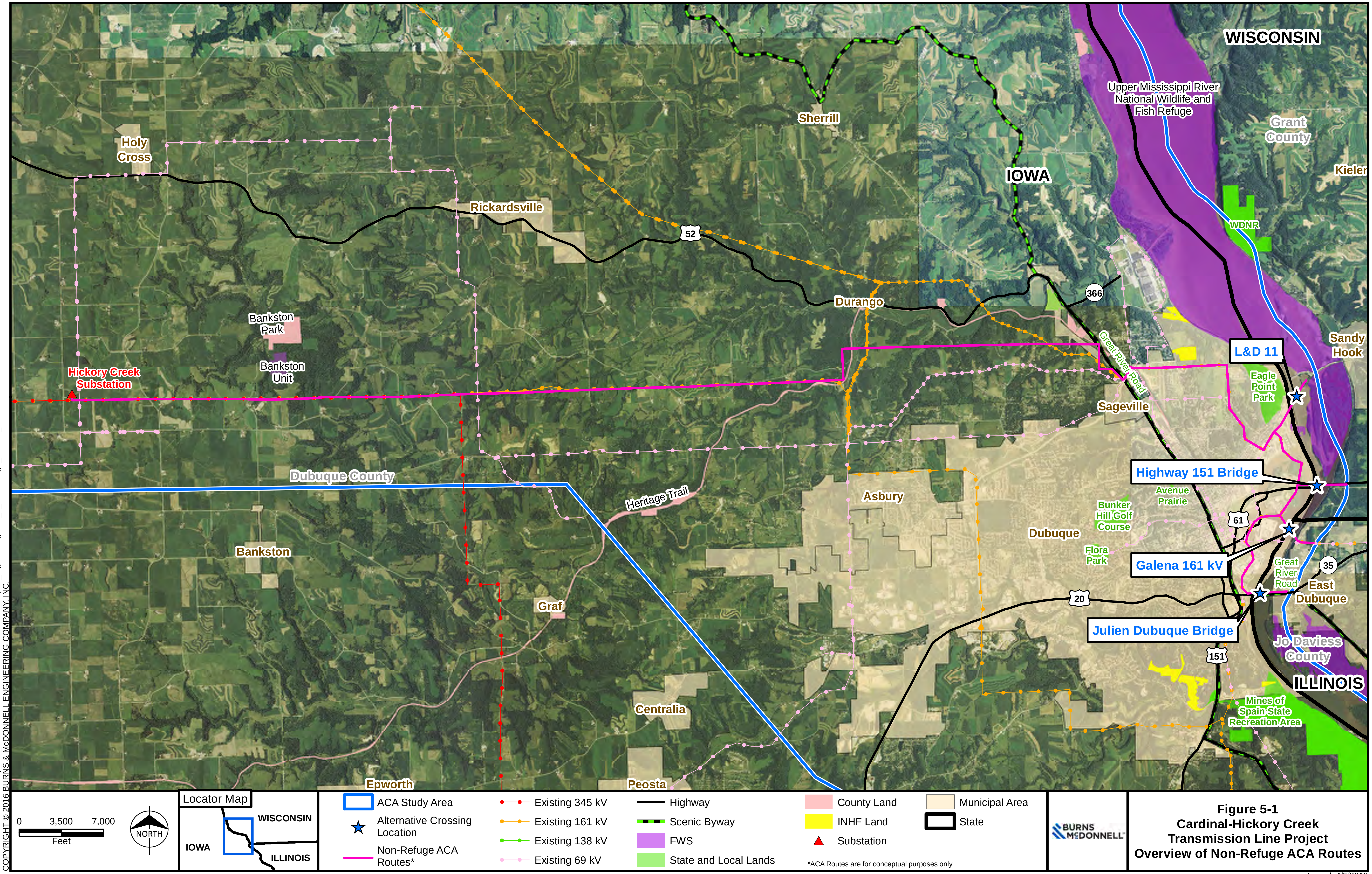

Figure 5-1
Cardinal-Hickory Creek Transmission Line Project
Overview of Non-Refuge ACA Routes

Source: NAIP 2013 Clayton, Dubuque, and Grant Counties; IDNR; FWS; USGS; INHF; Energy Velocity; ESRI; ITC Midwest; Burns & McDonnell

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5.6.1 L&D 11 Alternative Crossing Location and ACA Route

The L&D 11 alternative crossing alternative is located at the north end of Dubuque, Iowa, near Eagle Point Park (Figure 5-2). Lock and Dam No. 11 is located within property managed and regulated by the Rock Island USACE District.

As with all ACA routes, the preliminary ACA route for L&D 11 begins at the proposed Hickory Creek Substation in Dubuque County, Iowa. The route generally extends along an existing 161 kV corridor until the existing 161 kV line turns south near Durango, Iowa, just northeast of Dubuque. The L&D 11 ACA route then extends generally east, crossing Highway 52 before entering the city limits of Dubuque. The route extends along the alignment of an existing transmission line through the northern portion of Dubuque, extending along the east side of the Mt. Calvary Cemetery before extending down from the bluff along Whittier Street. The route extends northeast along Kerper Boulevard and continues northeast, crossing Hawthorne Street before the last structure on the Iowa side of the Mississippi River along Volunteer Drive. The ACA route then crosses to Eagle Point Lane in Wisconsin, just south of Lock and Dam No. 11. Surrounding land uses in this area include a mix of agricultural lands and single family residences, as well as recreational facilities such as Birchwood golf course.

5.6.1.1 Constraint Output

The following sections discuss the constraint output for the L&D 11 ACA route. The full constraint output for this ACA route is presented in Table 5-1 (a full comparative of the data output for all seven alternative crossing locations in located in Appendix A). To guide the comparative analysis of the ACA routes, key characteristics of the 38 evaluation criteria are presented below. The analysis of these key characteristics provides an overall summary of the potential impacts of utilizing the L&D 11 ACA route and alternative crossing location.

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ACA Study Area
L&D 11 ACA Route*
USACE Restricted Area
Existing 161 kV
Existing 69 kV
Refuge
State and Local Lands
Rail
School
Home
Business/Commercial
Church
Water Tower
Cemetery
Park
Tower
Highway
Scenic Byway
Municipal Area
County

*ACA Routes are for conceptual purposes only

Figure 5-2
Cardinal-Hickory Creek Transmission Line Project
L&D 11 ACA Route
Dubuque, Iowa

Source: NTAD, IDNR, USFWS, FHWA, WDNR, Energy Velocity, ESRI, ITC, Burns & McDonnell

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Table 5-1: Potential Impact Summary Table for L&D 11 ACA Route

Criteria	Output	Criteria	Output
Engineering		**Social**	
Total length (miles)	22.3	Residences within 0-25 feet (number)	9
Number of angles greater than 30 degrees	13	Residences within 26-50 feet (number)	14
Length not along transmission lines (miles)	8.2	Residences within 51-100 feet (number)	35
Length of Mississippi River crossing (miles)	0.5	Residences within 101-300 feet (number)	150
Airport, airstrip, or heliport within 1 mile (number)	0	Schools within 300 feet (number)	0
Water towers within 1,000 feet (number)	1	Daycares within 300 feet (number)	0
Communication facilities within 1,000 feet (number)	4	Hospitals within 300 feet (number)	0
Length through USACE restricted area (miles)	0.1	Places of worship within 300 feet (number)	0
Length through floodplain (miles)	0.9	Business/commercial structure within 300 feet (number)	19
Length through terrain with greater than 30% slope (miles)	0.2	Public facilities within 300 feet (number)	2
Environmental		Cemeteries within 300 feet (number)	1
Total wetland acres in ROW (acres)	0.1	Archaeological sites in ROW (number)	3
Forested/shrub wetland in ROW (acres)	0.0	Historical resources within 1,000 feet (number)	74
Emergent wetland in ROW (acres)	0.1	Length not along actual fence row or property line (miles)	6.7
Total woodland acres in ROW (acres)	128.3	Length through developed space (miles)	4.5
Number of streams/waterways crossed	19	Length through cultivated crops (miles)	3.5
Length through state or local public lands (miles)	0.1	Length through pasture/hayland (miles)	7.3
Length through private conservation easements (miles)	0.0	Length through prime farmland (miles)	1.2
Length through USFWS Refuge (feet)	0		
USFWS Refuge land within ROW (acres)	0		
Parks within 1,000 feet (number)	1		

5.6.1.1.1 Social

Key characteristics of the potential impacts to social resources (e.g., residences, public facilities, businesses, cemeteries) resulting from the L&D 11 ACA route are listed below. Due to the nature of Dubuque, Iowa, as a major municipality, the ACA routes that extend through Dubuque are in closer proximity to a higher number of residences and businesses/commercial facilities compared to other ACA routes that travel through less developed areas.

- The L&D 11 ACA route would include 58 residences within the potential ROW; although the other routes that extend through Dubuque are similar, the next largest residential proximity estimate for the ACA routes that are located outside of Dubuque is 18 residences within the ROW (at L&D 10, in Guttenberg).
- The L&D 11 ACA route would include 19 business and commercial facilities within 300 feet of the route; this is similar to the remaining Dubuque ACA routes, with the exception of the Julien Dubuque Bridge, which would have 42 business and commercial buildings within the ROW.
- The L&D 11 ACA route would include the greatest number of public facilities within the ROW of all the Dubuque non-Refuge ACA routes (two public facilities—the Nicholas J. Sutton Public Swimming Pool and the Eagle Point Water Plant).
- The L&D 11 ACA route would include 74 historic resources within 1,000 feet of the corridor alignment and three archaeological sites within the ROW.

5.6.1.1.2 Environmental

In addition to potential impacts regarding construction in urban settings, the four non-Refuge Dubuque ACA routes also share a common segment from Hickory Creek Substation to the downtown area of Dubuque that includes proximity to numerous environmental resources. The key potential environmental impacts of the L&D 11 ACA route are as follows:

- The L&D 11 ACA route would cross the least amount of total wetlands compared to all other ACA routes analyzed in this ACA (0.1 acre).
- The L&D 11 ACA route would cross approximately 129 acres of woodlands, generally similar to the other non-Refuge routes at Dubuque. The ACA route with largest amount of woodlands would be L&D 10 ACA route, at 157 acres of woodlands crossed.
- The L&D 11 ACA route would cross 19 streams and/or waterways. Although this is similar to the other Dubuque alternatives and less than L&D 10 (37 streams), this is higher than the other remaining Refuge ACA routes at Nelson Dewey and Stoneman (each crossing 15 streams/waterways).

- As with the other non-Refuge ACA routes, the L&D 11 ACA route would not cross any Refuge lands (it should be noted that L&D 11 is unique compared to the other Dubuque ACA routes as it is located in a small break between Refuge properties to the north and south. The other non-Refuge ACA routes are located in the large Refuge break associated with the municipality of Dubuque, Iowa).

5.6.1.1.3 Engineering

Key characteristics of the design and engineering required for the L&D 11 ACA route are listed below. As previously noted, the four non-Refuge alternatives at Dubuque use the same common route segment for the vast majority of their length. Although the entire data output is presented for each route through Dubuque (Table 5-1), the primary differences in engineering characteristics among these routes are limited to the unique segments of each route after this shared segment.

- The L&D 11 ACA route is 22.3 miles, the shortest of all the four non-Refuge ACA routes that extend through Dubuque. The longest non-Refuge ACA route at Dubuque is the Julien Dubuque Bridge at 25.2 miles.
- The L&D 11 ACA route has the fewest number of angles greater than 30 degrees compared to all other Dubuque ACA routes (these angles need larger and more robust transmission structures).
- L&D 11, like all the non-Refuge Dubuque ACA routes, would cross over the USACE restricted area related to the floodwall along the Mississippi River. This would require additional analysis of structure locations and further consultation with the USACE regarding placement of structures near the floodwall.

5.6.1.2 Additional Constraints and Feasibility

There are several additional constraints along the L&D 11 ACA route that are not captured in the data output analysis, above. These characteristics help provide some additional information on resources and issues that could affect the feasibility of this ACA route for the Project.

5.6.1.2.1 USACE Evaluation

To determine whether the USACE would allow such a Project on and near the lock and dam facility, the Utilities consulted with the Rock Island District of the USACE to discuss the ACA route and review any technical concerns with a proposed crossing at the location of L&D 11.

The Utilities had numerous discussions with the USACE staff, culminating in a meeting with the Utilities and USACE staff from both the St. Paul and Rock Island Districts in January 2015 to discuss both the

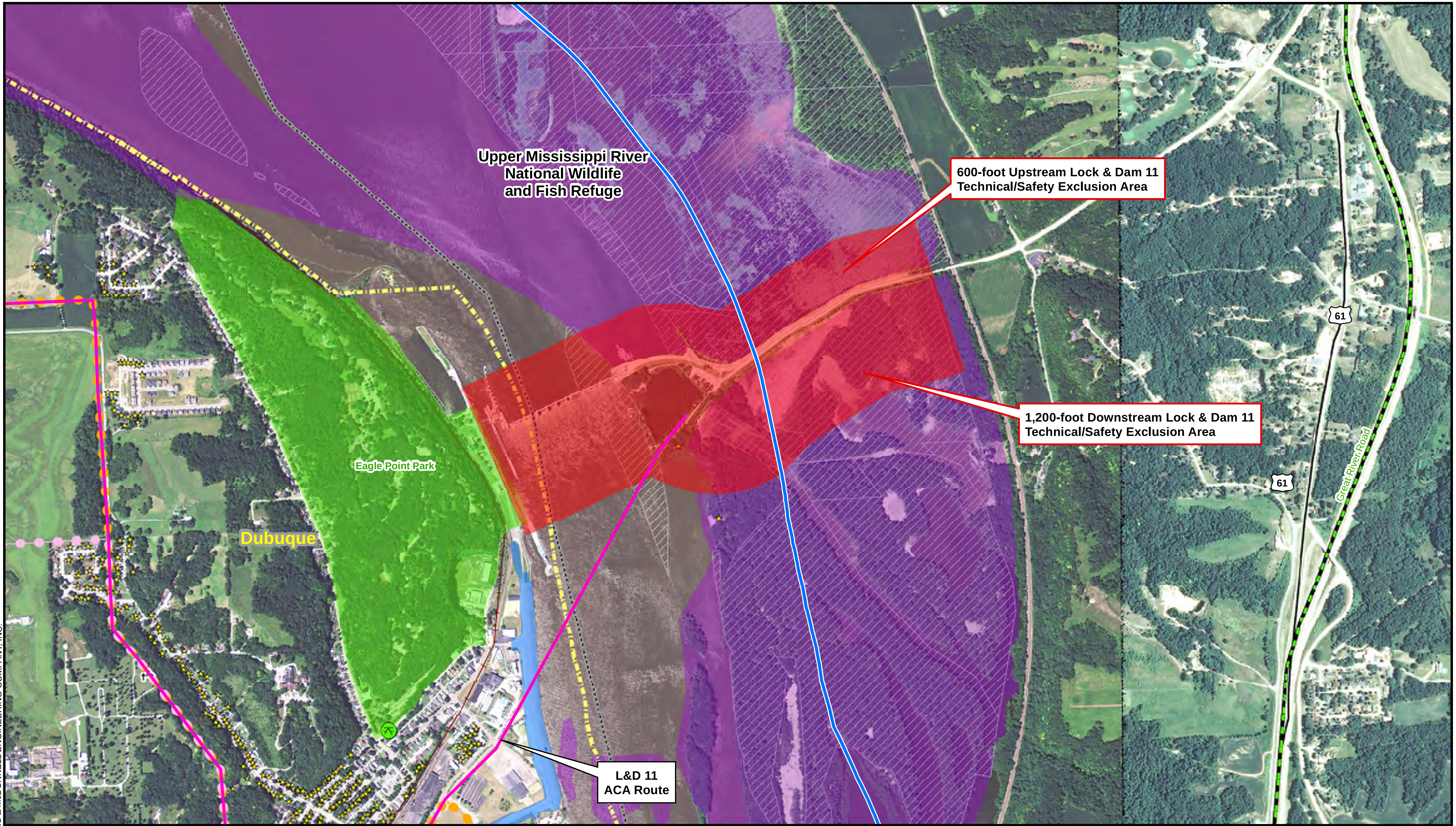
L&D 10 and 11 crossing locations. Previously, in December 2014, the Utilities provided USACE with a preliminary design for a 345 kV transmission line crossing located near Lock and Dam No. 11. Both the Rock Island and St. Paul USACE districts reviewed this preliminary design pursuant to the Rivers and Harbors Act, 33 U.S.C. § 408 and 33 U.S.C. § 403 ("Section 408" and "Section 10"). Based on the design provided by the Utilities, USACE identified several safety and maintenance concerns with the proposed pole locations in relation to the dam facilities.

Based on technical considerations, the USACE determined that the transmission line could not be constructed on Lock and Dam No. 10, Lock and Dam No. 11, their respective spillways, or within 600 feet upstream or 1,200 feet downstream of either dam without adversely affecting the safe operation of the dams (Figure 5-3).[31] The USACE also identified geotechnical concerns with any subsurface activities near the lock and dams, including the excavation necessary to drill foundations for new transmission structures. USACE staff advised that the embankments hold back a significant weight and that if there were construction near the lock and dam, it could shorten seepage paths that would result in "serious integrity concerns for the lock and dams." USACE also indicated that suspended wires from the proposed transmission line near the operating lock and dam posed a safety concern. USACE further advised that construction and use of barges along the braided channel downstream of Lock and Dam No. 10 could also present concerns. See Appendix B (meeting minutes summarizing USACE's review and concerns).

5.6.1.2.2 Archaeological and Historic Resources

Three archaeological sites are within the L&D 11 preliminary corridor ROW. The first site, 13DB492, is an historic Euro-American scatter and prehistoric Late Woodland habitation. The NRHP status of this site is undetermined. The second site, 13DB493, is a historic Euro-American historic scatter and a prehistoric Late Woodland and Middle Archaic habitation. The second site within the ROW is potentially eligible for listing on the NRHP. NRHP-eligible portions of the site outside the ROW were mitigated (Phase III data recovery) during a highway construction project. The last site, 13DB494, is an historic artifact scatter and prehistoric Late Woodland open habitation. The NRHP status for the site is undetermined.

[31] Final Meeting Notes, USACE and ITC Midwest dated February 17, 2015; City of Dubuque Resolution dated June 15, 2015. Appendix B.



ACA Study Area
ACA Route*
Existing 161-kV
Existing 69-kV
FWS
State and Local Lands
USACE Restricted Area
USACE
Rail
Scenic Byway
Highway
Business/Commercial
Cemetery
Church
House
Park
School
Tower
Municipal Area
County
Technical/Safety Exclusion Area

*ACA Routes are for conceptual purposes only

NORTH
0 500 1,000
Feet

WISCONSIN
IOWA
ILLINOIS
Locator Map

BURNS McDONNELL

Figure 5-3
Cardinal-Hickory Creek Transmission Line Project
Lock & Dam 11 ACA Route Technical/Safety Exclusion Area

Path: R:\ITC\74417_Hickory_Crk_Cassville\GIS\DataFiles\ArcDocs\ACA_Report_Figures\Figure5_3_LD11_Exclusion_Areas_20160405.mxd kasamuelson 4/5/2016

Source: USDA NAIP Aerial Photography (Dubuque 2011, Jo Davies 2012), NTAD, USGS, WDNR, IDNR, Energy Velocity, ESRI, ITC, Burns & McDonnell

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The L&D 11 ACA route would be within 1,000 feet of 74 historic-age resources. These resources are all buildings or structures. With the exception of two resources, the historic-age resources within 1,000 feet are not eligible to be listed on the NRHP, are non-contributing in a NRHP district, or have an undetermined NRHP status. The Eagle Point Bridge and the James A. Weitz house are eligible for listing on the NRHP. There is one historic district within 1,000 feet: the Lock and Dam No. 11 Historic District. These findings show that this ACA route could potentially have a high impact on historic-age resources.

5.6.1.2.3 Upstream and Downstream Constraints

The Refuge is located upstream and downstream from the L&D 11 ACA route (as well as with the L&D 10 route in Guttenberg, Iowa). Although there is an operational break at the Lock and Dam No. 11 location which allows for the USACE's management and operation of the facility (pursuant to the 2001 Cooperative Agreement between the USACE and the USFWS), the USFWS manages Refuge lands upstream and downstream of the lock and dam. The areas upstream and downstream of Dubuque, Iowa, include a variety of recreational areas and opportunities. The use of these areas could be affected by both construction and operation activities associated with an overhead transmission line at this location. The Sunfish Lake Landing is located east of the lock and dam. North of Lock and Dam No. 11 on the Iowa side is a portion of the Refuge known as the John Deere Marsh. The area has a hiking trail and a boat landing. This area is part of the USFWS John Deere Wetland Management Unit. The 439-acre John Deere Marsh Closed Area is located immediately north of the wetland area. This area is closed to all migratory bird hunting. No motors and voluntary avoidance occur October 15 through the end of the state duck hunting season in this area. The Mud Lake portion of the Refuge is north of the John Deere Marsh Closed Area, near river mile 588. There is also the Mud Lake Marina and Mud Lake Recreation Area near river mile 589. Downstream and immediately adjacent to the lock and dam is the 376-acre Tailwater Fishing Closure area, which is closed to fishing from December 1 through March 15. East of the Tailwater Fishing Closure is Stumpf Island, which is also part of the Refuge.

5.6.1.2.4 City of Dubuque

The Utilities began consultations with the City of Dubuque in 2012 to discuss the possibility of crossing the Mississippi River at Dubuque. The Utilities had additional meetings with City staff in 2013 and 2014. In late 2014, the Utilities provided preliminary ACA routes that utilize existing infrastructure crossings of the Mississippi River within the City of Dubuque. In addition, the Utilities provided the City of Dubuque with data regarding the potential impacts of these preliminary ACA routes on wetlands, woodlands, residences, historic sites, schools, and other key environmental and social criteria. The City of Dubuque staff examined this data for all three preliminary ACA routes in relation to the City's licensing ordinance for new transmission line facilities. On June 15, 2015, the City of Dubuque passed a resolution that stated:

> the filing of a petition by ITC for a license to erect, maintain and operate a facility within the city as proposed by ITC is not permittable and would not be permitted by the City Council, and that filing an application by ITC and proceeding with the process required by the City of Dubuque Code of Ordinances for such a license would not be in the public interest.

See Appendix C for a full copy of the resolution and associated map.

5.6.1.2.5 Wisconsin Routing Constraints in ACA Study Area

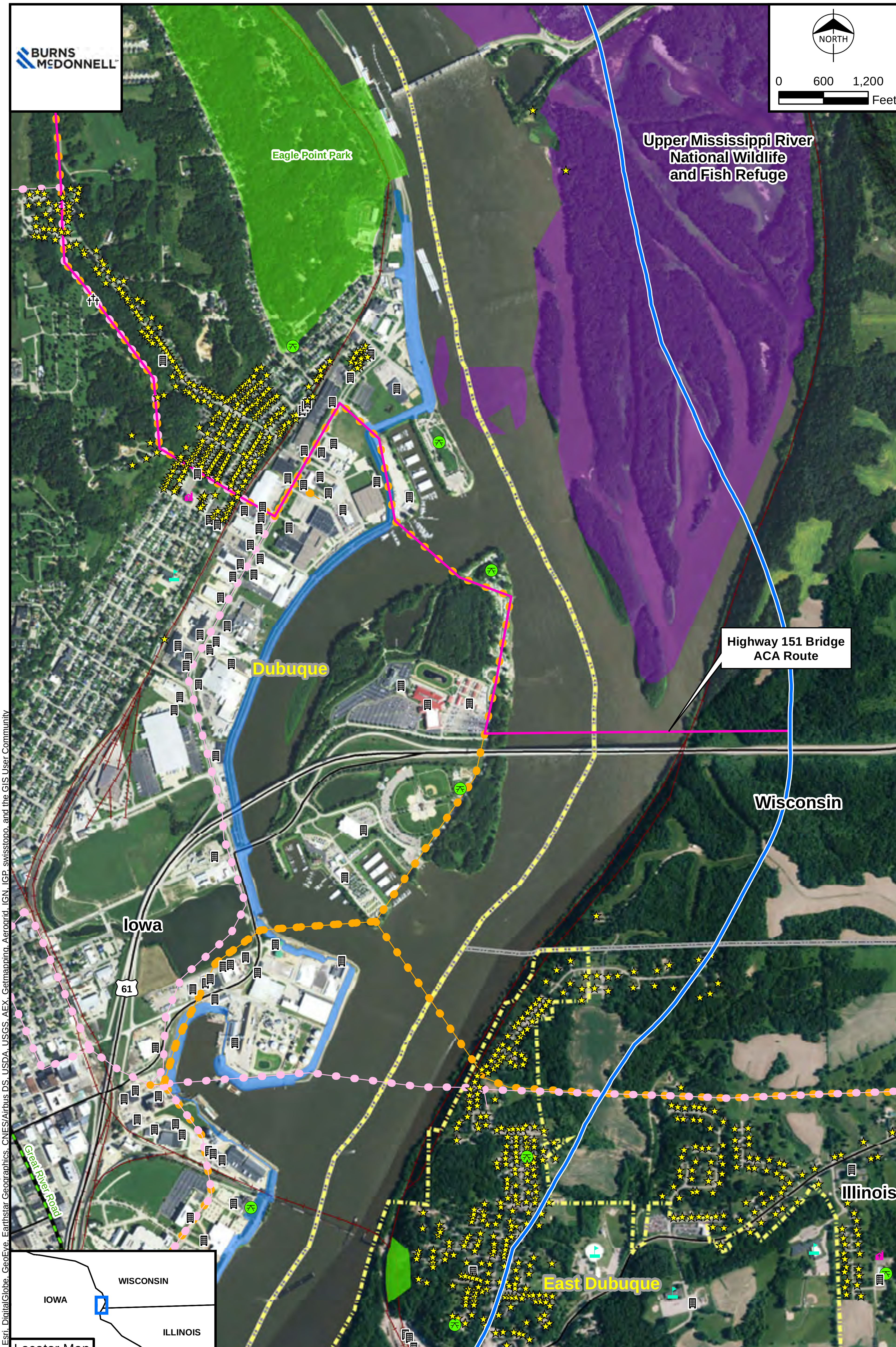
On the Wisconsin side of the Mississippi River, the L&D 11 ACA route would extend toward Eagle Point Lane. This road is also bounded on either side by the Refuge. No existing transmission infrastructure is in this location, so the L&D 11 ACA route would introduce a new feature to the landscape.

5.6.2 Highway 151 Bridge Alternative Crossing Location and ACA Route

The Highway 151 Bridge preliminary ACA route begins at the proposed Hickory Creek Substation in Dubuque County, Iowa (Figure 5-4) and follows the identical location of the common segment of all Dubuque routes to just before the L&D 11 location. From there, the Highway 151 Bridge ACA route extends northeast along Kerper Boulevard before turning and extending along Shiras Avenue. The route crosses to Schmitt Island, where it crosses through Riverview Park and then continues south to the east side of Mystique Casino. The Highway 151 Bridge ACA route then crosses parallel to the Highway 151 Bridge over the Mississippi River to Wisconsin. The ACA route alignment shown extending across both the Julien Dubuque and Highway 151 bridges (Figure 5-4 and Figure 5-5, respectively) is conceptual and is not intended to represent the exact location of a prospective 345 kV alignment on or near either bridge.

5.6.2.1 Constraint Output

The following sections provide details on the constraint output for the Highway 151 Bridge ACA route. The analysis of key characteristics provides an overall summary of the potential impacts of utilizing a route to the Highway 151 alternative crossing location. The full constraint output for this ACA route is presented in Table 5-2. A full comparative of the data output for all seven alternative crossing locations in located in Appendix A.



ACA Study Area
Highway 151 Bridge ACA Route*
USACE Restricted Area
Existing 161 kV
Existing 69 kV
FWS
State and Local Lands
Rail
School
Home
Business/Commercial
Church
Water Tower
Cemetery
Park
Tower
Highway
Scenic Byway
Municipal Area
County

*ACA Routes are for conceptual purposes only

Figure 5-4
Cardinal-Hickory Creek Transmission Line Project
Highway 151 Bridge ACA Route
Dubuque, Iowa

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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Source: NTAD, IDNR, USFWS, FHA, WDNR, Energy Velocity, City of Dubuque, ESRI, ITC, Burns & McDonnell

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Table 5-2: Potential Impact Summary Table for Highway 151 Bridge ACA Route

Criteria	Output	Criteria	Output
Engineering		**Social**	
Total length (miles)	23.1	Residences within 0-25 feet (number)	9
Number of angles greater than 30 degrees	18	Residences within 26-50 feet (number)	14
Length not along transmission lines (miles)	8.0	Residences within 51-100 feet (number)	35
Length of Mississippi River crossing (miles)	0.5	Residences within 101-300 feet (number)	138
Airport, airstrip, or heliport within 1 mile (number)	0	Schools within 300 feet (number)	0
Water towers within 1,000 feet (number)	1	Daycares within 300 feet (number)	0
Communication facilities within 1,000 feet (number)	4	Hospitals within 300 feet (number)	0
Length through USACE restricted area (miles)	0.2	Places of worship within 300 feet (number)	0
Length through floodplain (miles)	1.2	Business/commercial structure within 300 feet (number)	20
Length through terrain with greater than 30% slope (miles)	0.2	Public facilities within 300 feet (number)	0
Environmental		Cemeteries within 300 feet (number)	1
Total wetland acres in ROW (acres)	5.5	Archaeological sites in ROW (number)	3
Forested/shrub wetland in ROW (acres)	4.1	Historical resources within 1,000 feet (number)	68
Emergent wetland in ROW (acres)	1.4	Length not along actual fence row or property line (miles)	7.6
Total woodland acres in ROW (acres)	131.8	Length through developed space (miles)	5.3
Number of streams/waterways crossed	20	Length through cultivated crops (miles)	3.5
Length through state or local public lands (miles)	0.1	Length through pasture/hayland (miles)	7.3
Length through private conservation easements (miles)	0.0	Length through prime farmland (miles)	1.6
Length through USFWS Refuge (feet)	0		
USFWS Refuge Land within ROW (acres)	0		
Parks within 1,000 feet (number)	4		

5.6.2.1.1 Social

Key characteristics regarding potential impacts to social resources resulting from the Highway 151 Bridge alternative are listed below. As presented above for the L&D 11 ACA route, the Highway 151 Bridge alternative requires an ACA route to extend through downtown Dubuque, Iowa. This results in high levels of proximity to residences, business/commercial operations, and surrounding land uses related to similar routing through a major municipality.

- The Highway 151 Bridge ACA route would include 58 residences within the ROW, similar to L&D 11; 20 business and commercial facilities would be within 300 feet of the ACA route (the only non-Refuge ACA route that has more is the Julien Dubuque Bridge alternative, with 42 business and commercial facilities within 300 feet).
- The ACA route utilizing the Highway 151 Bridge would include 68 historic resources within 1,000 feet of the ACA route and 3 archaeological sites within the ROW.

5.6.2.1.2 Environmental

The following key characteristics are related to the potential impacts on environmental resources resulting from using the Highway 151 Bridge ACA route:

- The Highway 151 Bridge ACA route would cross the largest amount of emergent wetlands (1.4 acres) compared to the other ACA routes at Dubuque.
- The Highway 151 Bridge ACA route would remove the largest amount of woodland from the ROW among all the Dubuque ACA routes at approximately 132 acres; the only other ACA route with a higher amount of woodlands crossed is L&D 10 at 157 acres.
- There are four parks within 1,000 feet of the Highway 151 Bridge ACA route: A.Y. McDonald Park, Eagle Point Park, McAleece Park and Recreation Complex, and Riverview Park.

5.6.2.1.3 Engineering

Key characteristics of the design and engineering required for the Highway 151 Bridge ACA route are listed below. Although the full data output is provided for each ACA route that extends through Dubuque (Table 5-2), the primary differences in engineering characteristics are limited to the unique segments of each ACA route as it extends through Dubuque after the shared segment.

- Of all the non-Refuge ACA routes, the Highway 151 Bridge ACA route would cross over the 0.2 mile of USACE restricted area related to the floodwall along the Mississippi River. The Highway 151 Bridge alternative would require an additional crossing of the Mississippi River to extend over to Schmitt Island, then on to access the Highway 151 Bridge itself.
- The Highway 151 Bridge ACA route would cross approximately 1.2 miles of floodplain associated with Middle Fork Little Maquoketa River, Little Maquoketa River, Cloie Branch, and the Mississippi River.
- The Highway 151 Bridge ACA route would have a higher number of angles greater than 30 degrees compared to all other non-Refuge ACA routes other than the Julien Dubuque Bridge.

The complete constraint analysis for all 38 criteria analyzed for the Highway 151 Bridge ACA Route is presented in Table 5-2.

5.6.2.2 Additional Constraints and Feasibility

There are several other routing constraints associated with the Highway 151 Bridge ACA route. It would require extending through the City of Dubuque and Schmitt Island, which is a well-utilized recreational resource near Dubuque's North Port area. The Highway 151 Bridge ACA route would involve rebuilding the existing transmission line on Schmitt Island as a double-circuit. This transmission line currently extends through Miller Riverview Park and the campground in the park. The ACA route would also cross near the Dubuque Marina near A.Y. McDonald Park. Highway 151 Bridge ACA route would extend through USACE restricted areas near the Dubuque Marina. Structures may need to be placed in this restricted area.

5.6.2.2.1 IDOT Consultation and Evaluation

IDOT owns and regulates the use of the Highway 151 Bridge. In late 2014, the Utilities began discussions with IDOT to discuss the possibility of attaching the proposed 345 kV transmission line to either the Dubuque-Wisconsin Bridge (referred to as the Highway 151 Bridge in this ACA) or the Julien Dubuque Bridge. The Utilities provided IDOT with necessary design information to evaluate the feasibility of this co-location, including the weight of the cables and the conduits required for the 345 kV transmission line.

On Jan. 29, 2015, IDOT sent a letter to the Utilities summarizing its evaluation of using bridges for the crossing location and identified several safety and maintenance concerns. The primary issue was that the bridges have fracture-critical components that must be inspected “hands-on” every 2 years. If the Project was attached to either bridge structure, this would prevent access to the fracture-critical components and adversely impact bridge maintenance and repairs. IDOT also stated that these maintenance and repair activities would likely require an extended outage of the line and could adversely impact the Project's ability to meet its identified needs. Additionally, if the transmission facility was located adjacent to either side of the bridge, required maintenance activities using cranes or any access to the bridge from the Mississippi River would likely result in additional safety concerns for maintenance staff. Based on the impacts co-location would have on maintenance and repair activities, IDOT concluded it could not issue a permit for the Project's co-location on or near the Highway 151 Bridge or the Julien Dubuque Bridge.

5.6.2.2.2 Archeological and Historical Resources

The Highway 151 Bridge ACA route would cross the same three archaeological sites noted above in Subsection 5.6.1.2.2 for the L&D 11 ACA route. The Highway 151 Bridge ACA route would also be within 1,000 feet of the 68 historical resources. These resources are all buildings, structures, or objects. Except for one resource, the historic resources within 1,000 feet are not eligible for listing on the NRHP, are non-contributing in an NRHP district, or have undetermined NRHP status. The James A. Weitz house is eligible for listing on the NRHP. These results suggest that the Highway 151 Bridge ACA route could result in potential adverse impacts on historic-age resources.

5.6.2.2.3 City of Dubuque

The Utilities began consultations with the City of Dubuque in 2012 to discuss the possibility of crossing the Mississippi River at Dubuque. The Utilities had additional meetings with City staff in 2013 and 2014. In late 2014, the Utilities provided the City preliminary ACA routes that utilize existing infrastructure crossings of the Mississippi River within the City of Dubuque. In addition, the Utilities provided the City of Dubuque with data regarding the potential impacts of these ACA routes on wetlands, woodlands, residences, historic sites, schools, and other key environmental and social criteria. The City of Dubuque staff examined this data for all three ACA routes in relation to the City's licensing ordinance for new transmission line facilities. On June 15, 2015, the City of Dubuque passed a resolution that stated:

> the filing of a petition by ITC for a license to erect, maintain and operate a facility within the city as proposed by ITC is not permittable and would not be permitted by the City Council, and that filing an application by ITC and proceeding with the process required by the City of Dubuque Code of Ordinances for such a license would not be in the public interest.

See Appendix C for a full copy of the resolution and associated map.

5.6.2.2.4 Wisconsin Routing Constraints in the ACA Study Area

The Highway 151 Bridge ACA route would cross a steep slope in Grant County, Wisconsin. This ACA route would require woodland clearing immediately adjacent to the Mississippi River. Also, no other transmission infrastructure is in this area; thus, the ACA route would introduce a new transmission feature to the existing landscape.

5.6.3 Julien Dubuque Bridge Alternative Crossing Location and ACA Route

The Julien Dubuque Bridge ACA route begins at the proposed Hickory Creek Substation in Dubuque County, Iowa (Figure 5-5). The ACA route follows the same common segment as the other three ACA routes from the Hickory Creek Substation to downtown Dubuque. From Kerper Avenue in Dubuque, the Julien Dubuque Bridge ACA route crosses to Schmitt Island, crosses through Riverview Park, and then continues south to the east side of Mystique Casino, using an existing 161 kV corridor. The ACA route then crosses over Highway 61/151 and extends southwest along the east side of the McAleece Park and Recreation Complex, crossing the Dubuque Yacht Basin. At this point, the Julien Dubuque Bridge ACA route turns and extends west toward Kerper Boulevard, then parallels Bell Street until crossing over the National Mississippi River Museum & Aquarium and extending over Dubuque Harbor. The ACA route then extends due east north of the Julien Dubuque Bridge to East Dubuque.

The Julien Dubuque Bridge ACA route extends through a greater portion of downtown Dubuque as well as both the North Port and South Port, compared to all of the other non-Refuge ACA routes.

5.6.3.1 Constraint Output

The following sections provide details on the constraint output for the Julien Dubuque Bridge ACA route. As with the previous locations, the analysis of key characteristics provides an overall summary of the potential impacts of utilizing this alternative crossing location. As a result of the similar nature and type of the Julien Dubuque Bridge alternative crossing location and the Highway 151 Bridge crossing location, a portion of the routing constraints and unique characteristics of the Julien Dubuque Bridge are identical to the Highway 151 Bridge analysis, discussed above in Section 5.6.2.

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ACA Study Area
Julien Dubuque Bridge ACA Route*
USACE Restricted Area
Existing 161 kV
Existing 69 kV
FWS
INHF Land
State and Local Lands
Rail
School
Home
Business/Commercial
Church
Water Tower
Cemetery
Park
Tower
Highway
Scenic Byway
Municipal Area
County

*ACA Routes are for conceptual purposes only

Figure 5-5
Cardinal-Hickory Creek Transmission Line Project
Julien Dubuque Bridge ACA Route
Dubuque, Iowa

Source: NTAD, IDNR, USFWS, FHA, WDNR, Energy Velocity, City of Dubuque, ESRI, ITC, Burns & McDonnell

Path: R:\ITC\74417_Hickory_Crk_Cassville\GIS\DataFiles\ArcDocs\ACA_Report_Figures\Figure5_5_JulienDBQ_Route_20160405.mxd kasamuelson 4/5/2016

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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As with the Highway 151 Bridge alternative crossing location, IDOT provided a review of the particular issues and permitting constraints for the Julien Dubuque Bridge as a potential crossing location for this Project. As a result of their similar nature of these two bridge crossings, the potential impacts for the Julien Dubuque Bridge are not repeated in detail below. Instead, a brief overview of the potential constraints unique to this location are provided, in addition to a recap of IDOT's review of the permittability of a Mississippi River crossing alternative at these two Dubuque bridge locations. The full constraint output for this ACA route is presented in Table 5-3 (a full comparative of the data output for all seven alternative crossing locations in located in Appendix A).

- The Julien Dubuque Bridge ACA route is the longest (25.2 miles) of all the non-Refuge Dubuque ACA routes.
- Compared to the other non-Refuge ACA routes, the Julien Dubuque Bridge ACA route would cross over the greatest length of USACE restricted area related to the floodwall along the Mississippi River.
- The Julien Dubuque Bridge ACA route includes the greatest number of business and commercial properties (42 buildings) within 300 feet of all the ACA routes analyzed for this Project.
- The number of communication facilities within 1,000 feet (27 facilities) is the greatest compared to all other ACA routes.
- The Julien Dubuque Bridge ACA route includes the second-highest number of historical resources within 1,000 feet (122 resources) as compared to the other ACA routes; only the L&D 10 ACA route includes more (196 historical resources).
- The Julien Dubuque Bridge ACA route does not cross any private conservation easements. Five parks are within 1,000 feet of this ACA route: A.Y. McDonald Park, Eagle Point Park, McAleece Park and Recreation Complex, Riverview Park, and the Alliant Energy Amphitheater.

Table 5-3: Potential Impact Summary Table for Julien Dubuque Bridge ACA Route

Criteria	Output	Criteria	Output
Engineering		**Social**	
Total length (miles)	25.2	Residences within 0-25 feet (number)	9
Number of angles greater than 30 degrees	24	Residences within 26-50 feet (number)	14
Length not along transmission lines (miles)	8.0	Residences within 51-100 feet (number)	35
Length of Mississippi River crossing (miles)	0.4	Residences within 101-300 feet (number)	138
Airport, airstrip, or heliport within 1 mile (number)	1	Schools within 300 feet (number)	0
Water towers within 1,000 feet (number)	1	Daycares within 300 feet (number)	0
Communication facilities within 1,000 feet (number)	27	Hospitals within 300 feet (number)	0
Length through USACE restricted area (miles)	0.4	Places of worship within 300 feet (number)	0
Length through floodplain (miles)	2.2	Business/commercial structure within 300 feet (number)	42
Length through terrain with greater than 30% slope (miles)	0.2	Public facilities within 300 feet (number)	1
Environmental		Cemeteries within 300 feet (number)	1
Total wetland acres in ROW (acres)	6.7	Archaeological sites in ROW (number)	5
Forested/shrub wetland in ROW (acres)	5.6	Historical resources within 1,000 feet (number)	122
Emergent wetland in ROW (acres)	1.1	Length not along actual fence row or property line (miles)	9.2
Total woodland acres in ROW (acres)	128.3	Length through developed space (miles)	7.5
Number of streams/waterways crossed	19	Length through cultivated crops (miles)	3.5
Length through state or local public lands (miles)	0.1	Length through pasture/hayland (miles)	7.3
Length through private conservation easements (miles)	0.0	Length through prime farmland (miles)	1.6
Length through USFWS Refuge (feet)	0		
USFWS Refuge land within ROW (acres)	0		
Parks within 1,000 feet (number)	5		

5.6.3.2 Additional Constraints and Feasibility

The Julien Dubuque Bridge ACA route passes through a substantial portion of downtown Dubuque, including the North Port and the South Port of Dubuque. The North Port of Dubuque was recently redeveloped and is now a major tourist attraction; the South Port is scheduled for redevelopment and is planned to include substantial green space/recreation areas, consistent with the goals of the redevelopment (See Section 4.2.3 for more on the redevelopment plans for the South Port). In addition, the Julien Dubuque Bridge ACA route would involve rebuilding the existing transmission line on Schmitt Island as a double-circuit. This transmission line currently extends through Miller Riverview Park and the park campground. It also extends along the McAleece Park and Recreation Complex. This park was developed using a Land & Water Conservation Fund (LWCF) Grant from the National Park Service. Once this funding is used by a city, county, or agency for a project, the land or park features cannot be eliminated or acquired without coordination with the NPS. Mitigation must be done to replace the eliminated items. The funding was used to build softball fields, a baseball field, soccer fields, a skate park, a picnic area, and a concession stand. As a result of the expanded ROW necessary for this ACA route, a portion of these lands would likely be impacted should a potential route for the Project be selected for this location. The ACA route alignment shown extending across both the Julien Dubuque and Highway 151 bridges (Figures 5-4 and 5-5, respectively) is conceptual and is not intended to represent the exact location of a prospective 345 kV alignment on or near either bridge.

5.6.3.2.1 City of Dubuque

The Utilities began consultations with the City of Dubuque in 2012 to discuss the possibility of crossing the Mississippi River at Dubuque. The Utilities had additional meetings with City staff in 2013 and 2014. In late 2014, the Utilities provided preliminary ACA routes that utilize existing infrastructure crossings of the Mississippi River within the City of Dubuque. In addition, the Utilities provided the City of Dubuque with data regarding the potential impacts of these ACA routes on wetlands, woodlands, residences, historic sites, schools, and other key environmental and social criteria. The City of Dubuque staff examined this data for all three ACA routes in relation to the City's licensing ordinance for new transmission line facilities. On June 15, 2015, the City of Dubuque passed a resolution that stated:

> the filing of a petition by ITC for a license to erect, maintain and operate a facility within the city as proposed by ITC is not permittable and would not be permitted by the City Council, and that filing an application by ITC and proceeding with the process required by the City of Dubuque Code of Ordinances for such a license would not be in the public interest.

See Appendix C for a full copy of the resolution and associated map.

5.6.3.2.2 IDOT Consultation and Evaluation

As previously discussed, IDOT owns and regulates the use of the Julien Dubuque Bridge and the Highway 151 Bridge and has provided a review of the potential for utilizing both bridges as alternative crossing locations for the Project. As a result of the maintenance and safety concerns highlighted in its letter to the Utilities, IDOT indicated it could not issue a permit for the Project's co-location on or near the Highway 151 Bridge (referred to as the Dubuque-Wisconsin Bridge) or the Julien Dubuque Bridge.

5.6.3.2.3 Archeological and Historical Resources

In addition to the previously listed archaeological sites 13DB492, 13DB493, and 13DB494 in Section 5.6.1.2.2, there are two additional listed sites within the Julien Dubuque Bridge ACA route ROW. Site 13DB571 is a historic Euro-American industrial boat and boiler works site. It was recommended as eligible for listing on the NRHP by the Office of the State Archaeologist in 1998. Site 13JD646 was a historic Euro-American railroad engine house from the 1850s to circa 1904, the Keogh Excelsior Manufactory from circa 1904 to the 1910s, and the Dubuque Foundry from the 1920s to 1996. The NRHP eligibility of this site is undetermined.

The ACA route for the Julien Dubuque Bridge would be within 1,000 feet of 122 historic-age resources. These resources are all buildings, structures, sites, or objects. Sixteen of the historic-age resources within 1,000 feet are eligible for listing on the NRHP, are contributing in an NRHP district, or have undetermined NRHP status. A house at 534 W 6th Street in Dubuque is a contributing resource in an NRHP district. The Dubuque Ice Harbor, the Illinois Central Freight House, the McFadden Coffee and Spice Company Factory's Warehouse, the Ede's Robe Tanning Company Factory, the Frentress Log Cabin, and the James A. Weitz house are eligible for listing on the NRHP. The Julien Dubuque Bridge, the William M. Black dredge, the Dubuque Freight House, the Dubuque Star Brewery, the Dubuque Shot Tower, the Diamond Jo Boat Store and Office, the Schroeder-Kleine Grocer Company Warehouse/M. M. Walker Company Warehouse, and the BN Railroad Bridge over the Mississippi River are listed on the NRHP. There is one NRHP district, the Dubuque Millworking Historic District, within 1,000 feet of the alternative crossing location. These results indicate that this ACA route could result in potential impacts on historic-age resources, many of which are concentrated in the Dubuque area. The Julien Dubuque Bridge ACA route had the most historic-age resources within 1,000 feet of all ACA routes considered, with the exception of the L&D 10 ACA route.

5.6.3.2.4 Illinois Routing Constraints in ACA Study Area

The Julien Dubuque Bridge ACA route would extend into East Dubuque, Illinois. The ACA route would require crossing a portion of downtown East Dubuque, which is densely developed. The Julien Dubuque Bridge ACA route would also cross over the East Dubuque Public Boat Ramp.

5.6.4 Galena 161 kV Line Alternative Crossing Location and ACA Route

The Galena 161 kV ACA route is the only existing transmission line crossing of the Mississippi River within the ACA Study Area other than the Stoneman ACA route discussed in Section 5.7.2 (Figure 5-6).[32] As with the other non-Refuge Dubuque ACA routes, the Galena 161 kV ACA route uses the same common segment up to downtown Dubuque near the L&D 11 location. From there, the Galena 161 kV ACA route extends northeast along Kerper Boulevard before turning and extending along Shiras Avenue. The route crosses to Schmitt Island where it crosses through Riverview Park and then continues south to the east side of Mystique Casino. The ACA route then crosses Highway 61/151 and extends southwest along the east side of the McAleece Park and Recreation Complex.

The ACA route extends to the end of Marina Drive in the Dubuque Yacht Basin to the Mississippi River crossing structure. At this point the Galena 161 kV ACA route turns and extends across the Mississippi River to the structure on the bluff in East Dubuque, Illinois.

5.6.4.1 Constraint Output

The following sections provide details on the constraint output for the Galena 161 kV ACA route. The full constraint output for this ACA route is presented in Table 5-4. A full comparative of the data output for all seven alternative crossing locations in located in Appendix A.

[32] An existing 69 kV line also crosses the Mississippi River at Dubuque, located adjacent to the Galena 161 kV crossing location. The 69 kV line crosses into Wisconsin at the same general location as the Galena 161 kV line, and is therefore considered in this ACA as the same location as the Galena 161 kV crossing alternative.

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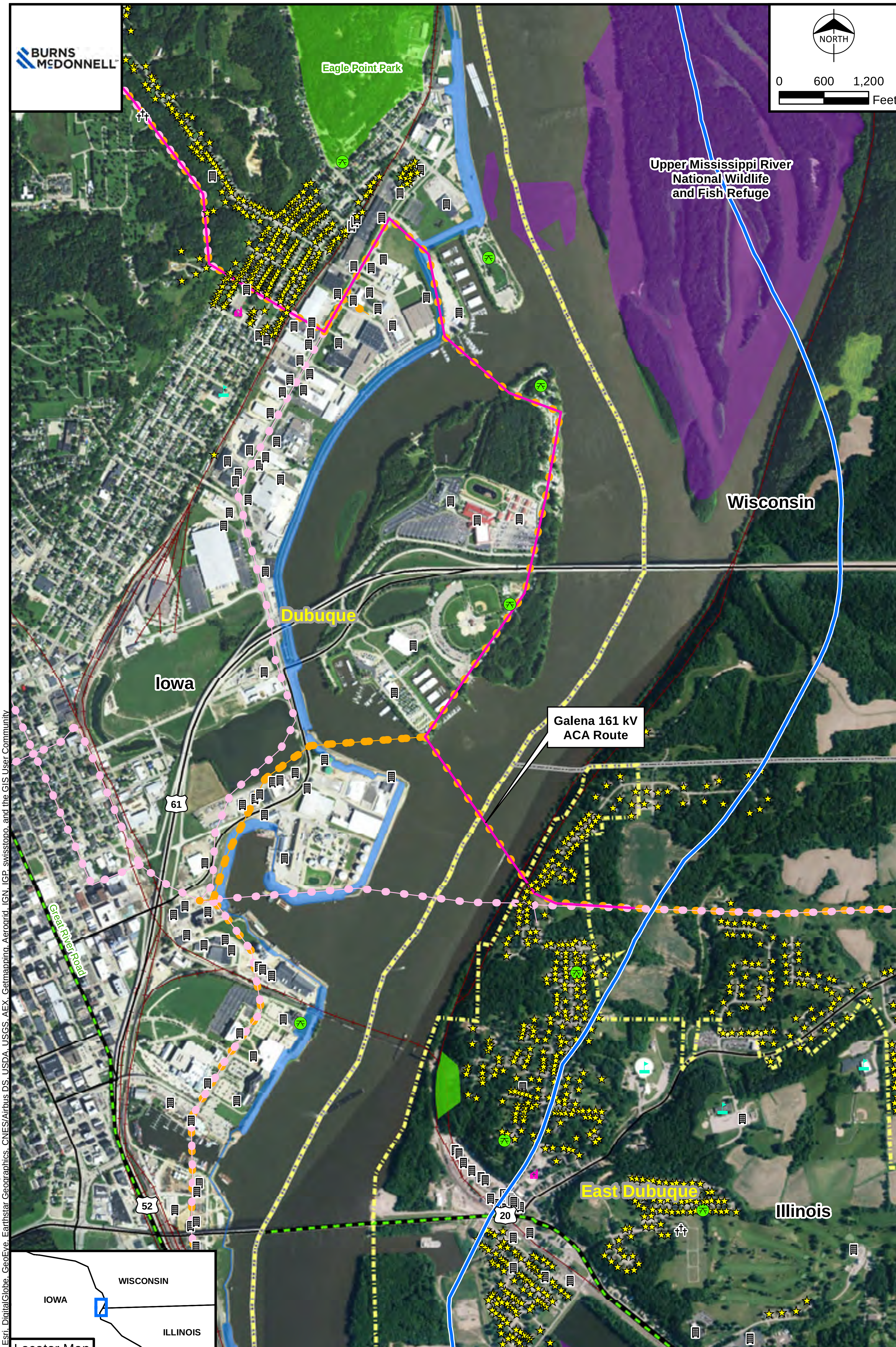

ACA Study Area
Galena 161 kV ACA Route*
USACE Restricted Area
Existing 161 kV
Existing 69 kV
FWS
State and Local Lands
Rail
School
Home
Business/Commercial
Church
Water Tower
Cemetery
Park
Tower
Highway
Scenic Byway
Municipal Area
County

*ACA Routes are for conceptual purposes only

Figure 5-6
Cardinal-Hickory Creek Transmission Line Project
Galena 161 kV ACA Route
Dubuque, Iowa

Source: NTAD, IDNR, USFWS, FHA, WDNR, Energy Velocity, City of Dubuque, ESRI, ITC, Burns & McDonnell

Path: R:\ITC\74417_Hickory_Crk_Cassville\GIS\DataFiles\ArcDocs\ACA_Report_Figures\Figure5_6_Galena161kV_Route_20160405.mxd kasamuelson 4/5/2016

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Table 5-4: Potential Impact Summary Table for Galena 161 kV Line ACA Route

Criteria	Output	Criteria	Output
Engineering		**Social**	
Total length (miles)	23.7	Residences within 0-25 feet (number)	9
Number of angles greater than 30 degrees	18	Residences within 26-50 feet (number)	15
Length not along transmission lines (miles)	7.2	Residences within 51-100 feet (number)	37
Length of Mississippi River crossing (miles)	0.4	Residences within 101-300 feet (number)	148
Airport, airstrip, or heliport within 1 mile (number)	0	Schools within 300 feet (number)	0
Water towers within 1,000 feet (number)	1	Daycares within 300 feet (number)	0
Communication facilities within 1,000 feet (number)	8	Hospitals within 300 feet (number)	0
Length through USACE restricted area (miles)	0.2	Places of worship within 300 feet (number)	0
Length through floodplain (miles)	1.7	Business/commercial structure within 300 feet (number)	20
Length through terrain with greater than 30% slope (miles)	0.2	Public facilities within 300 feet (number)	0
Environmental		Cemeteries within 300 feet (number)	1
Total wetland acres in ROW (acres)	4.3	Archaeological sites in ROW (number)	3
Forested/shrub wetland in ROW (acres)	4.1	Historical resources within 1,000 feet (number)	68
Emergent wetland in ROW (acres)	0.2	Length not along actual fence row or property line (miles)	8.1
Total woodland acres in ROW (acres)	131.0	Length through developed space (miles)	5.6
Number of streams/waterways crossed	20	Length through cultivated crops (miles)	3.6
Length through state or local public lands (miles)	0.1	Length through pasture/hayland (miles)	7.3
Length through private conservation easements (miles)	0.0	Length through prime farmland (miles)	1.6
Length through USFWS Refuge (feet)	0		
USFWS Refuge land within ROW (acres)	0		
Parks within 1,000 feet (number)	5		

5.6.4.1.1 Social

Key characteristics regarding potential impacts to social resources resulting from the Galena 161 kV ACA route are listed below; as with the other non-Refuge Dubuque ACA route, the Galena 161 kV ACA route would extend through downtown Dubuque, Iowa. This results in proximity to residences, business/commercial operations, and surrounding land uses similar to those discussed for the other alternative crossing locations at Dubuque:

- With 61 residences within the ACA route ROW, the Galena 161 kV ROW crosses the most residences compared to all other non-Refuge Dubuque ACA routes.
- The Galena 161 kV ACA route would include 68 historical resources within 1,000 feet of the ACA route, as well as 3 listed archaeological sites.

5.6.4.1.2 Environmental

The following key characteristics are related to the potential impacts on environmental resources resulting from using the Galena 161 kV ACA route:

- The Galena 161 kV ACA route has the second-least amount of emergent wetlands (0.2 acre) compared to the other non-Refuge Dubuque ACA routes.
- The Galena 161 kV ACA route does not cross any private conservation easements or Refuge land. Five parks are within 1,000 feet of the alignment: A.Y. McDonald Park, Eagle Point Park, McAleece Park and Recreation Complex, Riverview Park, and the Thomas G. Fluhr Playground.

5.6.4.1.3 Engineering

Key engineering characteristics of the Galena 161 kV ACA route are as follows:

- As a result of its location, the Galena 161 kV ACA route would be the second longest (23.7 miles) of all the non-Refuge Dubuque ACA routes.
- This ACA route would cross 0.2 mile of USACE restricted area and approximately 1.7 miles of floodplain associated with Middle Fork Little Maquoketa River, Little Maquoketa River, Cloie Branch, and the Mississippi River.
- One water tower along Roosevelt Street and eight communication facilities would be within 1,000 feet of the Galena 161 kV ACA route; all are located near or within Dubuque.

5.6.4.2 Additional Constraints and Feasibility

There are several other additional constraints associated with the Galena 161 kV ACA routes. Similar to the Julien Dubuque Bridge ACA route, the Galena 161 kV ACA route would involve rebuilding the existing transmission line on Schmitt Island as a double-circuit. Currently, this transmission line extends through Miller Riverview Park and along the McAleece Park and Recreation Complex. This park was developed using a LWCF Grant from the National Park Service. As previously noted, once this funding is used by a city, county, or agency for a project, the land or park features cannot be eliminated or acquired without coordination with the NPS. Mitigation must be done to replace the eliminated items.

The Galena 161 kV ACA route would also cross over two boat slips: the Dubuque Yacht Basin at the southern end of Schmitt Island and the Dubuque Marina near A.Y. McDonald Park. The ACA route would also cross USACE restricted areas near the Dubuque Marina.

5.6.4.2.1 Archeological and Historical Resources

The Galena 161 kV ACA route would also extend through the previously discussed listed archaeological sites in Section 5.6.1.2.2: 13DB492, 13DB493, and 13DB494. In addition, the ACA route would be within 1,000 feet of 68 historic-age resources. All of the historic-age resources within 1,000 feet are not eligible for listing on the NRHP, are non-contributing in an NRHP district, or have undetermined NRHP status except one resource.

5.6.4.2.2 City of Dubuque

The Utilities began consultations with the City of Dubuque in 2012 to discuss the possibility of crossing the Mississippi River at Dubuque. The Utilities had additional meetings with City staff in 2013 and 2014. In late 2014, the Utilities provided preliminary ACA routes that utilize existing infrastructure crossings of the Mississippi River within the City of Dubuque. In addition, the Utilities provided the City of Dubuque with data regarding the potential impacts of these ACA routes on wetlands, woodlands, residences, historic sites, schools, and other key environmental and social criteria. The City of Dubuque staff examined this data for all three ACA routes in relation to the City’s licensing ordinance for new transmission line facilities. On June 15, 2015, the City of Dubuque passed a resolution that stated:

> the filing of a petition by ITC for a license to erect, maintain and operate a facility within the city as proposed by ITC is not permittable and would not be permitted by the City Council, and that filing an application by ITC and proceeding with the process required by the City of Dubuque Code of Ordinances for such a license would not be in the public interest.

See Appendix C for a full copy of the resolution and associated map.

5.6.4.2.3 Illinois Routing Constraints in ACA Study Area

The Galena 161 kV ACA route would enter into East Dubuque, Illinois. This alternative would require crossing into an established residential area north of Illinois State Highway 35.

5.6.5 Summary of Non-Refuge ACA Routes and Alternative Crossing Locations

All four of the non-Refuge ACA routes extend through the City of Dubuque and, as a result, encounter numerous and substantial constraints. When compared to the Refuge ACA routes, the non-Refuge ACA routes are generally longer (with the exception of the L&D No 10 ACA route) and result in greater overall potential impacts to residences, business and commercial operations, archaeological sites, communication facilities, and USACE restricted areas related to the Mississippi River floodwall at Dubuque. In particular, at least 58 residences would need to be potentially displaced as they would be present within the ACA route's ROW. In addition to the Dubuque resolution (concluding that a route through Dubuque is not permittable) affecting all four non-Refuge ACA routes, the USACE's technical review of L&D 11 concluded that the agency would not permit a potential transmission line project over or near L&D 11. Also, IDOT's review of the use of the Highway 151 Bridge (also referred to as the Dubuque-Wisconsin Bridge) and the Julien Dubuque Bridge concluded that the agency would not permit a new 345 kV transmission line on either bridge. As a result of these analyses, the Utilities concluded that none of the non-Refuge ACA alternative crossing locations constitutes a reasonable or feasible alternative for the Project.

5.7 Refuge ACA Routes and Alternative Crossing Locations

Given the infeasibility of constructing at the non-Refuge alternative crossing locations, the Utilities analyzed the remaining three Mississippi River alternative crossing locations within the Refuge: the L&D 10 alternative crossing location at Guttenberg, Iowa, and the Nelson Dewey and Stoneman alternative crossing locations near Cassville, Wisconsin. The following analysis of the Refuge ACA routes and alternative crossing locations also follows the USFWS Mitigation Policy; an assessment of the potential impacts associated with these ACA routes are presented, along suggested design considerations to minimize potential impacts to Refuge lands.

5.7.1 L&D 10 ACA Route and Alternative Crossing Locations

As previously discussed, the L&D 10 alternative crossing location is located at a management/operational break in the Refuge related to the Lock and Dam No. 10 facility (Figure 5-7).

This facility is managed and operated under a 2001 cooperative agreement between the USACE and the USFWS (USFWS, 2006). Although there is a "break" in the Refuge at this location, this "break" relates specifically to the management and operation of the lock and dam facility and does not include a gap in the overall Refuge boundaries, or function, at this specific location. As a result, the L&D 10 ACA route is considered by the Utilities as being located within the Refuge. Outside of this operational break, the USFWS owns and manages Refuge lands immediately above and below the L&D 10 location. During ongoing discussions of the Project with the Utilities, USFWS staff noted individual concerns with the Project above and below the L&D 10 location.

The L&D 10 ACA route begins at the Hickory Creek Substation and extends generally north-northwest, crossing Highway 52 south of Millville and extending further north. The ACA route parallels the Millville to Elkader 69 kV line west for a short distance before extending north, crossing over the Turkey River before extending east into Guttenberg, Iowa. The L&D 10 ACA route crosses through downtown Guttenberg along Herder Street to the river bank, where it extends northeast to the western end of Lock and Dam No. 10. The ACA route then extends across Lock and Dam No. 10 and the Mississippi River.

5.7.1.1 Constraint Output

The following sections provide details on the constraint output for the L&D 10 ACA route (Table 5-5). As with the non-Refuge ACA routes, the data presented below guides the comparative analysis of the remaining ACA routes and alternative crossing locations. The analysis and methodology used for the assessment of the Refuge ACA routes and alternative crossing locations is identical to that used for the non-Refuge ACA routes and crossing locations.

Key characteristics of the 38 evaluation criteria developed in this ACA are presented below. The full constraint output for this ACA route is presented in Table 5-5, below. The analysis of these key characteristics provides an overall summary of the potential impacts of utilizing the L&D 10 ACA route and alternative crossing location.

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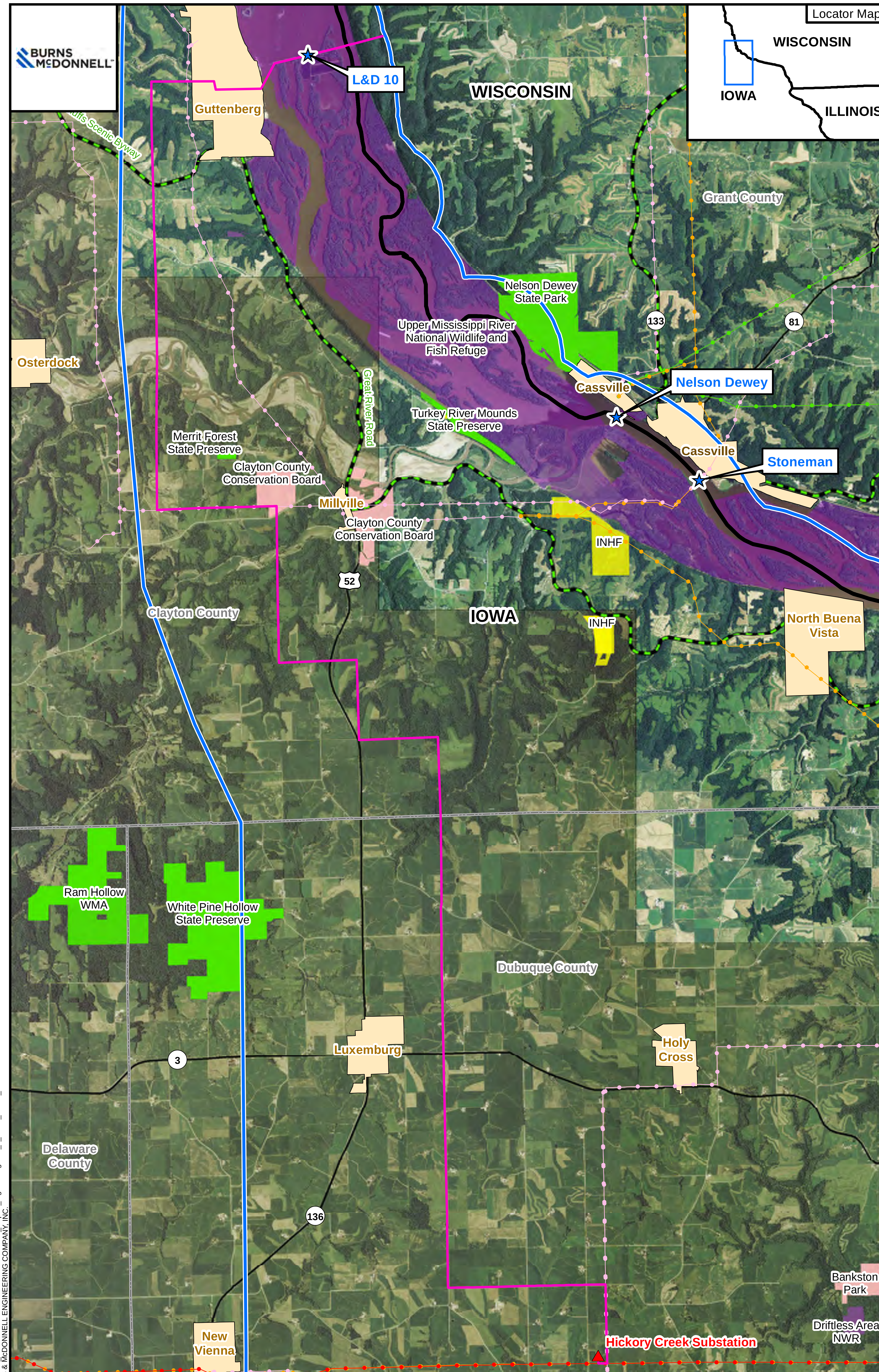

NORTH

0 3,000 6,000
Feet

ACA Study Area	Existing 345 kV	FWS	Municipal Area
Alternative Crossing Location	Existing 161 kV	INHF Land	County
L&D 10 ACA Route*	Existing 138 kV	County Land	State
Substation	Existing 69 kV	State Land	Highway
			Scenic Byway

*ACA Routes are for conceptual purposes only

Figure 5-7
Cardinal-Hickory Creek Transmission Line Project
Lock & Dam No. 10 ACA Route

Service Layer Credits: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Source: IDNR, Energy Velocity, NTAD, IDOT, INHF, WDNR, Clayton County, FHA, ESRI, ITC Midwest, Burns & McDonnell

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Table 5-5: Potential Impact Summary Table for L&D 10 ACA Route

Criteria	Output	Criteria	Output
Engineering		**Social**	
Total length (miles)	25.6	Residences within 0-25 feet (number)	5
Number of angles greater than 30 degrees	15	Residences within 26-50 feet (number)	0
Length not along transmission lines (miles)	22.8	Residences within 51-100 feet (number)	13
Length of Mississippi River crossing (miles)	1.4	Residences within 101-300 feet (number)	49
Airport, airstrip, or heliport within 1 mile (number)	1	Schools within 300 feet (number)	1
Water towers within 1,000 feet (number)	0	Daycares within 300 feet (number)	0
Communication facilities within 1,000 feet (number)	9	Hospitals within 300 feet (number)	0
Length through USACE restricted area (miles)	0.0	Places of worship within 300 feet (number)	1
Length through floodplain (miles)	1.4	Business/commercial structure within 300 feet (number)	33
Length through terrain with greater than 30% slope (miles)	0.2	Public facilities within 300 feet (number)	2
Environmental		Cemeteries within 300 feet (number)	0
Total wetland acres in ROW (acres)	3.9	Archaeological sites in ROW (number)	0
Forested/shrub wetland in ROW (acres)	3.9	Historical resources within 1,000 feet (number)	196
Emergent wetland in ROW (acres)	0.0	Length not along actual fence row or property line (miles)	2.9
Total woodland acres in ROW (acres)	156.6	Length through developed space (miles)	4.0
Number of streams/waterways crossed	37	Length through cultivated crops (miles)	8.3
Length through state or local public lands (miles)	0.3	Length through pasture/hayland (miles)	2.8
Length through private conservation easements (miles)	0.0	Length through prime farmland (miles)	1.3
Length through USFWS Refuge (feet)	6,532.4		
USFWS Refuge land within ROW (acres)	28.3		
Parks within 1,000 feet (number)	2		

5.7.1.1.1 Social

Key characteristics of the potential impacts to social resources resulting from utilization of the L&D 10 ACA route are listed below. The L&D 10 ACA route is longer than any other Refuge ACA route and has a disproportionally high number of archaeological and historic resources compared to other ACA routes extending through less developed areas:

- To access the general location of the L&D 10 crossing location, the L&D 10 ACA route would extend directly through downtown Guttenberg and would be located in proximity to residences, businesses, parks and public facilities, and historic resources.
- The L&D 10 ACA route would encounter 196 historical resources within 1,000 feet of the proposed alignment; this is the greatest number of historical resources among all seven ACA routes analyzed for this Project.
- In addition to 18 residences within the route ROW, the L&D 10 ACA route would pass within 300 feet of one school, one place of worship, and two public facilities (Guttenberg City Hall and the Guttenberg Post Office).

5.7.1.1.2 Environmental

The ACA route for L&D 10 encounters numerous environmental resources along its length, as follows:

- The L&D 10 ACA route would result in the removal of the largest amount of woodland acreage (approximately 157 acres) among all seven ACA routes.
- The L&D 10 ACA route would cross the greatest number of streams (37 streams/waterways) among the ACA routes.
- The L&D 10 ACA route would cross the largest amount of terrain with greater than 30 percent slope (areas of steep slope can result in more robust transmission structures, increased potential for soil erosion, and constructability concerns) compared to the other Refuge alternatives.
- The L&D 10 ACA route would cross through the greatest amount of state or local public lands (0.3 mile) compared to all other alternative crossing locations.
- There are two parks within 1,000 feet of the L&D 10 ACA route: Ingleside Park and a small park with soccer fields at the corner of Herder Street and South Bluff Street.

5.7.1.1.3 Engineering

Key design and engineering requirements for the L&D 10 ACA route are listed below:

- The L&D 10 ACA route is the longest (25.6 miles) compared to all other ACA routes.
- The L&D 10 ACA route would result in the greatest length not located along existing transmission lines compared to all other ACA routes (approximately 23 miles), creating the greatest amount of new transmission corridor.
- The L&D 10 ACA route would result in the longest Mississippi River crossing distance of all Refuge alternatives (1.4 miles). The second longest Mississippi River crossing among all other ACA routes is 0.3 mile.
- The ACA route would cross approximately 1.4 miles of floodplain associated with Hickory Creek, North Fork Maquoketa River, Bluebell Creek, Little Turkey River, Turkey River, Miners Creek, and the Mississippi River.

5.7.1.2 Additional Constraints and Feasibility

There are several additional constraints in proximity to the L&D 10 ACA route. As previously noted, these characteristics help provide some additional information on resources and issues that could affect the feasibility of this alternative crossing location for the Project. As discussed above for the L&D 11 ACA route, the most notable constraint is the lock and dam infrastructure itself. Additional details on these unique characteristics of L&D 10 are provided below.

5.7.1.2.1 USACE Consultation and Evaluation

Lock and Dam No. 10 is owned and operated by the St. Paul District of the USACE. Although there is an operational break at the Lock and Dam No. 10 location, the USFWS manages Refuge lands upstream and downstream of the Lock and Dam No. 10 location; USFWS staff have noted other individual concerns regarding the potential use of these areas for the Project. As discussed above, the Utilities began meeting with USACE in 2012 to discuss the possibility of the Project crossing the Mississippi River at Lock and Dam No. 10 in Guttenberg, Iowa. In December 2014, the Utilities provided USACE with a preliminary design for a 345 kV transmission line crossing located near Lock and Dam No. 10.

Both the Rock Island and St. Paul USACE districts reviewed this preliminary design pursuant to the Rivers and Harbors Act, 33 U.S.C. § 408 and 33 U.S.C. § 403 (“Section 408” and “Section 10”). Based on the design provided by the Utilities, USACE identified several safety and maintenance concerns with the proposed pole locations in relation to dam facilities. Based on technical considerations, the St. Paul District concluded that the transmission line could not be constructed on the dam or spillway itself, or within 600 feet upstream or 1,200 feet downstream of Lock and Dam No. 10 (Figure 5-8). Similar to the restrictions placed on Lock and Dam No. 11 in Dubuque, the St. Paul District determined that a 600-foot upstream technical/safety exclusion area was required to ensure that any potential pole failure would not impinge on gate operations. USACE determined that the 1,200 feet downstream technical/safety exclusion area was required to allow maintenance units and cranes to safely operate below the dam and protect pole systems from high dam scour areas below the dam.

As with Lock and Dam No. 11, USACE staff noted other individual concerns relating to geotechnical issues, maintenance requirements, and additional technical considerations for the Project. The complete minutes from this meeting are found in Appendix B.

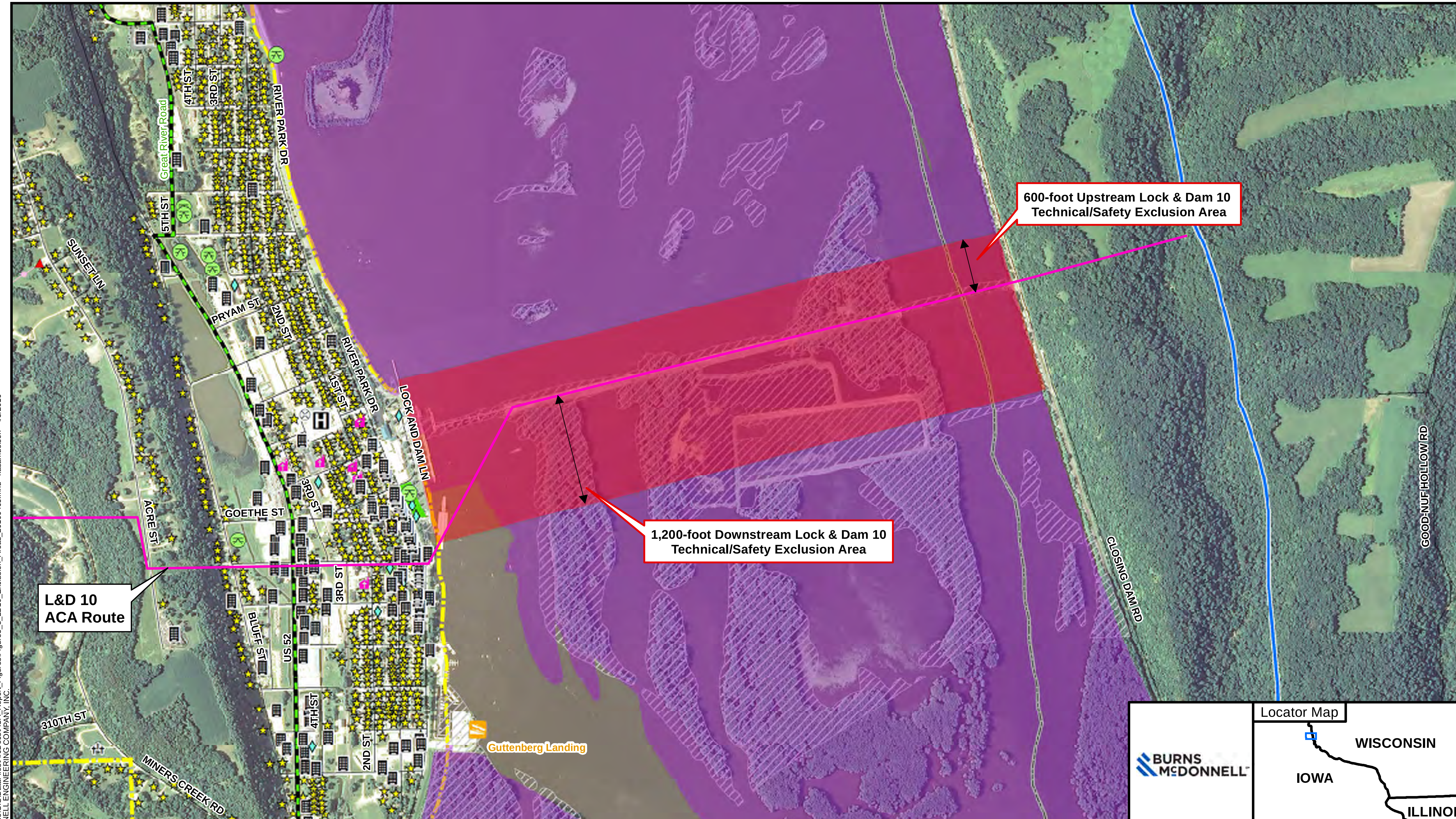
5.7.1.2.2 Archaeological and Historic Resources

The L&D 10 ACA route would be within 1,000 feet of 196 historic-age resources. Five NRHP historic districts are also within 1,000 feet of the L&D 10 ACA route: the Front Street Historic District, the Guttenberg National Fish Hatchery and Aquarium Historic District, the Jungt Brewery District, the Mississippi River Lock and Dam No. 10, and Saint Mary's Catholic Church District. Other historic-age resources include multiple houses, Saint Mary's Church and associated buildings, St. Clair Hotel, the Lockmasters House, business buildings, and other structures. A total of 11 resources are listed on the NRHP, and many buildings are within a historic district. As a result, this ACA route was determined to likely result in potential impacts on historic-age resources, many of which are concentrated in the Guttenberg area.

All proposed alternative crossing locations occur on or near Refuge lands and in proximity to the Mississippi River. The abundance of environmental resources along the Mississippi River has continuously attracted humans for millennia from Paleo-Indians approximately 12,000 years ago to more recent Euro-American inhabitants. The diverse and extensive cultural resources within the Refuge include villages, burial and ceremonial mounds, camp sites, rockshelters, shell middens, lithic scatters, historic-aged homes, cabins and homesteads, a mill, and a gas pumping station. Any excavation or removal of archeological resources within the Refuge would require an Archaeological Resources Protection Act of 1979 (ARPA) permit. Section 106 of the National Historic Preservation Act is also applicable to activities within the Refuge.

5.7.1.2.3 City of Guttenberg

The L&D 10 ACA route would require extending through a portion of the City of Guttenberg. Guttenberg's downtown area has many historic structures ranging from the 1700s to the 1880s. The local schools are also located in close proximity to the western end of Lock and Dam No. 10. Lastly, the Great River Road, a National Scenic Byway, passes through Guttenberg and would be crossed by the L&D 10 ACA route.



NORTH

0 500 1,000

Feet

- ACA Study Area
- L&D 10 ACA Route*
- Substation
- Technical/Safety Exclusion Area
- Existing 69 kV lines
- USACE
- FWS
- State and Local Lands
- Scenic Byway
- Boat Launch or Ferry Landing
- Rail
- Helipad
- Airport
- Business/Commercial
- Cemetery
- Church
- Hospital
- House
- Park
- Public Facility
- Municipal Area
- County Boundary

*ACA Routes are for conceptual purposes only

Figure 5-8
Cardinal-Hickory Creek Transmission Line Project
Lock & Dam 10 ACA Route
Technical/Safety Exclusion Areas

Source: IDNR, Corps Land Use Allocation Plan 2011, USDA Clayton County NAIP 2013, Energy Velocity, IDOT, INHF, WDNR, Clayton County, FHWA, ESRI, ITC Midwest, Burns & McDonnell

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5.7.1.2.4 Upstream and Downstream Constraints

The Refuge is located upstream and downstream from the L&D 10 ACA route. Although there is an operational break at the Lock and Dam No. 10 location for the operation and management of the lock and dam facility by the USACE, the USFWS owns and manages Refuge lands upstream and downstream of the Lock and Dam No. 10 location. Nearby recreational areas offer a wide range of uses that could potentially be affected by the construction and operation of an overhead transmission line in this area. Immediately upstream and adjacent to the lock and dam is the 12 Mile Island Closed Area, denoting the area is closed to all migratory bird hunting. No motors and voluntary avoidance occurs October 15 through the end of the state duck hunting season in this area.

Downstream and immediately adjacent to the lock and dam is the 252-acre Guttenberg Ponds Closed Area, which restricts entry between October 1 and the end of the state duck hunting season. South of the Guttenberg is the 32-acre Goetz Island, which is a no hunting/trapping zone. This area is closed to hunting and trapping at all times. There is a hiking trail on Goetz Island. South of the Guttenberg Ponds Area is the 1,145-acre 12 Mile Island Closed Area, which is closed to all migratory bird hunting. No motors and voluntary avoidance occurs October 15 through the end of the state duck hunting season in this area. Lastly, immediately south of the Existing 12 Mile Island Closed Area is the 12 Mile Island Research Natural Area.

5.7.1.2.5 Wisconsin Routing Constraints in ACA Study Area

The L&D 10 ACA route would cross a steep slope once in Grant County, Wisconsin. The alternative would require woodland clearing immediately adjacent to the Mississippi River. There is no existing linear infrastructure past the Mississippi River bank on the Wisconsin side or high-voltage transmission lines in the area. Thus, L&D 10 ACA route would introduce a new feature to the landscape in this area, which would be inconsistent with Wisconsin Siting Priorities law, which requires—to the greatest extent feasible—following corridors in the following order: existing utility corridors, highway and railroad 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, and then new corridors.

5.7.2 Stoneman ACA Route and Alternative Crossing Location

The Stoneman ACA route includes one of two existing transmission line crossings of the Mississippi River within the ACA Study Area. The other existing transmission line crossing occurs at the Galena 161 kV alternative crossing location at Dubuque (see Section 5.4.2.6 for more detail on the Galena 161 kV ACA route). The Stoneman alternative crossing location already includes two existing transmission lines, the Millville to Stoneman 69 kV line and Turkey River to Stoneman 161 kV line crossing (co-located) in Cassville, Wisconsin. The 69 kV line enters the Refuge from the west in a separate corridor than the existing 161 kV line, but joins the 161 kV corridor near the center of the Refuge as a double-circuit 69 kV/161 kV line (configuration shown in Figure 3-2).

The Stoneman ACA route begins at the proposed Hickory Creek Substation in Iowa and extends north toward the Turkey River Substation (Figure 5-9). The ACA route extends generally north from the Hickory Creek Substation, crossing Highway 52 in Dubuque County before extending into Clayton County to the Turkey River Substation. The Stoneman ACA route bypasses the Turkey River Substation and extends along the existing Turkey River to Lore 161 kV line and the Turkey River to Stoneman 161 kV line.[33] At this point, the Turkey River to Lore 161 kV line extends southeast along the bluffs of the Mississippi River. The Stoneman alternative continues to follow the alignment of the Turkey River to Stoneman 161 kV line northeast down the bluffs and across the existing rail line into the Refuge. The Stoneman ACA route then extends east through Refuge lands across the Mississippi River to the Stoneman Substation. In Wisconsin, the Stoneman preliminary ACA route then extends through Cassville, Wisconsin, to reach the eastern edge of the ACA Study Area boundary. The location of the Stoneman ACA route in this report follows the existing 161 kV alignment through Cassville, Wisconsin.

5.7.2.1 Constraint Output

The following sections provide details on the potential constraints for the Stoneman ACA route. The analysis of key characteristics provides an overall summary of the potential impacts of utilizing the Stoneman ACA route. The full constraint output for this ACA route is presented in Table 5-6; a full comparative of the data output for all seven alternative crossing locations in located in Appendix A.

[33] The proposed design for rebuilding theTurkey River Substation is preliminary; the final location and configuration of this substation will be revised once a preferred route is selected for this Project. The new 345 kV line proposed for this Project would not terminate at the Turkey River Substation, but may extend through the substation location, depending on the final design. The ACA route segments coming into and exiting the area in and around the Turkey River Substation may be revised at this location once a final substation design is developed. The route adjustments near the rebuilt Turkey River Substation would likely occur on ITC Midwest property near the substation and would therefore not substantially impact the resources analyzed for this Project.

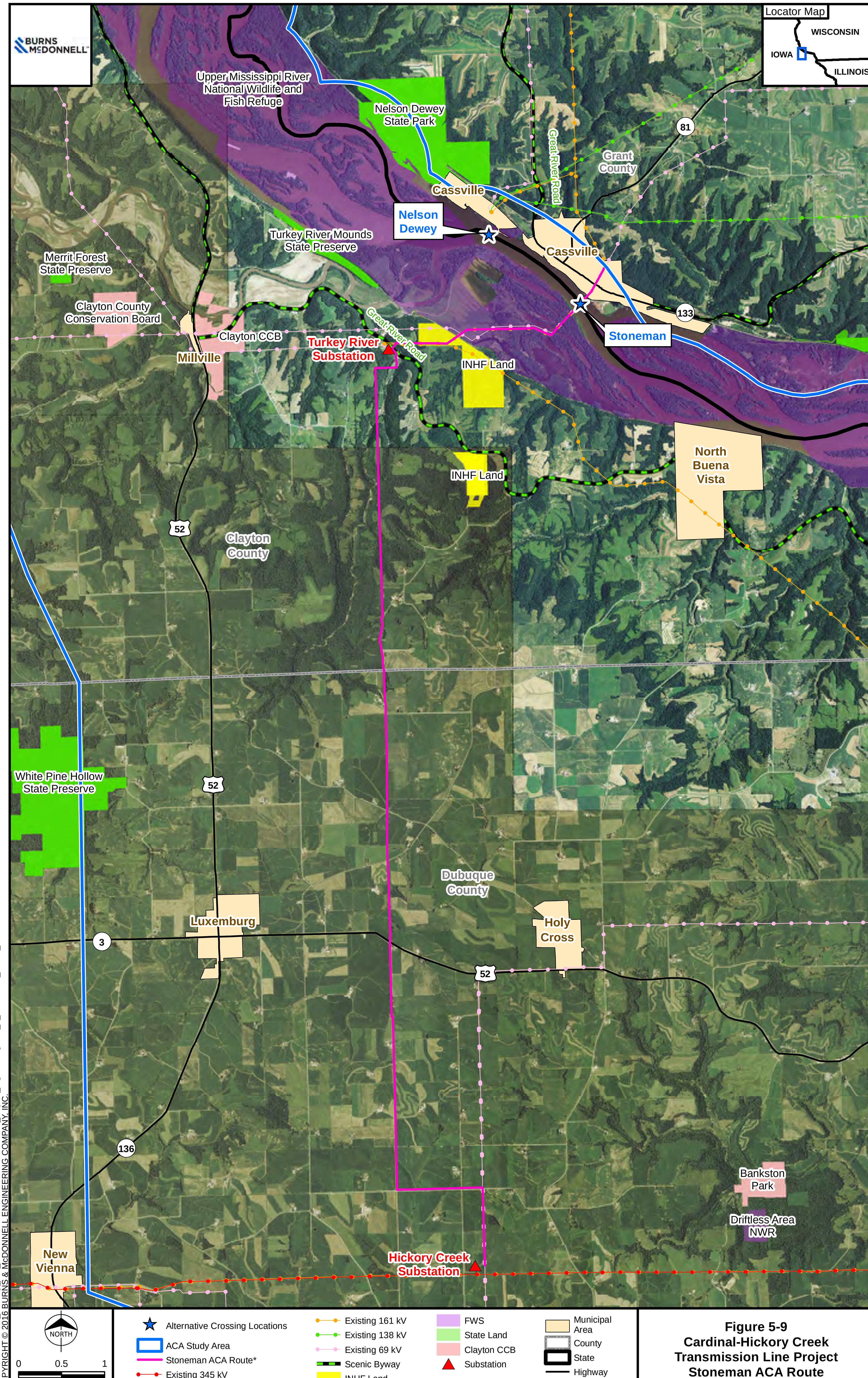

Figure 5-9
Cardinal-Hickory Creek Transmission Line Project
Stoneman ACA Route

Source: NAIP 2013 Clayton, Dubuque, and Grant Counties; IDNR; FWS; USGS; Energy Velocity; WDNR; ESRI; ITC Midwest; Burns & McDonnell

Issued: 4/5/2016

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Table 5-6: Potential Impact Summary Table for Stoneman ACA Route

Criteria	Output	Criteria	Output
Engineering		**Social**	
Total length (miles)	14.9	Residences within 0-25 feet (number)	4
Number of angles greater than 30 degrees	13	Residences within 26-50 feet (number)	1
Length not along transmission lines (miles)	11.1	Residences within 51-100 feet (number)	4
Length of Mississippi River crossing (miles)	0.3	Residences within 101-300 feet (number)	13
Airport, airstrip, or heliport within 1 mile (number)	1	Schools within 300 feet (number)	2
Water towers within 1,000 feet (number)	0	Daycares within 300 feet (number)	1
Communication facilities within 1,000 feet (number)	2	Hospitals within 300 feet (number)	0
Length through USACE restricted area (miles)	0.0	Places of worship within 300 feet (number)	1
Length through floodplain (miles)	0.8	Business/commercial structure within 300 feet (number)	4
Length through terrain with greater than 30% slope (miles)	0.1	Public facilities within 300 feet (number)	0
Environmental		Cemeteries within 300 feet (number)	0
Total wetland acres in ROW (acres)	36.1	Archaeological sites in ROW (number)	1
Forested/shrub wetland in ROW (acres)	23.0	Historical resources within 1,000 feet (number)	1
Emergent wetland in ROW (acres)	13.1	Length not along actual fence row or property line (miles)	2.6
Total woodland acres in ROW (acres)	82.2	Length through developed space (miles)	3.6
Number of streams/waterways crossed	15	Length through cultivated crops (miles)	5.0
Length through state or local public lands (miles)	0.0	Length through pasture/hayland (miles)	0.5
Length through private conservation easements (miles)	0.5	Length through prime farmland (miles)	2.3
Length through USFWS Refuge (feet)	7,712.8		
USFWS Refuge land within ROW (acres)	46.0		
Parks within 1,000 feet (number)	2		

5.7.2.1.1 Social

Key characteristics of the potential impacts to social resources resulting from utilization of the Stoneman ACA route are listed below. As a result of the nature of the surrounding lands, both the Stoneman and Nelson Dewey alternative crossing locations have fewer residential or business/commercial properties than the remaining ACA routes, but impacts to nearby residences and businesses may occur, depending on the final location of the alignment through these areas. The output for the Stoneman ACA route also includes constraints for the first one-half mile of the route through Cassville, Wisconsin.

- The ACA route for Stoneman would encounter nine residences within its ROW, the second-fewest of any alternative crossing location (only Nelson Dewey has fewer residences within the ROW).
- Properties in the Stoneman ACA route would include two public schools, Cassville High School and Cassville Middle School, in Cassville, Wisconsin.
- The ACA route for Stoneman would pass within 300 feet of a place of worship and associated daycare facility in Cassville, Wisconsin.
- The Stoneman ACA route includes only one historical resource within 1,000 feet of the alignment. In addition to the Nelson Dewey alternative, this is the least number of historical properties near any of the alternatives. The Stoneman ACA route would have one archaeological site within its ROW.

5.7.2.1.2 Environmental

The Stoneman ACA route follows the existing 161 kV line through approximately 1.5 miles of Refuge lands. As such, the Stoneman ACA route extends through sensitive resources within Refuge lands, including wetlands, woodlands, and sloughs actively managed by the USFWS.

- The Stoneman ACA route includes the greatest amount of wetlands, including emergent and forested/shrub wetlands, within its ROW of any alternative crossing locations analyzed in this ACA.
- The Stoneman ACA route would remove approximately 82 acres of woodland from the Project ROW. For comparison, the Nelson Dewey ACA route would remove less woodland (approximately 62 acres), but the L&D 10 ACA route would remove 157 acres of woodlands.
- The Stoneman ACA route would cross approximately 7,713 feet of Refuge lands.
- The Stoneman ACA route would include approximately 46 acres of Refuge lands within the Project ROW, the greatest of any Refuge alternative.

5.7.2.1.3 Engineering

Key characteristics of the design and engineering required for the Stoneman ACA route are listed below. The majority of engineering-related constraints for the Stoneman ACA route are located on or near the portion the ACA route that extends through Cassville, Wisconsin.

- The Stoneman ACA route in Wisconsin would cross within approximately 2,400 feet of the Cassville Municipal Airport; transmission structures related to this alternative may be limited in height on the bluff east of Cassville, as most of the bluff is located within the conical surface area of the Cassville Municipal Airport, resulting in Federal Aviation Administration (FAA) review of all structures within this area.
- The Stoneman ACA route includes only two communication facilities within 1,000 feet, the fewest of any alternative; additionally, no water towers are present near the ACA route.
- The Stoneman ACA route would co-locate with existing transmission lines more than any other Refuge ACA route.

5.7.2.2 Additional Constraints and Feasibility

The Stoneman ACA route would have several additional constraints, which are primarily related to its ACA route through Cassville, Wisconsin. Because the Stoneman and Nelson Dewey ACA routes share a common segment for the vast majority of their length (85 percent); the differences between these two Refuge ACA routes are limited to their alternative crossing locations and their ACA route segments in Wisconsin.

Both the Stoneman and the Nelson Dewey ACA routes extend through Refuge lands. As previously discussed in Section 4.6.1.1, the Refuge provides important habitat within the Mississippi Flyway for migratory birds, fish, and other wildlife, as well as many species of plants.

5.7.2.2.1 Avian Resources

The Stoneman ACA route extends across the Mississippi River and through the Refuge. The Mississippi River flyway is the most significant bird migration corridor in North America. These resources are used by waterfowl, water and shore birds, neotropical migrant species, and other avian species. Additionally, woodlands associated with the Mississippi River and located outside of the Refuge boundaries are crossed by the Stoneman ACA route. These areas provide migratory stop-over habitat, nesting, brood rearing, and refuge for neotropical migrant species. The National Audubon Society designated an estimated 135,000-acre area in Clayton and Allamakee Counties, Iowa, as the Effigy Mounds-Yellow River Forest Bird Conservation Area, a GIBA. The ACA routes for the L&D 10, Stoneman, and Nelson Dewey crossing locations would extend through this area. The connection of this area to nearby woodlands and riparian/upland/wetland complexes within the Mississippi Flyway includes habitat within the Refuge.

The Refuge was established for use by resident and migratory avian species throughout the year and during certain times in their life span (e.g., migrations, stop-over, nesting, brood rearing). It has been estimated that more than 325 species of birds use the Mississippi River during migration, including approximately 40 percent of North American waterfowl (National Audubon Society, 2015). More than 300 species of birds have been observed using the Refuge (Upper Mississippi River Conservation Commission, 2001). Existing overhead transmission lines of various heights, diverse conductor configurations, and multiple directions are present throughout the Mississippi Flyway. This includes numerous existing transmission lines within the Refuge, such as the existing Millville to Stoneman 69 kV line and Turkey River to Stoneman 161 kV line. This existing transmission infrastructure has resulted in adaptations (e.g., avoidance of contact, habitat usage due to habitat alterations) by avian species that use the areas and encounter these man-made features.

The Stoneman ACA route would alter the existing 161 kV and 69 kV transmission line corridors through the Refuge. The Stoneman ACA route, as currently designed, would remove the existing 69 kV line and its associated ROW corridor from the Refuge entirely and replace it with the new proposed 345 kV line, co-located with the existing 161 kV line in one single corridor through the Refuge. The Stoneman ACA route would result in a transmission line corridor through the Refuge that is essentially the same linear distance as the existing 161 kV/69 kV corridor (approximately 7,700 feet). However, because the width of the corridor would be expanded due to the low-profile single plane structures, the design would require slightly larger overall area of total ROW within the Refuge (approximately 46 acres for the combined corridor compared with 37 acres of ROW for the existing corridors). This increase takes into account the proposed design for low profile structures used through the Refuge, which require a wider ROW. The expanded corridor at Stoneman may also create potential habitat for neotropical migrant birds that require disturbance, openings, or diverse microclimates in forested areas (i.e., indigo bunting, oriole species, grosbeak species) as well as pollinating invertebrate species.

To design low-profile structures through the Refuge, an associated expansion of the existing 161 kV/69 kV ROW would occur, resulting in some additional tree removal to widen the existing ROW. This ACA route's design through the Refuge would also increase the height of the transmission structures from 56.5 feet to approximately 75 feet for the majority of structures located in the Refuge.

Considering the abundance and diversity of avian species in the Refuge and that the Stoneman ACA route would increase the height of the transmission line in the existing corridor through the Refuge, there is a potential for direct impacts and indirect impacts to avian species at the Stoneman alternative crossing location. Potential avian impacts are generally evaluated at three levels: (1) the individual bird; (2) groups of birds or daily movements; and (3) bird populations or migratory pathways. Individual birds have the potential to be impacted at portions of the Stoneman ACA route by collisions with the conductors, static wires, or other transmission infrastructure on or off the Refuge. However, in general, the proposed line will be more visible to avian species because it will have larger structures, larger conductors, and shield wire markings. The risk of collision will also be reduced over existing conditions because the number of horizontal planes across the river with go from four (including shield wire) to two (including shield wire). Potential impacts to avian species would be under the jurisdiction of the USFWS under the MBTA and the BGEPA. Additionally, some habitat conversion or potential impacts to existing habitat will result through the necessary ROW clearing; this may lead to seasonal changes in usage of those areas by individual birds.

Potential habitat clearing for construction activities during the nesting seasons of migratory species would likely lead to greater impacts on individuals, groups, and potentially some populations of avian species than during other times of the year. However, the majority of these potential impacts would be limited to short-term construction activities or areas where habitat is utilized within the Project ROW. Habitat conversion of areas on or off of the Refuge has the potential to impact groups of birds or daily movements of birds avoiding the new infrastructure or transferring to new locations where habitat is more suitable. The habitat created through ROW conversion has the potential to attract avian species that prefer woodland edges or woodland openings, and are not generally affected by land development. As previously discussed, numerous transmission lines exist within the Mississippi Flyway and Refuge and are incorporated into the population level persistence and movement of avian species. Although potential impacts to individual birds or groups may occur, the Stoneman ACA route is not anticipated to have potential impacts at the population level for avian species or to migratory pathways.

Additionally, the Stoneman ACA route would be co-located with an existing transmission line crossing of the Mississippi River. Existing potential impacts to avian resources include the presence of two existing transmission lines that do not include visual avian diverters (e.g., bird flight diverters) through the Refuge or over the Mississippi River and the presence of the Village of Cassville, Wisconsin, on the east side of the Mississippi River. The Utilities would propose to minimize avian impacts by installing avian marking devices throughout the Refuge for the Stoneman ACA route.

The design of Stoneman ACA route follows the "minimization" objective of the USFWS mitigation process to avoid, minimize, and mitigate/compensate. The Stoneman ACA route would incorporate mitigation strategies to minimize environmental impacts to the avian species, in consultation with the USFWS. These mitigation measures include, but are not limited to, utilizing an existing transmission line corridor and ROW through the Refuge, as well as moving from smaller un-marked wood poles that are partially obscured within the existing vegetation, to larger, more visible structures that would include bird diverters. The preliminary engineering for the portion of this ACA route in the Refuge would include structures, conductors, and static wires with shorter spans (estimated at 500 feet) and a lower total height (estimated at 75 feet) in the Refuge than standard transmission structure design. The projected structure height is also below the approximate maximum height of the majority of the woodland areas in the vicinity of this ACA route in the Refuge. Additionally, the conductors within the Refuge would be placed within a single horizontal plane in order to minimize the number and height of visible conductors for potential interaction with birds. The static wires would be marked with avian flight diverters in compliance with USFWS consultation as well as guidance from the Avian Powerline Interaction Committee (APLIC) *Reducing Avian Collisions with Power Lines: The State of the Art in 2012* (APLIC, 2012). The two transmission lines that would be removed within the existing transmission corridor as a result of the construction of the Stoneman ACA route are shorter in height (56.5 feet) than what is proposed for the new transmission line, but the existing transmission lines do not include any avian diverters or line markings. The Missisippi River crossing structures and the associated conductors and static wires near the Mississippi River would need to be taller, estimated at 198 feet, to allow the overhead transmission line's conductors to cross the waterway at a height that is permittable by the U.S. Coast Guard.

5.7.2.2.2 Archeological and Historical Resources

There is one archaeological site, 13CT3 (also known as Pete Adams Mound Group 4), within the Stoneman ACA route ROW. It is a conical, effigy, linear mound site located east of the Turkey River Substation, outside of the Refuge. The Iowa SHPO recorded the site condition as destroyed, but recommended field checking the site to confirm. There are no known identified historic or archaeological sites within the ACA route ROW in Iowa or Wisconsin.

The Stoneman ACA route would be within 1,000 feet of one historic-age resource. The structure is a smokehouse located approximately 5 miles east of New Vienna in Dubuque County, Iowa. The NRHP status is undetermined.

The Stoneman ACA route would reduce the potential impact on historic-age resources compared to the other ACA routes, with the exception of the Nelson Dewey ACA route. The Nelson Dewey and Stoneman ACA routes each have only one historic-age resource within 1,000 feet and one archaeological site within the ROW, which is the fewest of all alternatives, Refuge and non-Refuge.

Any removal or excavation of archeological resources within the Refuge would require compliance with the Archaeological Resources Protection Act of 1979 (ARPA). Activities within the Refuge are also subject to Section 106 of the National Historic Preservation Act.

5.7.2.2.3 Wisconsin Routing Constraints

As previously noted, the Village of Cassville and the associated land uses within this village represent additional constraints to the Stoneman ACA route. Utilization of the Stoneman alternative crossing location would result in the ACA route extending near schools, residences, place of worship, and business and commercial sites, and approximately 2,500 feet from the Cassville Municipal Airport.

The Stoneman ACA route would extend over the Mississippi River near the Stoneman Substation, which is located adjacent to a boat launch (Cassville Public Access boat launch). Potential construction activities may require temporary closure of the boat launch. The existing 161 kV alignment that is used for the Stoneman ACA route crosses Wisconsin Highway 133 and passes the Cassville High School and Middle School on Amelia Street, and near the Cassville Elementary School on Crawford Street. As currently designed, the Stoneman ACA route would be within 300 feet of St. Charles Catholic Church, which also has daycare services.

The Cassville Municipal Airport is located southeast of the Stoneman Substation. A preliminary FAA analysis identified potential issues that may arise from the proximity of the airport to the Stoneman ACA route. Based on a runway end elevation of 627 feet, the approach slope would be approximately 810 feet above mean sea level (AMSL) at the site. The ground elevation at the site is approximately 600 feet AMSL, which would result in more than 200 feet available for structure height near the Mississippi River crossing. Any structure more than 200 feet above ground level would require obstruction marking and lighting. Due to the presence of the airport and the height of the bluff immediately east of Cassville, structures located in the airport’s conical surface (which would include any structure planned for the bluff) would likely require additional evaluation and design, and may be limited in total height.

5.7.3 Nelson Dewey ACA Route and Alternative Crossing Location

The Nelson Dewey alternative crossing location was designed as an additional option to the existing Stoneman crossing location near Cassville, Wisconsin. Similar to the Stoneman ACA route, the Nelson Dewey ACA route would originate at the Hickory Creek Substation, following the same path as the Stoneman ACA route past the Turkey River Substation which will be rebuilt for the Project and along the same existing Turkey River to Lore and Turkey River to Stoneman 161 kV corridor into the Refuge (Figure 5-10). The Nelson Dewey ACA route would enter Refuge lands using the existing Turkey River to Stoneman 161 kV corridor. When this existing corridor turns east, (approximately 650 feet into Refuge lands), the new Nelson Dewey ACA route extends north across the Refuge (and the large private parcel within the Refuge) and continues north-northeast across the Mississippi River toward the Nelson Dewey Substation associated with the recently closed Nelson Dewey Generating Station. The ACA route then bypasses the substation to the south, and then extends north for a short distance before extending northeast along the double-circuit Nelson Dewey to Eden (Montfort, WI) and Nelson Dewey to Hillman (Platteville, WI) 138 kV transmission lines.

5.7.3.1 Constraint Output

The following sections provide details on the constraint output for the Nelson Dewey ACA route from the Hickory Creek Substation to within one-half mile into Wisconsin. The Nelson Dewey ACA route shares approximately 85 percent of its length with the Stoneman ACA route. As such, the primary differences between those two alterative crossing locations are limited to the area through the Refuge and across the Mississippi River into Cassville, Wisconsin. The full constraint output for this ACA route is presented in Table 5-7 (output for all seven alternative crossing locations is presented in Appendix A).

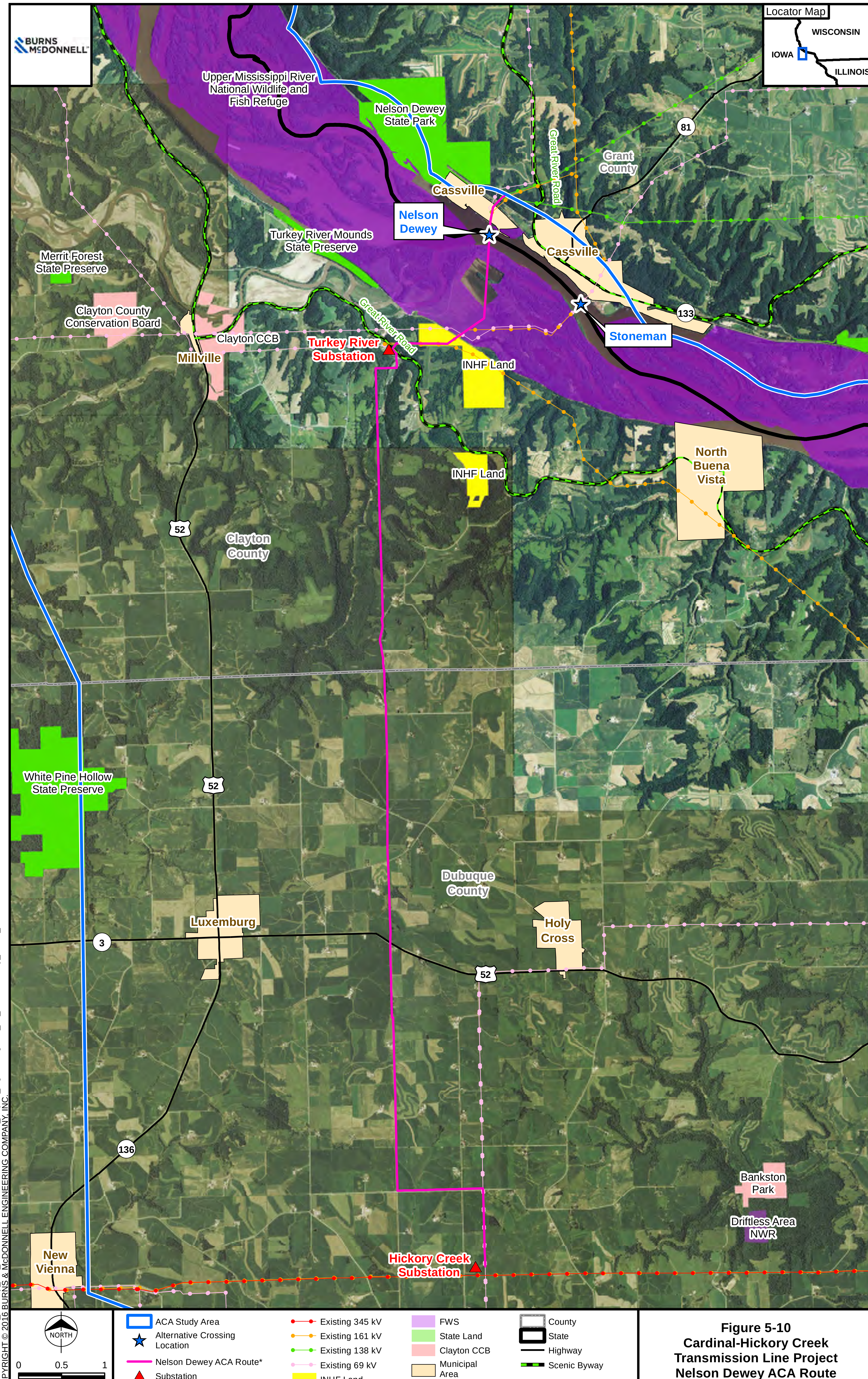

Figure 5-10
Cardinal-Hickory Creek Transmission Line Project
Nelson Dewey ACA Route

Path: R:\ITC\74417_Hickory_Crk_Cassville\GIS\DataFiles\ArcDocs\ACA_Report_Figures\Figure5_10_NelsonDewey_Route_20160405.mxd kasamuelson 4/5/2016

Source: NAIP 2013 Clayton, Dubuque, and Grant Counties; IDNR; FWS; USGS; WDNR; Energy Velocity; ESRI; ITC Midwest; Burns & McDonnell

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Table 5-7: Potential Impact Summary Table for Nelson Dewey ACA Route

Criteria	Output	Criteria	Output
Engineering		**Social**	
Total length (miles)	14.6	Residences within 0-25 feet (number)	0
Number of angles greater than 30 degrees	13	Residences within 26-50 feet (number)	1
Length not along transmission lines (miles)	12.7	Residences within 51-100 feet (number)	1
Length of Mississippi River crossing (miles)	0.3	Residences within 101-300 feet (number)	6
Airport, airstrip, or heliport within 1 mile (number)	0	Schools within 300 feet (number)	0
Water towers within 1,000 feet (number)	0	Daycares within 300 feet (number)	0
Communication facilities within 1,000 feet (number)	18	Hospitals within 300 feet (number)	0
Length through USACE restricted area (miles)	0.0	Places of worship within 300 feet (number)	0
Length through floodplain (miles)	0.8	Business/commercial structure within 300 feet (number)	0
Length through terrain with greater than 30% slope (miles)	0.1	Public facilities within 300 feet (number)	0
Environmental		Cemeteries within 300 feet (number)	0
Total wetland acres in ROW (acres)	9.5	Archaeological sites in ROW (number)	1
Forested/shrub wetland in ROW (acres)	7.5	Historical resources within 1,000 feet (number)	1
Emergent wetland in ROW (acres)	2.0	Length not along actual fence row or property line (miles)	2.7
Total woodland acres in ROW (acres)	61.8	Length through developed space (miles)	3.3
Number of streams/waterways crossed	15	Length through cultivated crops (miles)	5.1
Length through state or local public lands (miles)	0.0	Length through pasture/hayland (miles)	0.5
Length through private conservation easements (miles)	0.5	Length through prime farmland (miles)	2.1
Length through USFWS Refuge (feet)	3,695.8		
USFWS Refuge land within ROW (acres)	22.1		
Parks within 1,000 feet (number)	0		

Social

Key characteristics of the potential impacts to social resources resulting from utilization of the Nelson Dewey alternative crossing location are listed below. Similar to the Stoneman alternative, the nature of the surrounding lands results in fewer residential or business/commercial proximity concerns compared to the other alternatives. The output for the Nelson Dewey alternative also includes constraints for the first one-half mile of the ACA route through Cassville, Wisconsin.

- The Nelson Dewey ACA route would have two residences within the Project ROW, the fewest of any ACA route analyzed for the Project.
- The Nelson Dewey ACA route would not have a direct impact to any schools, places of worship, or daycare facilities in Cassville, Wisconsin.
- The Nelson Dewey ACA route would encounter zero business or commercial properties, the fewest of any alternative.
- The Nelson Dewey ACA route would include only one historical resource within 1,000 feet of the preliminary route or corridor; identical to the Stoneman ACA route, this is the fewest number of historical properties near any of the ACA routes. The Nelson Dewey ACA route would also have one archaeological site within its ROW.

5.7.3.1.1 Environmental

The Nelson Dewey ACA route was designed with a more direct route through the Refuge compared to the Stoneman ACA route, which follows an existing ROW; as such, the amount of natural resources on Refuge lands potentially affected by the Nelson Dewey ACA route are reduced compared to the Stoneman ACA route. The following key characteristics are related to the potential impacts on environmental resources resulting from using the Nelson Dewey alternative:

- The Nelson Dewey ACA route would have approximately 62 acres of woodland within its ROW that would be cleared, which is the least amount of woodland clearing required by any ACA route.
- The Nelson Dewey ACA route would result in a length of approximately 3,700 feet (less than 0.75 mile) over Refuge lands. This is approximately half the distance through the Refuge compared to the Stoneman alternative crossing location.
- The Nelson Dewey ACA route would result in approximately 22 acres of Refuge lands within its ROW, compared to 46 acres of Refuge lands within the Stoneman ACA route ROW.
- The Nelson Dewey ACA route would potentially impact approximately 9.5 acres of wetlands, which is approximately 75 percent less than the Stoneman ACA route.

- Emergent wetlands underlying the Nelson Dewey ACA route would include approximately 2.0 acres, an approximate reduction of approximately 85 percent compared to the Stoneman ACA route.

5.7.3.1.2 Engineering

Key characteristics relating to the design and engineering required for the Nelson Dewey ACA route are listed below. As with the Stoneman ACA route, the majority of engineering-related constraints for the Nelson Dewey ACA route are located on or near the portion of the ACA route that extends through Cassville, Wisconsin.

- The Nelson Dewey ACA route would result in approximately 13 miles of new line corridor not located along an existing transmission line, slightly greater than the 11 miles of new transmission line corridor for the Stoneman alternative.
- The Nelson Dewey ACA route would cross within 1,000 feet of 18 communication facilities, while the Stoneman ACA route would only encounter two facilities at that same distance.

5.7.3.2 Additional Constraints and Feasibility

There are several additional potential constraints for the Nelson Dewey ACA route. As with the Stoneman ACA route, one of the key constraints is the potential impacts to avian resources that utilize both the Refuge and the Mississippi Flyway. The potential impacts to these resources were presented above in Section 5.5.2.3. As a result of the proximity of the Nelson Dewey ACA route to the Stoneman ACA route (the two alternatives share the exact same starting point on Refuge lands and are only 1.2 miles apart at the Mississippi River), and in comparison to the overall extent of the Refuge and the Mississippi Flyway, the potential impacts to avian resources that are anticipated in general are not reiterated in detail in the following discussion on the Nelson Dewey ACA route.

5.7.3.2.1 Avian Resources

The Nelson Dewey ACA route would be a new transmission line corridor through the Refuge. It would also allow for the associated removal and revegetation of two existing transmission line corridors containing transmission lines, which would help to offset potential bird strikes in this area. The Nelson Dewey ACA route would result in a shorter transmission line corridor through the Refuge relative to what is currently present at the Stoneman location. Additionally, when compared to the wetlands and riparian habitats underlying the existing corridor at Stoneman, the Nelson Dewey ACA route includes relatively non-diverse, primarily row-crop agriculture habitats within the Refuge. The open and row-crop agriculture areas of the Nelson Dewey ACA route would provide less diverse and suitable habitat for supporting avian resources, compared to the Stoneman ACA route.

As with the Stoneman ACA route, the abundance and diversity of avian species in the Refuge results in the potential for direct and indirect impacts to avian species. Similarly with the Stoneman ACA routes, individual birds have the potential to be impacted at portions of the Nelson Dewey ACA route and at portions off the Refuge by collisions with the conductors, static wires, or other infrastructure. The Nelson Dewey ACA route is not anticipated to have potential impacts at the population level for avian species or to migratory pathways. Indirect benefits to avian species as a result of the Nelson Dewey ACA route include the revegetation of the existing transmission line corridor that would be removed through the Refuge, thus creating potential habitat for avian species that prefer wetlands, habitat edges, and early successional riparian forests.

The design and the location of the Nelson Dewey ACA route follows the “minimization” portion of the USFWS mitigation process to avoid, minimize, and mitigate/compensate. The Nelson Dewey ACA route would incorporate strategies to minimize environmental impacts to the avian species, in consultation with the USFWS. These measures include, but are not limited to, minimizing the distance of new transmission line ROW on the Refuge through the creation of a relatively straight path. Similar to the Stoneman ACA route, within the Refuge all conductors would be placed within the same horizontal plane to minimize the number and height of visible conductors for potential interaction with birds. The existing transmission lines in the Refuge that would be removed have a vertical configuration that has more potential for interaction with birds. The static wires would be marked with avian flight diverters in compliance with USFWS and Refuge consultation as well as guidance from the APLIC’s *Reducing Avian Collisions with Power Lines: The State of the Art in 2012* (APLIC, 2012). The two transmission lines at Stoneman that would be removed as a result of the construction of the Nelson Dewey alternative are shorter in height (approximately 56.5 feet) than what is proposed for the Nelson Dewey ACA route, but the existing transmission lines do not include any avian diverters or line markings and are located in habitat deemed to be more important to avian and wildlife resources than that underlying the Nelson Dewey ACA route. As with the Stoneman alternative crossing location, the Mississippi River crossing structure and the associated conductors and static wires near the Mississippi River would need to be taller (approximately 198 feet to allow the overhead transmission line to cross the waterway at a height that is permittable by the U.S. Coast Guard.

The Nelson Dewey ACA route would likely provide an overall benefit to avian resources in the area, relative to the existing Stoneman transmission infrastructure, or the proposed Stoneman ACA route. The

Nelson Dewey ACA would be located in a relatively open area, configured with conductors along a horizontal plane, include relatively short span thus decreasing overall line height, and include markings on the shield wires to minimize avian collisions compliant with APLIC 2012 guidelines. This design would create a more visible structure and conductor compared to the existing 69 kV and 161 kV lines at the Stoneman location. Additionally, the existing Stoneman transmission line ROW would be allowed to revegetate naturally, providing diverse and additional resources to avian and wildlife species that require disturbance, openings, or diverse microclimates in forested areas.

5.7.3.2.2 Archaeological and Historic Resources

As with the Stoneman ACA route, there is one archaeological site, 13CT3 (also known as Pete Adams Mound Group 4), within the Nelson Dewey ACA route ROW. There are no identified historic sites within the ROW. Potential impacts to historic-age resources would be the generally similar as described under the Stoneman alternative crossing location.

Any removal or excavation of archeological resources within the Refuge (would require an Archaeological Resources Protection Act of 1979 (ARPA) permit. Activities with the Refuge area also subject to Section 106 of the National Historic Preservation Act.

5.7.3.2.3 Oak Road and Ferry Crossing

The Nelson Dewey ACA route would also cross the Cassville Car Ferry route. The Cassville Car Ferry takes passenger cars from Cassville to the landing on Oak Road in Iowa. The ferry has been in service since 1833 and is the oldest operating ferry service in Wisconsin. The ferry connects two scenic byways: the Iowa Great River Road and the Wisconsin Great River Road (Village of Cassville, 2015b). The Nelson Dewey alternative crossing location would require a structure close to the ferry landing on the Iowa side of the river near Oak Road; during construction, this could temporarily impact accessibility of the ferry landing area.

5.7.4 Summary of Refuge Options

The three Refuge ACA routes are located in two primary locations, Guttenberg, Iowa, (L&D 10) and near Cassville, Wisconsin, (Nelson Dewey and Stoneman), with each location having notable differences in the type and extent of constraints and potential impacts. L&D 10 does not have an existing transmission line crossing at its location; a new 345 kV transmission line at this location would be required to span approximately 1.4 miles of the Mississippi River and would encounter substantial archaeological and historical resources in and near the City of Guttenberg in addition to the technical issues around such a long span over water. Importantly, the USACE review of the Project at this location noted numerous technical issues and concerns with placing a 345 kV transmission line on or near the lock and dam infrastructure, resulting in the exclusion zones shown in Figure 5-8. As a result of these factors, the Utilities do not consider the L&D 10 alternative crossing location as feasible for this Project.

Both remaining Refuge locations, Nelson Dewey and Stoneman, are considered by the Utilities as feasible ACA routes for the Project.

The Nelson Dewey and Stoneman Refuge crossings are generally similar in location, but offer important distinctions between their constraints. Within Refuge lands, the Nelson Dewey ACA route would require less length and new ROW habitat alterations through the Refuge, remove less emergent and forested wetland from within the ROW, and would require fewer woodland areas to be removed. It is anticipated that the Nelson Dewey ACA route would provide an overall benefit to avian resources and wildlife when compared with the Stoneman ACA route as a result of the available habitat types and general location of the Stoneman alternative crossing location compared to the Nelson Dewey ACA route.

Across the Mississippi River in Cassville, Wisconsin, the Nelson Dewey ACA route extends through relatively undeveloped lands to connect with existing transmission line corridors which eventually lead to an intermediate substation near Montfort, Wisconsin. At Cassville, the Stoneman ACA route would extend directly through the Village of Cassville and would encounter numerous routing constraints that include residences, businesses, and schools within or immediately adjacent to the Project ROW. Additionally, selection of the Nelson Dewey alternative crossing location would prevent potentially lengthy electrical outages that would occur if the Stoneman alternative is selected, which would require taking these lines out of service for construction activities.

Additional comparative information for these two remaining feasible Refuge ACA routes is presented in Chapter 8.0.

5.8 Underground Construction Options

As part of this analysis, USFWS requested an evaluation of underground design for the Project. The Utilities prepared an Evaluation of Underground Transmission Installation Report (Appendix D). The following discussion presents a summary of this document.

5.8.1 Potential Locations for Underground Construction

Two potential underground alternatives (the Stoneman and Nelson Dewey underground crossing alternatives) were analyzed for the Project. (The Utilities completed this underground analysis while they were only contemplating a 345 kV/161 kV crossing. Accordingly, the analysis presented here and in

Appendix D pertains only to a 345 kV/161 kV underground alternative.) An initial assessment of the potential for an underground alternative at the other five alternative crossing locations was completed by the Utilities. As a result of the constraints encountered to access these locations for an underground crossing, and the lack of agency and/or municipality permitting or approval for preliminary or corridors to each of these alternative crossing locations, it was determined that further investigation of an underground alternative at these locations was not warranted at this time.

The Nelson Dewey underground crossing alternative would be placed in a new corridor. The Stoneman underground crossing alternative would utilize a portion of the existing overhead 161 kV corridor for placement of the underground alternative. The locations of the two underground route alternatives were selected to minimize the potential impact on the environment and Refuge lands. The preliminary routing options investigated as part of the feasibility study include (note the routes are described from east to west):

- The Stoneman underground crossing alternative starts southeast of the Village of Cassville and heads west to the Stoneman Substation then continues west/southwest under the Mississippi River channel to the western river limits near the existing overhead alignment. From this location, the underground alternative continues southwest slightly north of the current overhead alignment before rejoining the existing overhead alignment. From this location the preliminary corridor turns back west and extends within the overhead alignment to the riser pole location near the railroad tracks where the alternative would continue as an overhead line. The Stoneman underground crossing alternative would include approximately 9,600 feet of total underground length.
- The Nelson Dewey underground crossing alternative is in a new corridor. The proposed 345 kV/161 kV underground crossing starts at the southeast corner of the Nelson Dewey Substation, heads southwest to the east bank of the Mississippi River and continues southwest under the channel to the existing western river limits near the Cassville Ferry Landing boat ramps. From this location, the underground alternative continues to the southwest, in a straight alignment to the existing overhead transmission line corridor to the riser pole location near the railroad tracks. The alternative would continue west as an overhead line from the riser pole. The Nelson Dewey underground crossing alternative would include approximately 7,900 feet of total underground length.

5.8.2 Review of Potential Costs

Preliminary construction cost estimates were developed based on the preliminary underground alternatives, installation methods, and cable system(s), as evaluated in the full underground installation report (Appendix D). These cost estimates are based on RSMeans Heavy Construction Cost Data as well as past projects, budgetary quotes provided by vendors, and professional experience. An underground design would add an estimated $80 million to $100 million (depending on the final route selected), to a total Project cost, representing a more than 20 percent cost increase for the total Project. The increase in costs associated with an underground alternative for the Project could potentially require additional review by MISO.

- The total cost estimate for placing the 345 kV/161 kV Nelson Dewey crossing underground is $82.0 MM.
- The total cost estimate for placing the 345 kV/161 kV Stoneman crossing underground is $97.6 MM.

More detailed breakdowns of these costs can be found in Appendix D.

5.8.3 Analysis of an Underground Alternative at the Refuge

The underground crossing alternatives would result in potential impacts to environmental and social resources as well as engineering constraints. USFWS staff have yet to determine the environmental impacts of an underground alternative; it is the Utilities' understanding that the USFWS will use this report (and the included underground report found in Appendix D) as a starting point for its evaluation of the Refuge crossings proposed in this ACA, including the underground alternative.

5.8.3.1 Wetlands

The two underground alternatives have wetlands within their respective ACA routes. The wetlands potentially impacted by the location of the underground corridors are primarily designated as forested/shrub wetlands and emergent wetlands. Riser poles would be required for both underground crossing scenarios and underground construction types. The riser poles would require the conversion of approximately 1.0 acre of land. The currently proposed riser pole locations are within the Refuge on land classified as emergent wetland and a very small area of forested/shrub wetland. The proposed eastern and western transition stations would be located outside of Refuge boundaries on the eastern side of the Mississippi River and at the rebuilt Turkey River Substation, respectively.

Both underground construction options would require underground splice vaults every 1,750 feet. Each vault is approximately 50 feet by 150 feet. It is anticipated that both alternatives would require a total of five splice locations, each containing four vaults (three for the 345 kV line and one for the 161 kV line) for a total of 20 vaults within the Refuge. Although the actual locations of these vaults are not known at this time, due to the presence of wetlands in this area (particularly underlying the Stoneman underground alternative which has more wetland habitat), it is likely a majority of the acreage required for vault construction would occur in designated wetlands. In addition, vegetation management areas would be required near these splice vault locations so that root incursion into the underground cable systems would be prevented with a minimum cleared area of 7,500 square feet per vault.

In comparing the two types of underground construction, the open trench method would require the excavation of a utility corridor through the entire Refuge, including wetland areas. Measures to avoid wetlands in the final alignment for construction would be employed; however, as a result of the extensive wetlands in this area, permanent wetland impacts potentially would occur where vegetation removal and soil excavation is required. The open trench method would cross approximately 1,100 feet of wetlands under Nelson Dewey crossing alternative and approximately 7,000 feet of wetlands under the Stoneman crossing alternative. The proposed horizontal directional drilling (HDD) option would also require a new utility corridor through both the Refuge and wetland areas, but potential impacts to wetlands would be minor outside of the staging and splice vault areas, as the HDD method would extend underneath wetland areas through the Refuge. Splice vaults would be required at the same five locations and would be installed by excavation. Vegetation management would be required in and around the riser poles and the splice vaults to allow for safe operation of the cable systems. In these areas, existing forested/shrub wetland vegetation, if present, would be permanently removed. Trench backfilling for this underground alternative would generally not be completed using the native soil material; heat-dissipating sand is used for the 42+ inch trench depth and removal of the native material would be required. This would include adding non-native fill to Refuge lands and to wetlands along the underground alternative route.

5.8.3.2 Land Cover and Land Use

In the vicinity of the Refuge are areas of open water, developed open space, low intensity development, deciduous forest, grassland/herbaceous area, pasture/hay fields, cultivated crops, forested/shrub wetlands, and emergent herbaceous wetlands. Several residences are near the Stoneman and Nelson Dewey underground alternatives, including the Promiseland Winery and Vineyard operation close to the Turkey River Substation location. A small private parcel is located within the Refuge boundaries and would be traversed by the Nelson Dewey underground alternative; this area is currently used for cultivated crops. In addition, another smaller private parcel that parallels the rail line on the western edge of the Refuge is located just north of the Nelson Dewey underground alignment. A parcel of land managed by the INHF would be traversed by the Stoneman underground alternative.

The scenic views of the Refuge attract hundreds of visitors each year for a variety of activities, such as hiking and boating. As a result of the area topography, some construction activities would likely be visible from vantage points around the Refuge, but this would be limited to major construction activities. Visual evidence of underground transmission infrastructure through the Refuge would include the area cleared for splice vault locations along the buried cable corridor, the riser pole area, and access roads to reach both the vault locations and the riser pole area. The transition station itself would also be visible, but would be located at the rebuilt Turkey River Substation. Permanent vegetation removal would be required at these locations and would be evident from elevated views surrounding the Refuge.

It is anticipated that either underground alternative would require 20 vaults within the Refuge. At each of these locations, the transmission line would need to be slightly closer to the surface grade. This proximity may affect soil composition and seed germination in the surrounding vegetation due to possible heat transfer when the conductors are buried at a shallower depth. A proposed re-vegetation plan to address this issue would be developed in consultation with the USFWS.

5.8.3.3 Floodways/Floodplains

FEMA designates areas that are likely to experience flooding in a 100-year storm event. Since the Project is in such close proximity to the Mississippi River, much of the routes are in Zone AE or X. Zone AE includes areas subject to inundation of floodwater by the 1-percent annual chance flood event, also known as a 100-year floodplain (FEMA, 2015). The segments in Zone X have moderate risk within the 0.2-percent-annual-chance (or 500-year) floodplain. Zone X also includes areas of 1-percent-annual-chance flooding where average depths are less than 1 foot and areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, both of which present a moderate risk of flood. Outside of the 100-year and 500-year floodplains, there is minimal risk of floods.

The segments through Zone X are those that are on the bluffs above the Mississippi River. This area is more than 200 feet higher in elevation than those areas in the 100-year floodplain closer to the river. There may be fewer potential impacts to floodplain areas if the HDD method is utilized compared to the open trench option, depending on differences in the amount and location of staging areas in relation to a specific route alignment. In general, the open trench would potentially require more of a construction footprint within the floodplain during construction, but may result in a reduced permanent impact in terms of permanent ROW compared to the HDD method, as a result of the narrower operation footprint compared to HDD.

Approximately half of the underground corridor would need to be placed within FEMA-designated 100-year floodplains. The proposed Project is not anticipated to cause a potential reduction in floodflows or reduction in flood storage volumes in the vicinity of the Refuge. The infrastructure required to operate the underground 345 kV cable systems within the floodplain would be limited in size, but would result in the permanent conversion of land designated as floodplain within the ROW for each construction method. Construction within the floodplain would increase the potential for issues with maintenance access, particularly during severe weather events and certain seasonal conditions, particularly flooding.

5.8.3.4 Cultural Resources

An assessment of Iowa cultural and archeological resources in the surrounding area identified archaeological sites listed on the NRHP as well as other recorded sites. Data was obtained from the Iowa SHPO.

The Nelson Dewey underground crossing alternative would cross in proximity to one mound group, thought to be from the Woodland period. This mound group has only been investigated through archival research and thus its integrity is unknown. If an underground alternative were chosen, the mound group location would need to be verified and its integrity investigated with SHPO consultation prior to start of construction activities. This site has not been evaluated to determine its eligibility for listing on the NRHP. The Stoneman underground crossing alternative would have two archeological resources within the projected ROW width. According to data obtained from the Iowa SHPO, these two resources are burial mounds that were previously destroyed. There are no known historical structures identified within 1,000 feet of either alternative underground route. Overall, within the Refuge, there have been 108 archaeological, geomorphological, history, and research investigations that have produced more than 129,000 artifacts (USFWS, 2006). Any removal or excavation of archeological resources within the Refuge would require an Archaeological Resources Protection Act of 1979 (ARPA) permit. Activities in the Refuge are also subject to Section 106 of the National Historic Preservation Act.

5.8.3.5 Existing or Planned Development

Several areas with existing or planned development are in the general vicinity of the proposed underground alternatives. The Nelson Dewey underground crossing alternative would be near the launch for the Cassville Car Ferry, a passenger ferry between Cassville, Wisconsin, and Oak Road in Clayton County, Iowa. Construction of the Nelson Dewey underground crossing alternative may temporarily disrupt the ferry service as closures of Oak Road might be required during trenching and installation of the underground transmission line. Also, depending on the crossing location selected, required construction activities near the Mississippi River may disrupt normal operations of the ferry.

An active Canadian Pacific railroad extends northwest to southeast along the Mississippi River and would need to be crossed by either underground alternative. Potential boring activities at the site may require disruption of normal rail traffic through the area.

5.8.3.6 Navigation Considerations

Barges, boats, and other river vessels utilize the Mississippi River channel near the potential underground transmission crossings. Construction timing would be coordinated with the U.S. Coast Guard to avoid potential impacts to Private Aids to Navigation in this portion of the Mississippi River. Closures of the Mississippi River channel near either the Nelson Dewey or Stoneman may be required during construction activities. These closures would need to be coordinated by the Utilities, the USFWS, the USACE, and the U.S. Coast Guard in terms of the planned duration and extent of the navigation considerations on the river.

Periodic maintenance of all transmission facilities would be required. Impacts to navigation aids on the Mississippi River are not anticipated as a result of operation of either underground construction scenario or crossing location. Significant delays to maritime traffic on the Mississippi River are not anticipated to result from either construction activities or ongoing maintenance.

5.8.3.7 Access Considerations

Where no current access is available or existing access is inadequate to cross roadway ditches or other features, new access roads may be constructed. Permission from landowners and/or land managers would be obtained prior to using any of these areas to access the ROW for construction. Where necessary to accommodate heavy construction equipment, including cranes, cement trucks, and hole-drilling equipment, existing roads may be upgraded or new roads may be constructed. If new roads must be constructed, in addition to permission from landowners, the Utilities would also obtain permissions necessary from the local road authority. During construction activities, the Utilities would work with appropriate road authorities to utilize proper maintenance procedures of roadways traversed by construction equipment.

Ground-level vegetation disturbed or removed from the ROW during construction of either underground alternative would naturally reestablish to pre-construction conditions. Areas where significant soil compaction or other disturbance from construction activities occur would require additional assistance in re-establishing the vegetation and controlling soil erosion. BMPs to be used during the construction of the Project would be identified in a Storm Water Pollution Prevention Plan.

5.8.4 State Regulatory Considerations

Increased costs due to undergrounding may create significant challenges in obtaining state approvals in Iowa and Wisconsin. The PSCW siting authority requires that the benefits of the Project be reasonable in relation to cost.[34] Due to the significantly higher costs associated with underground construction, the PSCW has previously held that underground construction "is not a viable transmission construction option unless engineering considerations require it or circumstances leave no other reasonable option available."[35] In that same decision, the PSCW noted that an underground crossing has its own environmental impacts, and that "the transition stations required for underground crossings… would present undesirable aesthetic impacts of their own."[36] The PSCW is also concerned about limited access for repairs and ROW congestion problems associated with undergrounding transmission lines.[37] Consequently, the PSCW has limited approval of underground transmission lines to situations where there is "a reliability issue, building clearance concerns, or a nearby airport."[38]

Similarly, the IUB frequently denies requests to underground transmission lines because it is not "fair, just, or proper" to require ratepayers to pay the increased expense of underground construction[39] which

[34] Wis. Stat. § 196.491(3)3t (2014).
[35] *Joint Application of Dairyland Power Cooperative, Northern States Power Company-Wisconsin, and Wisconsin Public Power, Inc., for Authority to Construct and Place in Service 345 kV Electric Transmission Lines,* Docket No. 5-CE-136, Final Decision at 36 (May 30, 2012) [hereinafter La Crosse Project Final Decision]; Joint Application of Wisconsin Electric Power Company, for Authority to Construct a New Distribution Substation and Related Electric Distribution Facilities in the City of Wauwatosa and American Transmission Company, LLC, for Authority to Construct Related 138 kV Electric Transmission Facilities in the Cities of Milwaukee and Wauwatosa, Docket No. 5-CE-139, Final Decision at 32 (Mar. 20, 2013)[hereinafter *Western Milwaukee County Electric Reliability Project*] ("use of underground construction should in general be limited to where it is technically necessary and no reasonable options exist").
[36] La Crosse Project Final Decision at 36.
[37] Western Milwaukee County Electric Reliability Project at 32; *see also, Application of American Transmission Company to Construct a New 138 kV Line from the North Madison Substation to the Huiskamp Substation in the Towns of Vienna and Westport and the Village of Waunakee in Dane County, WI*, Docket No. 137-CE-139, FINAL DECISION at 20 (July 7, 2007) (discussing excessive cost of undergrounding and increased time and difficulty associated with repairing underground lines).
[38] Western Milwaukee County Electric Reliability Project at 32.
[39] *In re: MidAmerican Energy Company*, Docket Nos. E-21752, E-21753, E-21754, 2006 WL 2134555, Proposed Decision and Order Granting Franchises at *14 (Iowa U.B. July 26, 2006) (denying request to underground because the cost of underground construction can be as much as ten time the cost of overhead construction), *aff'd*, 2006 WL 2710649, Order Affirming Proposed Decision and Order Granting Franchises (Iowa U.B. Sept. 12, 2006); *e.g.*, *In re: ITC Midwest LLC*, Docket Nos. E-21948, E-21949, E-21950, E-21951, Order Denying Petition for Limited Intervention and Granting Petitions for Electric Franchises at 79 (Iowa U.B. June 1, 2011) (affirming Board staff engineers' determination that undergrounding transmission line was not economically feasible); *In re: Cedar Falls*

can be "as much as ten times as much the cost of overhead construction." Overall, the Utilities believe that the significant increase in Project cost associated with underground construction; the potential impact on Refuge lands related to underground construction; and, the regulatory challenges do not warrant further evaluation of underground construction.

Utilities, Docket No. E-21647, 2005 WL 7138145, Proposed Decision and Order Granting Franchise at *9 (Iowa U.B. July 6, 2005), *aff'd*, 2005 WL 2860287, Order Affirming Proposed Order, Addressing Motions, and Granting Permission to Appear (Iowa U.B. Sept. 21, 2005) (affirming decision not to underground because cost of underground construction was over five time that of overhead construction).

6.0 MAJOR FEDERAL, STATE, AND LOCAL PERMITS AND APPROVALS

For the Mississippi River crossing, the Project must obtain approvals from multiple federal agencies which must complete environmental reviews under NEPA. The Project must also obtain state and local siting and condemnation authorizations in Iowa, Wisconsin, and, potentially, Illinois, depending on the final route. This chapter describes the approvals and authorizations the Project requires for the Mississippi River crossing of the ACA routes, including the Refuge options.

6.1 NEPA

NEPA provides a general procedure for federal activities that may impact the environment (42 U.S.C. § 4331, et. seq.) Part of its underlying policy is to ensure that "presently unquantifiable environmental amenities and values be given appropriate consideration in decision making …" (42 U.S.C. § 4332(B)). If a federal action "significantly affects[s] the quality of the human environment" a "detailed statement" of such effects must be provided so that they may be considered in the decision-making process (42 U.S.C. § 4332(C)).

Each federal agency also has rules to implement NEPA's requirements. The NEPA process has three levels of environmental analysis: categorical exclusion determination; preparation of an Environmental Assessment/Finding of No Significant Impact (EA/FONSI); and preparation of an Environmental Impact Statement (EIS). The EPA describes the three levels as follows (EPA, 2016):

- Categorical Exclusion: At the first level, an undertaking may be categorically excluded from a detailed environmental analysis if it meets certain criteria which a federal agency has previously determined as having no significant environmental impact. A number of agencies have developed lists of actions which are normally categorically excluded from environmental evaluation under their NEPA regulations.
- EA/FONSI: At the second level of analysis, a federal agency prepares a written Environmental Assessment (EA) to determine whether a federal undertaking would significantly affect the environment. If the answer is no, the agency issues a Finding of No Significant Impact (FONSI). The FONSI may address measures which an agency would take to mitigate potentially significant impacts such that the federal undertaking would avoid significant environmental effects.
- EIS: If the EA determines that the environmental consequences of a proposed federal undertaking may be significant, an EIS is prepared. An EIS is a more detailed evaluation of the proposed

action and alternatives. The public, other federal agencies, and outside parties may provide input into the preparation of an EIS and then comment on the draft EIS when it is completed.[40]

The environmental review is expected to include an evaluation of impacts on carbon dioxide emissions based on CEQ guidance. The CEQ issued its Revised Draft Guidance for Greenhouse Gas Emissions and Climate Change Impacts December 18, 2014 (GHG Guidance) that require federal agencies to consider the impacts of a proposed project on GHG (CEQ, 2014). Although not binding, the CEQ encourages all agencies to "apply this guidance to all new agency actions moving forward and, to the extent practicable, to build its concepts into currently ongoing reviews."[41]

There is typically one lead agency that would oversee the NEPA environmental review and prepare the environmental document. Based on its consultations with federal agencies, the Utilities anticipate that an EIS would be prepared for the Project.

The lead agency is responsible for establishing liaison with all federal, state, local, and tribal agencies with legal jurisdiction or special expertise relating to any environmental impact involved in a proposed action and to request their participation as cooperating agencies on an EIS, as appropriate. Other federal agencies may become cooperating agencies and provide assistance in the preparation of the environmental document.

There are two federal agencies that may become lead agency, USFWS or RUS. Potential cooperating agencies include USACE and either USFWS or RUS.

6.2 Primary Federal Authorizations and Approvals for the Mississippi River Crossing

Federal authorizations and approvals would be required for the Project to cross the Mississippi River.

6.2.1 USFWS

The USFWS manages the Refuge including USFWS-owned and USACE-owned lands. The USFWS has sole siting authority for new transmission facilities within the Refuge. The National Wildlife Refuge Improvement Act of 1997 provides that the Refuge is to be managed to "fulfill the mission of the System, as well as the specific purposes for which that refuge was established."[42] The Act also expressly

[40] http://www.epa.gov/compliance/basics/nepa.html#requirement, last retrieved May 4, 2015.
[41] *Id*. at 31.
[42] 16 U.S.C. § 688DD(a)(3)(a).

recognizes that new electric uses may be approved within the Refuge. The USFWS is authorized to grant new ROW for power line use. Specifically, the United States Department of Interior Secretary is authorized to:

> (B) permit the use of, or grant easements in, over, across, upon, through, or under any areas within the System for purposes such as but not necessarily limited to, powerlines, telephone lines, canals, ditches, pipelines, and roads, including the construction, operation, and maintenance thereof, whenever he determines that such uses are compatible with the purposes for which these areas are established.[43]

The "term 'compatible use' means a wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Director, <u>will not materially interfere</u> with or detract from the fulfillment of the mission of the System or the purposes of the refuge."[44] If the power line use is found to be compatible, the use would need a special use permit, archaeological/historic, and a ROW permit, which would involve surveys, studies, and mitigation. Additionally, the USFWS has jurisdiction over species and habitats designated as protected by the FWCA, ESA, BGEPA, and MBTA. Compliance or concurrence from the USFWS in regard to these regulations must be obtained for any action that requires additional federal permitting or funding.

6.2.2 RUS

Dairyland intends to seek financial assistance from RUS for the Project for its ownership interest in the Project. As a result, RUS must determine if the financial assistance would be a federal action (7 CFR § 1970.8(c). If so, RUS's financing would be subject to review under NEPA, including RUS Environmental Policies and Procedures, and 40 CFR Parts 1500-1508.

6.2.3 USACE/EPA

The USACE is responsible for issuing permits under Section 404 of the Clean Water Act. The EPA establishes policies and procedures for permitting under the Clean Water Act and reviews certain permitting decisions by USACE. USACE has authority under Section 10 of River and Harbors Act for permitting crossing of the Mississippi River. Additional permitting may be required if any structures need to be placed on a regulated levy. Permitting authority of levies can belong to the USACE, or can be delegated to a local authority, depending on the location and potential impacts.

[43] 16 U.S.C. § 688DD(d)(1)(B).
[44] 16 U.S.C. § 668EE(1) (emphasis added).

6.2.4 U.S. Coast Guard

The U.S. Coast Guard has permitting authority over the placement of structures in or work in or affecting the navigable waters of the United States, including the Mississippi River. The U.S. Coast Guard has standards that regulate the minimum vertical clearance heights above the Mississippi River, as well as reference points against which to measure the vertical clearance as listed in 33 CFR 322.

6.3 State Need, Siting, and Condemnation Approvals for the Mississippi River Crossing

Iowa, Wisconsin, and Illinois would potentially require approvals for the Mississippi River crossing.

6.3.1 Iowa

All alternative crossing locations would require approval from the IUB. No person may construct, operate, or maintain an electric transmission line capable of operating at a voltage of 69 kV or more and greater than a mile in length located outside of a city in Iowa without first obtaining a separate franchise for each county from the IUB (Iowa Code § 478.1.). A franchise from the IUB must be obtained for each county traversed by the proposed transmission line.

The IUB must expressly find that the proposed line is necessary to serve a public use and represents a reasonable relationship to an overall plan of transmitting electricity in the public interest. Transmission line routes must comply with Iowa Code § 478.18(2) and 199 IAC 11.1(7), which set forth the requirements for the selection of a route for an electric transmission line based on routing priorities. Routing priorities are:

- Roads.
- Active railroad ROW.
- Division lines of land, including section, quarter section, and quarter-quarter section lines.

The IUB may grant a franchise, in whole or in part, and may impose terms, conditions, restrictions, or modifications of location and route, as the IUB deems just and proper (Iowa Code § 478.4). The franchise would also provide the petitioner the right of eminent domain outside of an Iowa municipality if requested in the petition and granted by the IUB to the extent it is found necessary for public use (Iowa Code §§ 478.6 and 478.15).

6.3.2 Wisconsin Certificate of Public Convenience and Necessity

Every person constructing a transmission line exceeding one mile in length designed for operation at a nominal voltage of 100 kilovolts or more in the state of Wisconsin must obtain a CPCN from the PSCW prior to commencing construction.[45] The Project must also obtain permits from the WDNR, including wetlands and storm water discharge permits.[46]

To issue a CPCN in Wisconsin, Wis. Stat. § 196.491(3)(d) requires the PSCW to make specific findings relating to need and routing. The PSCW must find that the project satisfies the reasonable needs of the public for an adequate supply of electric interest. Further, for a 345 kV transmission line, the PSCW must further find that the project costs are reasonable in relation to project benefits:

> For a high-voltage transmission line that is designed for operation at a nominal voltage of 345 kilovolts or more, the high voltage transmission line provides usage, service or increased regional reliability benefits to the wholesale and retail customers or members in this state and the benefits of the high-voltage transmission line are reasonable in relation to the cost of the high voltage transmission line.

In addition, Wis. Stat. § 196.491 (3)(d)5. requires that the facility cannot "add to the cost of service without proportionately increasing the value and available quantity of service . . . "

In determining the route, the PSCW must follow the Siting Priorities Law[47] which establishes priority transmission corridors. The Siting Priorities Law provides:

> (6) Siting of electric transmission facilities. In the siting of new electric transmission facilities, including high-voltage transmission lines, as defined in s. 196.491 (1) (f), it is the policy of this state that, to the greatest extent feasible that is consistent with economic and engineering considerations, reliability of the electric system, and protection of the environment, the following corridors should be utilized in the following order of priority:
>
> (a) Existing utility corridors.
> (b) Highway and railroad corridors.
> (c) Recreational trails, to the extent that the facilities may be constructed below ground and that the facilities do not significantly impact environmentally sensitive areas.
> (d) New corridors.[48]

6.3.3 Illinois

A 345 kV transmission line project must obtain a CPCN from the ICC.[49] To obtain a CPCN, the project proponent must demonstrate:

[45] Wis. Stat. §§ 196.491(1)(f) and 196.491(3).
[46] Wis. Stat. §§ 283.33(1)(a) or (am), 281.36.
[47] Wis. Stat. § 1.12(6).
[48] *Id.*
[49] 220 ILCS 5/8-406.

(1) that the proposed construction is necessary to provide adequate, reliable, and efficient service to its customers and is the least-cost means of satisfying the service needs of its customers or that the proposed construction will promote the development of an effectively competitive electricity market that operates efficiently, is equitable to all customers, and is the least cost means of satisfying those objectives;
(2) that the utility is capable of efficiently managing and supervising the construction process and has taken sufficient action to ensure adequate and efficient construction and supervision thereof; and
(3) that the utility is capable of financing the proposed construction without significant adverse financial consequences for the utility or its customers.[50]

In making its decision on a CPCN, the ICC must “attach primary weight to cost or cost savings to the customers of the utility (Illinois Code 220 ILCS 5/8-406).”

6.3.4 Other State-Required Permits

The Project would also be subject to other state regulatory requirements for construction of large utility infrastructure projects. While not specifically enumerated in this chapter, the requirements include but are not limited to National Pollutant Discharge Elimination System storm water permits.

Additional State permits and clearances that may be required for a river crossing include Section 401 Water Quality Certification, protected species reviews, cultural resources reviews, and floodplain permits. Section 401 permits are typically permitted concurrently with Section 404 permits through USACE and the state authority using a Joint Permit Application. In Iowa, Section 401 permitting is conducted through the IDNR. In Wisconsin, the State authority for Section 401 permitting is the WDNR. The Illinois EPA regulates Section 401 permitting in Illinois. State-protected species reviews are conducted through the IDNR, the WDNR, and the Illinois Department of Natural Resources. Cultural Resource reviews, pursuant to Section 106 of the National Historic Preservation Act of 1966 (as amended), are conducted through the State Historical Society of Iowa, the Wisconsin Historical Society, and the Illinois Historic Preservation Agency.

A sovereign lands and rivers construction permit from the Iowa Natural Resources Commission may be required for river crossings as well. The permit applies to:

[50] 220 ILCS 5/8-406(b).

> all fee title lands and waters under the jurisdiction of the commission; dedicated lands and waters under the jurisdiction of the commission and managed by the commission for public access to a meandered sovereign lake or meandered sovereign river; meandered sovereign lakes; meandered sovereign rivers; and sovereign islands, except those portions of the Iowa River and the Mississippi River where title has been conveyed to charter cities" (571 IAC 13.2).

In the ACA Study Area, there are no sovereign lakes. Sovereign rivers in the ACA Study Area include the Mississippi River, the Turkey River, the Maquoketa River, and the Little Maquoketa River[51].

Floodplain permits may be required if any fill material or structures need to be placed within regulated 100-year floodplains or floodways. The IDNR Flood Plain Permit may be required for structures located within a floodplain in Iowa. The WNDR regulates floodplains within Wisconsin; however, permitting is typically delegated to local level authority. The Illinois Department of Natural Resources Division of Water Resource Management issues floodplain permits for work in and along rivers in Illinois.

6.4 Local Siting and Condemnation Approvals for the Mississippi River Crossing

For portions of all alternative crossing locations in Iowa, local approvals would also be required.

6.4.1 City of Dubuque

All alternative crossing locations analyzed in this report would require a franchise from the IUB because they include segments in Iowa located outside of municipal boundaries. There are four alternative crossing locations (L&D 11, Galena 161 kV, Julien Dubuque Bridge, and Highway 151 Bridge) for which Dubuque approvals would also be required. Dubuque, not the IUB, must grant a permit for a new transmission line to be located within its municipal boundaries.[52]

Dubuque has a licensing ordinance that requires a public utility to obtain a license for any new proposed "electric transmission line" located within the City.[53] The Ordinance limits the siting of new transmission lines in proximity to buildings. The Ordinance specifically states: "no transmission line shall be constructed, except by agreement, within 250 feet of any dwelling house or other building, except where said line crosses or passes along a public highway or is located alongside or parallel with the ROW of any railway company."[54] The Dubuque City Code does not define public highway. However, Iowa Admin

[51] As noted the Project may require a sovereign lands and rivers construction permit from the Iowa Natural Resources Commission; this area is not shown on the figures in this ACA to aid in the identification of the Refuge.
[52] Iowa Code § 364.2(4)(a).
[53] Dubuque City Code § 11-6-1.
[54] Dubuque City Code § 11-6-7.

Code § 701-67.1(425A) defines "Public Highways" as "means and includes any way or place available to the public for purposes of vehicular travel notwithstanding temporarily."

6.4.2 City of Guttenberg

Guttenberg has sole siting authority for new transmission facilities within its municipal boundaries.[55] Authorization from Guttenberg would be required for the L&D 10 alternative. In contrast to Dubuque, Guttenberg does not have any existing city ordinances related to the process for obtaining approval to route a transmission line within the city limits.

[55] Iowa Code § 364.2(4)(a)

7.0 AGENCY OUTREACH

In 2012, the Utilities began engaging with federal, state, and local agencies interested in the Mississippi River crossing for the Project. Between 2012 and the present, the Utilities have had 11 meetings with USFWS to discuss this Project. The Utilities have also had meetings with other permitting authorities including USACE, IUB, IDNR, PSCW, WDNR, City of Dubuque, and City of Guttenberg to discuss the Mississippi River crossing. Meetings were also held with other municipalities that may potentially be impacted by the crossing location, including the Village of Cassville and the City of East Dubuque. The Utilities also met with interested stakeholders, including the Iowa Sierra Club, Iowa Environmental Council, and the Center for Rural Affairs related to the Mississippi River crossing. In these meetings, the Utilities provided Project information and discussed preliminary Mississippi River crossing options, obtained feedback regarding permitting requirements, and received comments and suggestions on routing options. The Utilities also had other informal communciations with agency representatives in the development of this ACA. Tables 7-1 to 7-11 provide a listing of agency meetings held to date related to the Mississippi River crossing, according to the agency. This list of meetings will grow as the Utilities continue to engage permitting authorities and other stakeholders as a part of Project development.

7.1 Federal Agencies

The following tables list meetings held with federal agencies about the Mississippi River crossing.

Table 7-1: USFWS Meetings

Date	Attendees	Purpose of Meeting
4/16/2012	USFWS, USACE, ATC, Stantec	Meeting to introduce Project and identify potential locations for crossing the Mississippi River.
9/18/2012	USFWS, USACE, PSCW, WDNR, IUB, City of Dubuque, ATC, Stantec	Meeting to discuss potential crossings of Mississippi River.
6/18/2013	USFWS, ITC Midwest	Meeting to discuss potential crossings of Mississippi River.
10/10/2013	USFWS, Iowa Natural Heritage Foundation, Iowa Environmental Council, the Iowa Chapter of the Audubon Society, the Iowa Chapter of the Nature Conservancy, the Iowa Chapter of the Sierra Club, the Center for Rural Affairs, ITC Midwest	Overview of the MVP projects, including the Mississippi River crossing, with the environmental agencies in Des Moines, Iowa.

Date	Attendees	Purpose of Meeting
10/31/2013	USFWS, Iowa Chapter of Sierra Club, ITC Midwest, Burns & McDonnell	Onsite tour with environmental agencies and stakeholders.
3/4/2014	USFWS, ITC Midwest	Meeting to discuss potential crossings of Mississippi River.
5/6/2014	USFWS, ATC, ITC Midwest, Sparrow	Meeting to discuss potential impacts of routing 345 kV line through Dubuque.
9/19/2014	USFWS, ATC, ITC Midwest, Sparrow	Meeting to discuss potential crossings of Mississippi River.
1/30/2015	USFWS, ITC Midwest	Meeting about USFWS compatibility determination.
2/4/2015	USFWS, USACE, ATC, ITC Midwest, Burns & McDonnell	Update on Project status and review of crossing alternatives, feasibility of non-Refuge crossings, and key constraints.
2/12/2015	USFWS, USACE, ATC, ITC Midwest, Burns & McDonnell, Sparrow	Meeting to discuss analysis of Nelson Dewey and Stoneman alternatives.
3/9/2015	USFWS, ATC, ITC Midwest	Meeting to discuss updates on potential Mississippi River crossing alternatives.
5/11/2015	USFWS, ITC Midwest	Meeting to discuss comparable analysis factors in the ACA.

Table 7-2: USACE Meetings

Date	Attendees	Purpose of Meeting
4/16/2012	USACE, USFWS, ATC, Stantec	Meeting to introduce Project and identify potential locations for crossing the Mississippi River.
8/13/2012	USACE, ATC	Meeting to discuss L&D 11 crossing alternative.
9/18/2012	USACE, USFWS, PSCW, WDNR, IUB, City of Dubuque, ATC, Stantec	Meeting to discuss potential crossings of Mississippi River.
10/30/2014	USACE, ATC, ITC Midwest	Meeting about USACE permit process.
1/7/2015	USACE, ITC Midwest, Burns & McDonnell	Meeting about potential crossings at L&D 10 and L&D 11.
2/4/2015	USFWS, USACE, ATC, ITC Midwest, Burns & McDonnell	Update on Project status and review of crossing alternatives, feasibility of non-Refuge crossings, key constraints.
2/12/2015	USFWS, USACE, ATC, ITC Midwest, Burns & McDonnell, Sparrow	Meeting with more detailed analysis of Nelson Dewey and Stoneman alternatives.
10/15/15	USACE, ITC Midwest, ATC	Meeting to provide an update on Mississippi River crossing alternatives.

7.2 State Agencies

The following tables outline meetings held with state agencies since the beginning of the Project about the Mississippi River crossing.

Table 7-3: Iowa Utilities Board Meetings

Date	Attendees	Purpose of Meeting
7/31/2012	IUB, ATC, Davis Brown Law representing ATC	Introductory meeting with the IUB on Project.
9/22/2014	IUB, ITC Midwest, ATC	Meeting to update IUB on Project and the Mississippi River crossing; announce public outreach in Wisconsin.
1/13/16	IUB, ITC Midwest, ATC, and DPC	Meeting to update IUB on Project and the Mississippi River crossing.

Table 7-4: Iowa Department of Natural Resources Meetings

Date	Attendees	Purpose of Meeting
7/31/2012	IDNR, ATC, Davis Brown Law representing ATC	Introductory meeting with the IDNR on Project.

Table 7-5: Public Service Commission of Wisconsin and Wisconsin Department of Natural Resources Meetings

Date	Attendees	Purpose of Meeting
8/15/2012	PSCW, WDNR, ATC, Cullen, Weston, Pines & Bach representing ATC	Introductory meeting with PSCW and WDNR on Project.
9/18/2012	PSCW, WDNR, USWFS, USACE, IUB, City of Dubuque, ATC, Stantec	Meeting to discuss potential crossings of Mississippi River.
9/30/2014	PSCW, WDNR, ATC, ITC Midwest	Update on Project and announce public outreach in Wisconsin.

7.3 Local Government Units

The following tables list meetings held with local government units since the beginning of the Project about the Mississippi River crossing.

Table 7-6: City of Dubuque Meetings

Date	Attendees	Purpose of Meeting
7/18/2012	City of Dubuque, ATC, Davis Brown Law representing ATC	ATC's initial meeting with the City of Dubuque.
9/18/2012	City of Dubuque, USFWS, USACE, IUB, WDNR, PSCW, ATC, Stantec	Meeting to discuss Mississippi River crossing locations.
5/2/2014	City of Dubuque, ITC Midwest	Meeting to discuss potential impacts of routing 345 kV line through Dubuque.
9/23/2014	City of Dubuque, ITC Midwest	Meeting with City Manager of Dubuque regarding potential Mississippi River crossing in Dubuque.
10/8/2014	City of Dubuque, ITC Midwest	Meeting regarding potential Mississippi River crossing.
11/18/2014	City of Dubuque, ITC Midwest	Updates on three preliminary corridors for crossing alternatives in the Dubuque area and the results of cultural research.
3/5/2015	City of Dubuque, ITC Midwest, Briggs and Morgan representing ITC Midwest	Meeting about Dubuque transmission line permitting requirements.
3/11/2015	City of Dubuque, ITC Midwest	Meeting with Dubuque City Manager regarding potential preliminary corridors for alternative crossing locations in Dubuque.
3/25/2015	City of Dubuque, ITC Midwest	Meeting with City of Dubuque regarding potential preliminary corridors for alternative crossing locations in Dubuque.
4/8/2015	City of Dubuque, ITC Midwest, Briggs and Morgan representing ITC Midwest	Meeting regarding potential preliminary corridors for alternative crossing locations in Dubuque and permitting requirements.

Table 7-7: City of East Dubuque Meetings

Date	Attendees	Purpose of Meeting
6/24/2015	East Dubuque, ITC Midwest, Burns & McDonnell	Meeting to share maps of the seven alternative crossing locations.

Table 7-8: Village and Township of Cassville Meetings

Date	Attendees	Purpose of Meeting
9/15/2014	Cassville Township, ATC, ITC Midwest	Meeting to introduce Project to Cassville Township.
9/18/2014	Village of Cassville, ATC, ITC Midwest	Meeting to introduce Project to Village of Cassville.

Table 7-9: City of Guttenberg Meetings

Date	Attendees	Purpose of Meeting
4/24/2015	City of Guttenberg, ITC Midwest, Burns & McDonnell	Meeting to provide overview of proposed Project.

7.4 Multi-Agency and Other Agencies

The following tables outline meetings held with other agencies since the beginning of the Project about the Mississippi River crossing.

Table 7-10: Iowa Environmental Council Meetings

Date	Attendees	Purpose of Meeting
6/10/2014	Iowa Environmental Council, ITC Midwest	Meeting to discuss potential Cassville crossings.
11/5/2014	Iowa Environmental Council, ITC Midwest	Update on Mississippi River crossing alternatives.
4/8/15	Iowa Environmental Council, ITC Midwest	Update on Mississippi River crossing alternatives.

Table 7-11: Center for Rural Affairs in Iowa

Date	Attendees	Purpose of Meeting
10/10/2013	The Center for Rural Affairs, USFWS, Iowa Natural Heritage Foundation, Iowa Environmental Council, the Iowa Chapter of the Audubon Society, the Iowa Chapter of the Nature Conservancy, the Iowa Chapter of the Sierra Club, ITC Midwest	Overview of the MVP projects, including the Mississippi River crossing, with the environmental agencies in Des Moines, Iowa.
6/23/2015	Center for Rural Affairs in Iowa, ITC Midwest	Meeting to introduce Stephanie Enloe to ITC Midwest, explain the process and steps taken on the Project.

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8.0 PREFERRED CROSSING LOCATION FOR THE PROJECT

This chapter presents the Utilities' preferred crossing location for the Project and discusses the differences in potential constraints associated with the Stoneman and Nelson Dewey crossing locations. An optional design through the Refuge is also briefly discussed and presented.

8.1 Elimination of Alternatives from Further Consideration

The Utilities assessed seven potential crossings of the Mississippi River. Four of these crossing locations are located outside of Refuge boundaries, and three are located within Refuge boundaries. Utilities analyzed the potential environmental and human impacts of all seven alternative crossing areas, as presented in Chapter 5. This analysis demonstrates that all four non-Refuge crossing alternatives and respective ACA routes would have greater overall potential impacts to environmental and human resources when compared to the remaining Refuge crossing locations and ACA routes. The Utilities also engaged federal, state, and local entities with permitting authority over the seven crossing locations. These agencies conducted an independent assessment of the crossing location under their purview and identified technical, engineering, environmental and/or social impacts that would preclude issuance of required permits for the four non-Refuge options as well as the L&D 10 location within the Refuge. Based on the overall impact assessment of the alternative crossing locations, and the permitting agencies' conclusions, the Utilities determined that the non-Refuge alternative crossing locations do not constitute feasible crossing locations for the Project.

As the Refuge could not be avoided, pursuant to the USFWS Mitigation Policy the Utilities assessed the remaining three Refuge ACA routes to determine if a potentially feasible Mississippi River crossing location within the Refuge could be identified. As a result of the impact assessment presented in Chapter 5 and the technical engineering conflicts with construction on or near the operable lock and dam facilities, the L&D 10 ACA alternative crossing location was also removed from further consideration. Additionally, the L&D 10 ACA route would potentially impact extensive historical and cultural resources within Guttenberg and would encounter additional environmental resources as a result of its additional length, which is required to reach this northernmost alternative crossing location. The L&D 10 ACA route would also require constructing a new 345 kV overhead transmission line across 1.4 miles of the Mississippi River and Refuge, where there are no existing overhead lines. Also, if a crossing location other than either Nelson Dewey or Stoneman is selected for the Project, the existing transmission lines at Stoneman would remain unchanged.

The remaining two ACA routes, Stoneman and Nelson Dewey, were both evaluated and assessed for potential impacts, as discussed in Chapter 5. Following this evaluation, the Utilities concluded that both the remaining overhead crossing alternatives to be technically and economically feasible, as well as constructible for the Project. However, these two remaining ACA routes through the Refuge must be reviewed by the USFWS to determine if they are compatible and permittable. It is anticipated that the USFWS will undertake its substantive review after receiving this ACA.

As previously noted, the Stoneman ACA route utilizes a portion of an existing 161 kV and 69 kV corridor between Millville, Iowa, and Cassville, Wisconsin. Both the Stoneman and Nelson Dewey ACA routes would eliminate the need for the existing Millville to Stoneman 69 kV transmission line through the Refuge because a new 69 kV source is proposed at the rebuilt Turkey River Substation. The number of transmission circuits in the Refuge after construction of the Project (using either location) would remain unchanged at two. Further, both locations offer the opportunity to consolidate the Project with existing transmission facilities and maintain a single transmission corridor across the Refuge. Under either the Stoneman or Nelson Dewey alternatives, the existing number of transmission corridors, and individual transmission structures, would be reduced. The Stoneman and Nelson Dewey ACA routes meet the purpose and need for the Project and avoid the likelihood of potential impacts to residences and businesses encountered at Dubuque, Iowa.

8.2 Selection of the Preferred Crossing Location

While the Utilities have determined that both the Nelson Dewey and Stoneman ACA routes are technically and economically feasible, as well as constructible for the Project, the analysis presented in the Chapter 5 of the ACA provided some notable differences between the two alternative crossing locations. On Refuge lands, the Nelson Dewey ACA route would extend through fewer forested and emergent wetlands, extend through fewer woodlands, and require less total ROW within Refuge lands compared to the Stoneman ACA route. In addition, the design presented for the Nelson Dewey ACA route would reduce the total structures within Refuge lands from 30 structures to 10, and the Mississippi River crossing structures would be designed under 200 feet and would not requiring FAA lighting. The structure design for a portion of the line in the Refuge would change from a vertically stacked conductor to horizontal and would use of bird diverter marking on the shield wires, which the existing transmission lines do not have. The low-profile structure height for the design presented for the Nelson Dewey ACA route would also be at or below the height of the mature woodlands on the north side of Oak Road.

Outside the Refuge, the Nelson Dewey ACA route would be located further from the Cassville Municipal Airport and would also encounter fewer routing constraints in the Village of Cassville, Wisconsin, due to the surrounding land uses at each respective crossing location. As shown below in Table 8-1, the type and extent of routing constraints in proximity to each location, are notable.

Table 8-1: Routing Constraints Associated with Stoneman and Nelson Dewey ACA Routes

Criteria	Stoneman	Nelson Dewey
Residences within ROW	9	2
Residences within 300 feet	22	8
Schools within 300 feet	2	0
Places of worship within 300 feet	1	0
Daycares within 300 feet	1	0
Business/commercial structure within 300 feet	4	0
Airports within 1 mile	1	0
Number of streams/waterways crossed	15	15
Length through terrain with greater than 30 percent slope (feet)	527	606

The Nelson Dewey ACA route better responds to the purpose and need for the Project, presents fewer overall constraints to Project engineering, and would result in fewer overall impacts to the environmental and social criteria analyzed for this Project. In addition, as detailed below, the Nelson Dewey alternative would reduce the risk of avian impacts compared to existing conditions present at the current Stoneman alignment through the Refuge. Therefore, the Utilities selected the Nelson Dewey alternative crossing location as the Utilities' Preferred Crossing.

8.2.1 Design of the Utilities' Preferred Alternative Crossing Location

The Nelson Dewey ACA route was designed to minimize the potential impacts associated with a new transmission line through the Refuge. In addition to locating the Nelson Dewey ACA route away from extensive wetland complexes near the existing Stoneman line, the Utilities propose to construct this ACA route by using a low-profile structure design that reduces overall height through the Refuge. Also, the Nelson Dewey ACA route would be designed to minimize the distance of new transmission line ROW on the Refuge through the use of a relatively straight alignment and by utilizing portions of a private parcel. Additionally, the Nelson Dewey alignment also minimizes impacts to on-going revegetation management activities within the Refuge. The design would also reduce the likelihood of interaction with avian species as a result of the reduction in separate planes of wires. The current transmission line corridor at Stoneman has conductors on three planes and a static wire on a fourth plane. With the Nelson Dewely ACA route, the Stoneman facilities would be removed and all conductors of the new facilites would be placed within a single horizontal plane on each structure within the Refuge to minimize the number and height of visible conductors that could potentially impact birds (Figure 8-2). Additionally, the static wires would be marked with avian flight diverters and/or marker balls in compliance with USFWS and Refuge consultation as well as guidance from the APLIC *Reducing Avian Collisions with Power Lines: The State of the Art in 2012* (APLIC, 2012).

While the Project requires both the existing 161 kV line and proposed 345 kV line, the Utilities are presenting in this ACA a design with 345 kV/345 kV specifications within the Refuge. The facilities would be operated at 345 kV/161 kV, but be capable of operating at 345 kV/345 kV in case future system conditions warrant it. Constructing the line in its ultimate configuration is a prudent and cost-effective investment to accommodate future needs in a manner that avoids future impacts to the Refuge if another 345 kV transmission line between Iowa and Wisconsin were needed. As with the other transmission features planned for the Refuge, the final design of the transmission facilities will be determined in consultation with the USFWS.

The low-profile structures would typically be 75 feet high and have 500-600 foot spans (Figure 1-4). The proposed ROW through the Refuge would be 260 feet wide in order to accommodate the reduced structure height. There would be 10 total structures on Refuge lands, reduced from the current number of 30 structures. A preliminary plan and profile design is shown in Figure 8-1.[56] The Utilities will work with USFWS to identify any necessary adjustments of the Nelson Dewey ACA route through the Refuge and to identify the most appropriate structure design to limit wildlife and aesthetic impacts to the Refuge. As a result of the potential for channel scour on the banks of the Mississippi River, the Utilities assessed the location of the crossing structure in relation to wing dams located along the navigable channel of the Mississippi River. The selected location of the crossing structure on the west bank of the Mississippi River would take advantage of upstream wing dams that adjust the flow of the navigable channel away from the riverbank near the proposed crossing structure (Figure 8-2). This structure location would assist the Project in meeting its projected lifecycle needs while reducing the likelihood of a potential scour event or washout resulting from channel migration of the Mississippi River.

[56] The preliminary plan and profile shown in Figure 8-1 is intended to provide a general view of the Nelson Dewey ACA route alignment through the Refuge and in relation to the surrounding mature vegetation. Although Figure 8-1 shows the 260-foot ROW extending across the Mississippi River, the 260-foot ROW presented in the plan and profile would terminate at the Refuge boundary.

	X	Y	HT	Z
SUBSTATION	X=5584870.18	Y=3728080.94	HT=50.00	Z=619.09
1	X=5585190.49	Y=3728427.61	HT=156.28	Z=731.75
2	X=5585870.69	Y=3728420.13	HT=176.78	Z=827.03
3	X=5586641.32	Y=3728410.43	HT=181.78	Z=835.82
4	X=5587141.16	Y=3728404.71	HT=166.78	Z=864.78
5	X=5587626.87	Y=3728398.30	HT=166.78	Z=869.63
6	X=5588311.77	Y=3728383.09	HT=156.28	Z=854.41
7	X=5588669.26	Y=3728635.24	HT=166.78	Z=834.04
8	X=5589572.36	Y=3729263.11	HT=75.00	Z=608.62
9	X=5590065.00	Y=3729605.61	HT=75.00	Z=607.14
10	X=5590557.49	Y=3729948.01	HT=75.00	Z=606.76
11	X=5590596.28	Y=3730546.93	HT=75.00	Z=607.02
12	X=5590628.60	Y=3731045.89	HT=75.00	Z=606.29
13	X=5590660.93	Y=3731544.84	HT=75.00	Z=606.03
14	X=5590693.25	Y=3732043.80	HT=75.00	Z=605.84
15	X=5590725.57	Y=3732542.75	HT=75.00	Z=604.92
16	X=5590764.36	Y=3733141.50	HT=75.00	Z=606.63
17	X=5590825.77	Y=3734089.51	HT=198.00	Z=608.07
18	X=5590944.03	Y=3735915.24	HT=198.00	Z=623.18

500.0 FT. HORIZ. SCALE

50.0 FT. VERT. SCALE

ROW BOUNDARY (260 FT OR 200 FT)

RIVER CLEARANCE (Z=696.00)

AFL ALUMACORE AC-65/555 DNO-6071 OPGW, 18% RBS AT 0F INITIAL, DISPLAYED AT -20F INITIAL

AFL ALUMACORE AC-77-583 OPGW, 18% RBS AT 0F INITIAL, DISPLAYED AT -20F INITIAL

T2 DRAKE ACSR, 18% RBS AT 0F INITIAL, DISPLAYED AT 212F FINAL

THE MINIMUM REQUIRED ELEVATION ABOVE THE MISSISSIPPI RIVER NAVIGABLE CHANNEL ARE BASED ON THE CALCULATIONS BELOW REQUIRED BY USACE REGULATION 33CFR322 SECTION I.2 FOR A 345 KV LINE:

THE GREATEST OF THE FOLLOWING:
USCG HEIGHT ABOVE NORMAL POOL (60') + FEDERAL GUIDANCE (26') + NORMAL POOL ELEVATION (603') = 689'
NEAREST BRIDGE HEIGHT (65') + FEDERAL GUIDANCE (26') + NORMAL POOL ELEVATION (603') = 694'
USCG 52' HEIGHT ABOVE 50-YEAR FLOOD (52') + FEDERAL GUIDANCE (26') + 50-YEAR FLOOD (618') = 696' (CONTROLS)

NO.	DATE	REVISION	BY	CHK'D	APV'D

ITC

FIGURE 8-1
CARDINAL TO HICKORY CREEK 345 KV TRANSMISSION LINE PROJECT
PRELIMINARY PLAN AND PROFILE OF NELSON DEWEY ACA ROUTE
ACA ROUTES ARE FOR CONCEPTUAL PURPOSES ONLY

DWG. NO.

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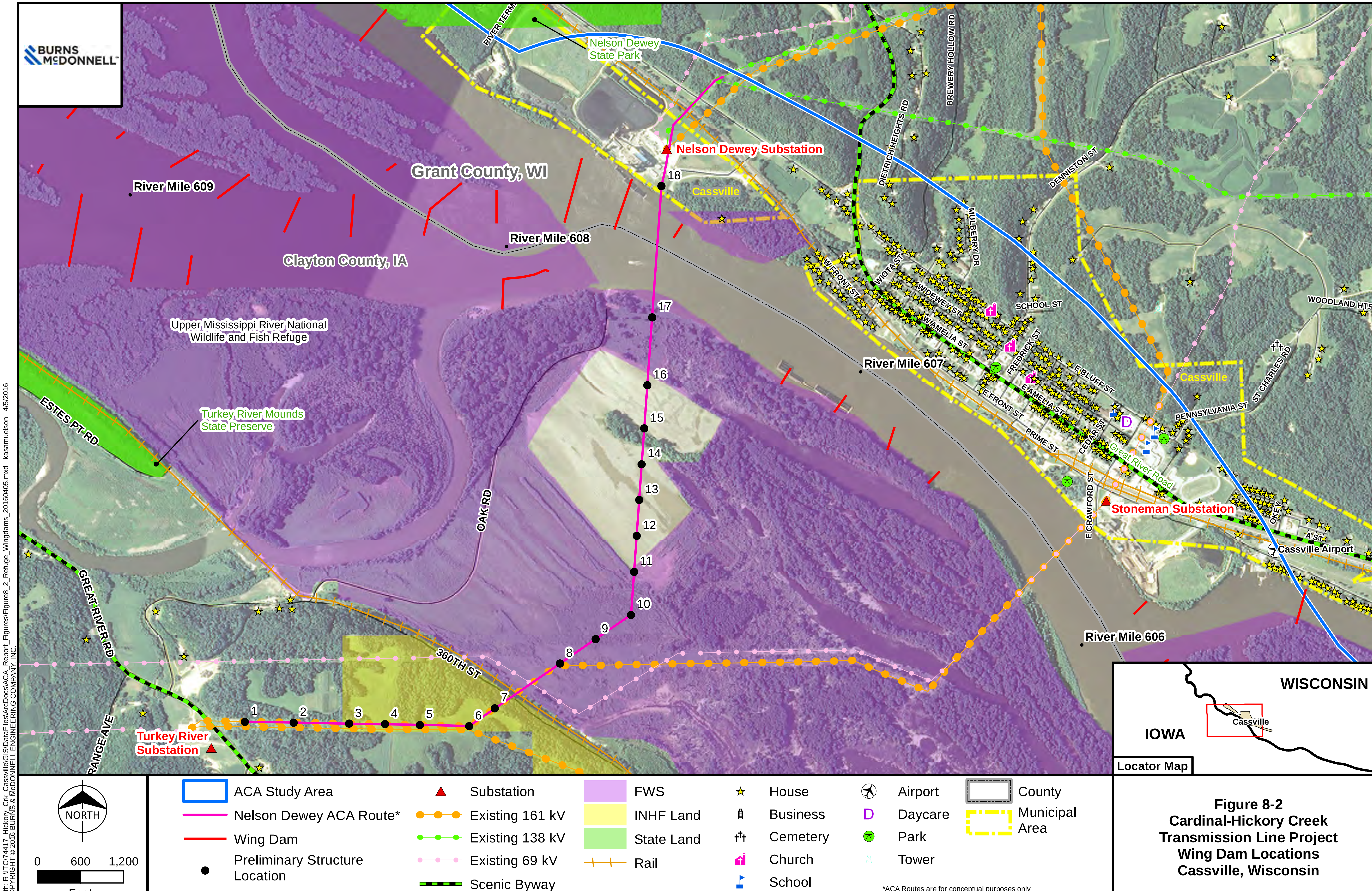

Figure 8-2
Cardinal-Hickory Creek Transmission Line Project
Wing Dam Locations
Cassville, Wisconsin

Source: IDNR, USDA Clayton County NAIP 2013, Energy Velocity, IDOT, INHF, WDNR, Clayton County, FHWA, ESRI, ITC Midwest, Burns & McDonnell

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8.2.2 Measures to Mitigate Potential Impacts to the Refuge

In consultation with USFWS staff, the Utilities would propose additional measures to mitigate potential impacts to Refuge lands and avian resources within the Refuge. As discussed earlier, some of the mitigation measures include using low-profile structures, placing the conductors on a single horizontal plane, and using bird diverters and/or marker balls.

Another potential measure would be to revegetate portions of the Refuge to replicate some of the natural vegetative breaks that occur at the Nelson Dewey ACA route. These measures would be developed in conjunction with existing revegetation programs that are currently in place within the Refuge near this location, as previously noted. The intent of possible re-vegetation efforts would be to expand the extent of mature woodlands on both sides of the Nelson Dewey ACA route in order to provide additional vegetative breaks to reduce visual impact of the transmission line. As an example of the type and location of the revegetation effort, the Utilities developed a simulation of a preliminary revegetation plan for both the removal of the existing Millville to Stoneman 69 kV transmission line and Turkey River to Stoneman 161 kV line and the proposed alignment at the Nelson Dewey crossing alternative (Figure 8-3). It should be noted that this simulation is for comparative purposes only; any revegetation at the Refuge would be done in concert with USFWS review and direction and in compliance with applicable NERC regulated vegetation standards. As with the design of the Project, the Utilities would work closely with USFWS to identify the location, type, and overall revegetation plan that would be appropriate for the Project and this specific location of the Refuge.

8.2.3 Optional Transmission Design through Refuge

As indicated previously in Section 1.1, the Utilities' are presenting a design through the Refuge that includes transmission facilities constructed to a 345 kV/345 kV specification, but plan to operate them at 345 kV/161 kV until system conditions warrant operating the facility at 345 kV/345 kV. While the current needs are for a 345 kV line and a 161 kV line, the increase in voltage capability of the second circuit (at 345 kV) is a prudent and cost-effective investment to accommodate additional transmission facilities in a manner that would avoid future impacts to the Refuge if another 345 kV transmission line between Iowa and Wisconsin were needed.

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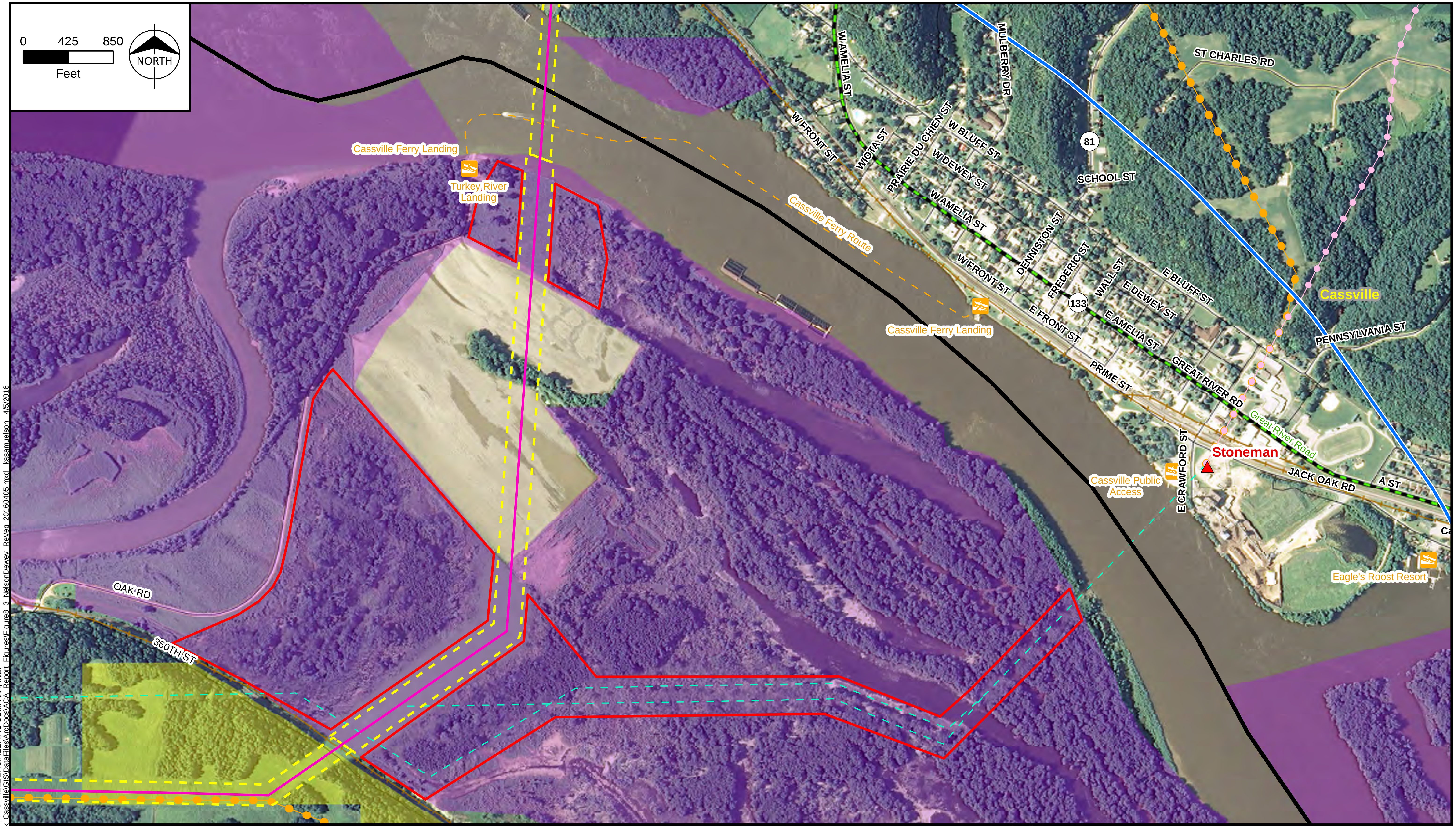

ACA Study Area	Existing 161 kV	Boat Launch or Ferry Landing
Nelson Dewey ACA Route*	Existing 69 kV	FWS
Substation	Scenic Byway	INHF Land
Line to be Removed	Cassville Ferry Route	

State Land	State
Rail	Conceptual Revegetation Area
Road	

*ACA Routes are for conceptual purposes only

BURNS & McDONNELL

IOWA
WISCONSIN
Cassville
Millville
Locator Map

Figure 8-3
Cardinal-Hickory Creek Transmission Line Project
Preferred Nelson Dewey ACA Route Conceptual Revegetation Area (for comparison purposes only)

Path: R:\ITC\74417_Hickory_Crk_Cassville\GIS\DataFiles\ArcDocs\ACA_Report_Figures\Figure8_3_NelsonDewey_ReVeg_20160405.mxd kasamuelson 4/5/2016

Source: USDA Clayton County NAIP 2013, Energy Velocity, IDOT, NTAD, IDNR, USGS, WDNR, USDA, ESRI, FHWA, ITC Midwest, Burns & McDonnell

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Additionally, the difference between the overall footprint of the 345 kV/345 kV facilities compared to the 345 kV/161 kV facilities is minor. Both structure designs would include a standard height through the Refuge at approximately 75 feet (with the exception of the Mississippi River crossing structures) and both would include span lengths through the Refuge at approximately 500-600 feet (although the preliminary sketch in Appendix G shows the optional structure design at 77 feet, the structure can be designed to 75 feet). This low-profile structure design would be used under both configurations with the objective of minimizing interactions with avian species that utilize this portion of the Refuge. The total number of structures within the Refuge would also remain the same regardless of which configuration is selected for the Project. The primary difference between the two configurations is the required ROW through the Refuge. As a result of the slightly wider design of the 345 kV/345 kV configuration, the required ROW would be approximately 260 feet for the low-profile structures through the Refuge. In the narrower 345 kV/161 kV configuration, the low profile structure would be asymmetrical, with the 345 kV on one side of the structure and the 161 kV on the other side; the required ROW would be reduced to 240 feet. This reduction in ROW for the Project through the Refuge would result in slightly fewer potential impacts to resources within or in proximity to the cleared ROW. The impact analysis of this reduced 240-foot ROW, as well as an example of the narrower asymmetrical structure design, is provided for the Nelson Dewey ACA route in the Alternatives Analysis table provided in Appendix G.

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Cardinal-Hickory Creek Transmission Line Project Alternative Crossings Analysis Appendices

ITC Midwest LLC
American Transmission Company LLC
Dairyland Power Cooperative

Cardinal-Hickory CreekTransmission Line Project

April 2016

APPENDIX A - ALTERNATIVE ANALYSIS DATA

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Impact Summary Table

Route Name	Total length (miles)	Number of angles greater than 30˚	Length not Along Transmission Lines (miles)	Length of Mississippi River crossing (miles)	Airport, airstrip, or heliport within 1 mile (number)	Water towers within 1,000 feet (number)	Communication facilities within 1,000 feet (number)	Length through USACE Restricted Area (miles)	Length through floodplain (miles)	Length Through Terrain with Greater than 30% Slope (miles)	Total Wetland acres in ROW (acres)	Forested/ shrub wetland in ROW (acres)	Emergent wetland in ROW (acres)	Total Woodland acres in ROW (acres)	Number of streams/ waterways crossed	Length through state or local public lands (miles)	Length through private conservation easements (miles)	Length through USFWS Refuge (feet)	USFWS Refuge Land within ROW (acres)	Parks within 1,000 feet (number)
Lock and Dam No. 10	25.6	15	22.8	1.4	1	0	9	0.0	1.4	0.2	3.9	3.9	0.0	156.6	37	0.3	0.0	6532.4	28.3	2
Nelson Dewey	14.6	13	12.7	0.3	0	0	18	0.0	0.8	0.1	9.5	7.5	2.0	61.8	15	0.0	0.5	3695.8	22.1	0
Stoneman	14.9	13	11.1	0.3	1	0	2	0.0	0.8	0.1	36.1	23.0	13.1	82.2	15	0.0	0.5	7712.8	46.0	2
Lock and Dam No. 11	22.3	13	8.2	0.5	0	1	4	0.1	0.9	0.2	0.1	0.0	0.1	128.3	19	0.1	0.0	0	0	1
Highway 151 Bridge	23.1	18	8.0	0.5	0	1	4	0.2	1.2	0.2	5.5	4.1	1.4	131.8	20	0.1	0.0	0	0	4
Galena 161kV	23.7	18	7.2	0.4	0	1	8	0.2	1.7	0.2	4.3	4.1	0.2	131.0	20	0.1	0.0	0	0	5
Julien Dubuque Bridge	25.2	24	8.0	0.4	1	1	27	0.4	2.2	0.2	6.7	5.6	1.1	128.3	19	0.1	0.0	0	0	5

Route Name	Total Length	Residences within 0-25 feet (number)	Residences within 26-50 feet (number)	Residences within 51-100 feet (number)	Residences within 101-300 feet (number)	Schools within 300 feet (number)	Daycares within 300 feet (number)	Hospitals within 300 feet (number)	Places of Worship within 300 feet (number)	Business/ Commercial structure within 300 feet (number)	Public Facilities within 300 feet (number)	Cemeteries within 300 feet (number)	Archaeological sites in ROW (number)	Historical resources within 1,000 feet (number)	Length not along actual fence row or property line (miles)	Length through developed space (miles)	Length through cultivated crops (miles)	Length through pasture/hayland (miles)	Length through prime farmland (miles)
Lock and Dam No. 10	25.6	5	0	13	49	1	0	0	1	33	2	0	0	196	2.9	4.0	8.3	2.8	1.3
Nelson Dewey	14.6	0	1	1	6	0	0	0	0	0	0	0	1	1	2.7	3.3	5.1	0.5	2.1
Stoneman	14.9	4	1	4	13	2	1	0	1	4	0	0	1	1	2.6	3.6	5.0	0.5	2.3
Lock and Dam No. 11	22.3	9	14	35	150	0	0	0	0	19	2	1	3	74	6.7	4.5	3.5	7.3	1.2
Highway 151 Bridge	23.1	9	14	35	138	0	0	0	0	20	0	1	3	68	7.6	5.3	3.5	7.3	1.6
Galena 161kV	23.7	9	15	37	148	0	0	0	0	20	0	1	3	68	8.1	5.6	3.6	7.3	1.6
Julien Dubuque Bridge	25.2	9	14	35	138	0	0	0	0	42	1	1	5	122	9.2	7.5	3.5	7.3	1.6

APPENDIX B - AGENCY MEETING MINUTES AND OTHER MATERIALS

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ITC MIDWEST
123 Fifth Street SE
Cedar Rapids, IA 52401
phone: 319.297.6700
www.itctransco.com

February 17, 2015

VIA EMAIL

Paul F. St. Louis
U.S. Army Corps of Engineers
1500 Iowa Interstate Railroad
Rock Island, IL 61201

Nathan Wallerstedt
U.S. Army Corps of Engineers
180 5th Street East
St. Paul, MN 55101

Re: Cardinal-Hickory Creek Transmission Project - Mississippi River Crossing Analysis - Lock and Dam No. 10 & Lock and Dam No. 11: Meeting Notes from January 7, 2014 Conference Call

Dear Messrs. St. Louis and Wallerstedt:

Enclosed please find the final meeting notes of our January 7, 2014 call regarding the proposed lock and dam crossing locations for the Cardinal-Hickory Creek Transmission Line Project ("Project"). The notes include changes provided by the United States Army Corps of Engineers on February 3, 2015. I note that these notes take the place of the dual letter referenced at the end of the meeting notes which was initially identified as the means of documenting discussions between ITC Midwest and the Corps. relating to the Project.

Please contact me with any questions.

Sincerely,

Dan Hagan
Permit Policy Specialist
Local Government & Community Affairs
DH/rlr

Cardinal-Hickory Creek Transmission Project –
Mississippi River Crossing Analysis - Lock and Dam No. 10 & Lock and Dam No. 11:
Meeting Notes from January 7, 2014 Conference Call

Attendees:

ITC Midwest	USACE	Burns & McDonnell
Dan Hagan	Paul St. Louis (Rock Island)	Jack Middleton
Mark Ryan	Nathan Wallerstedt (St. Paul)	Joe Pattison
Henry Wen	Henry DeHann	
Matt Carstens	Jim Piper	
	Robert Germann	
	Tom Heinold	
	Harland Shannon	
	Doug Crum (St. Paul)	
	Rick Hauck (St. Paul)	

Notes:

1) Dan Hagan provided a brief project introduction and background of the previous consultation efforts with both the USACE and USFWS; USACE staff indicated their appreciation for the overview and continued consultation efforts by ITC.

2) Dan explained that this is a joint project with ATC and briefly explained the project division between the two companies and some of the outreach efforts underway in each state.

3) Dan explained the development of the study area as well as the rationale behind the size and extent of the study area, as well as relationship to the original project configuration under MISO. Dan indicated that a feasibility analysis was being developed for all seven potential crossing locations within the study area and that the data being requested during this meeting would be compiled into this document, which would then serve as the base for a river crossing application.

4) Additional background was provided to USACE staff on the IDOT consultations in relation to the use of the two bridges within Dubuque. Dan summarized IDOT's concerns and USACE staff understood the limitations and restrictions from IDOT"s point of view; ITC staff indicated to USACE that a letter was being drafted to IDOT that would summarize ITC's understanding of their position and restrictions for placement of HVTL's on these bridges. Dan indicated that this type of letter was something they would like to generate for the two lock and dam crossing locations.

5) Paul St. Louis indicated that the 1,200' distance indicated in his email was a length based on review by river crossing engineering staff for this particular lock and dam --- Paul indicated that the 1,200' estimate was not USACE policy, but

rather a condition related to this specific lock and dam. Dan indicated that this was one of the larger issues of clarification and enquired with Nathan Wallerstedt whether or not there were any similar conditions on Lock and Dam No. 10. Nathan indicated that they also did not have a specific USACE requirement for a setback from the dam or spillway, but agreed that 1,200' feet was "a pretty good number" for distance from the dam and associated facilities such as the spillway.

6) Nathan Wallerstedt indicated that he had the same concerns as indicated in the Rock Island letter and that the line would need to be moved off "a safe distance" from the dam; there was some internal USACE discussion about the specific setback distance, with some staff indicating that 1,000' may be acceptable; however, there was no consensus among the group and the discussion eventually gravitated back to the 1,200' figure as being appropriate for each location.

7) Nathan stated similar safety concerns regarding cranes operating from the earth embankment; any transmission lines would need to be located a safe distance away. USACE staff also indicated that ongoing maintenance activities could be impacted by a nearby line, as well as the ability to respond to future scour hole issues downstream of the dam.

8) Tom Heinold also stated that the USACE would have geotechnical concerns with any subsurface activities near the lock and dams; Tom indicated that the embankments hold back a significant weight and that construction near the lock and dams could shorten seepage paths, resulting in serious integrity concerns for the lock and dams.

9) Paul St. Louis indicated that their preference was also to not have anything located within 600' upstream of the lock and dams for safety concerns; Nate Wallerstedt indicated that this would apply at Lock and Dam No. 10 as well.

10) Dan Hagan and Henry Wen brought up the issue of conductor clearance over the river channel and enquired about the 90' clearance number. USACE staff indicated that it may be lower in specific areas along the river and that the specific clearance is also related to the water surface profile when the locks are closed (as opposed to open). USACE staff stated that the Dubuque-WI bridge was 64' above pool height, while some overhead wires were approximately 78-79' in some locations. USACE staff indicated that ITC should also check with the Coast Guard concerning potential navigations issues relating to construction and maintenance activities.

11) USACE St. Paul staff enquired about the potential undergrounding of the line at Dubuque; Dan indicated that they have not looked into this in detail as there are some fairly tight restrictions for putting a line through Dubuque which would prevent a potential segment from even reaching a potential underground crossing location. Dan also indicated that there were areas where underground construction is being evaluated, but this is currently limited to the Refuge area; Dan also explained some of the potential concerns and impacts with undergrounding HVTLs.

12) Rob Germann also indicated that the suspended wires near operating lock and dam locations was a safety concern in general.

13) Paul St. Louis also brought up the recent 'Sunfish' restoration efforts just north of Lock and Dam No. 11; Paul suggested that ITC look into this restoration effort to see if there were any conflicts with a potential HVTL in this area.

14) Nathan Wallerstedt stated that there may also be concerns regarding construction of a potential HVTL downstream of Lock and Dam No. 10 as a result of the braided channel and use of barges for construction. Potential construction issues in proximity to the lock and dam locations was good information to relate to USFWS staff.

15) USACE St. Paul District staff brought up the potential issues with HVTL in relation to Bald Eagle winter habitat in proximity to the dams; as a result of the limited freezing near these locations, the areas have become an important winter-feeding area for Bald Eagles.

16) Paul St. Louis indicated that the USACE is currently updating their master/comprehensive plan for the Upper Mississippi. In it, the USACE has provided 'dedicated corridors' for utility development. Paul cautioned that this information is still being developed, but that we should enquire with Paul Lundt, who is managing the updates to the plan.

17) Dan Hagan concluded the meeting with a roundtable discussion of any additional concerns or clarifications from USACE staff. No additional item of concern was brought up that wasn't previously discussed during the call. Dan indicated that they would like to summarize the results of this conference call as well as the previous discussions with USACE staff. USACE staff indicated that a dual letter to both districts would be acceptable.

Utility Section
800 Lincoln Way - Ames, Iowa 50010
515.239.1014 (TEL) 515.239.1891 (FAX)
www.iowadot.gov/iowaroadsigns

January 29, 2015

Attn: Henry Wen
ITC Midwest
123 Firth Street SE
Cedar Rapids, IA 52241

Henry, our bridge people have weighed in on allowing attachment of the transmission line to either one of our bridges. These bridges have fracture critical components that must be inspected 'hands-on' every 2 years and placing high voltage lines on the bridge would prevent access to the fracture critical members. Future maintenance and repairs would be impacted adversely and probably require significant down time for the power lines during those times. Those are just the top issues on their list. There are less serious ones that we did not get into because the first ones are beyond consideration.

After having a discussion with the State Bridge Maintenance and Inspection Engineer I must convey the state **will not** be in a position to grant a permit for attachment of high power electric transmission lines to any of our Mississippi River bridges. If you desire further explanation or discussion please let me know. Sorry we are not able to help you. I hope you haven't expended too much time exploring this possibility.

There is a future Highway 20 bridge that is planned to cross the Mississippi. That bridge will have the same issues as the existing ones and is not in the 5 year program so it will likely be at least 10 years before construction would start.

Sincerely,

Bryan S. Bradley

Bryan Bradley
State Utility Engineer
bryan.bradley@dot.iowa.gov

BB:sa

APPENDIX C - CITY OF DUBUQUE RESOLUTION AND MATERIALS

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RESOLUTION NO. 215-15

PROVIDING THAT A PROPOSED PROJECT BY ITC MIDWEST LLC FOR A LICENSE TO ERECT, MAINTAIN AND OPERATE A PROPOSED ELECTRIC TRANSMISSION LINE FACILITY IN THE CITY OF DUBUQUE WOULD NOT BE PERMITTABLE UNDER THE CITY OF DUBUQUE CODE OF ORDINANCES AND WOULD NOT BE PERMITTED BY THE CITY COUNCIL AND THEREFORE AN APPLICATION FOR A LICENSE AND THE REQUIRED PROCESS FOR SUCH A LICENSE WOULD NOT BE IN THE PUBLIC INTEREST

Whereas, City of Dubuque Code of Ordinances Chapter 11-6 establishes a process for licensing electric transmission line companies which requires an electric transmission line company to apply for a license to erect, maintain and operate a facility within the city; and

Whereas, the applicant must hold a public informational meeting prior to filing the petition; and

Whereas, Chapter 11-6 requires the City Council to hold a public hearing when considering whether to grant, amend, extend, or renew such a license; and

Whereas, ITC Midwest LLC (ITC) proposes to apply for a license for three (3) proposed route alternatives for a 345 kilovolt (KV) overhead electric transmission line as shown on the attached map; and

Whereas, the City Manager has met with representatives of ITC to gather information about the proposed project; and

Whereas, the City Manager and City staff have investigated the project, including material provided by ITC; and

Whereas, the City Manager has provided the City Council with the attached recommendation that the filing of a petition by ITC and a formal public hearing process would not be in the public interest; and

Whereas, the City Council, having reviewed the City Manager's recommendation, and material provided by ITC, finds that the City Council has adequate information to determine that the proposed project is not permittable and would not be permitted under Chapter 11-6, and that the recommendation of the City Manager should be approved.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF DUBUQUE, IOWA:

Section 1. The City Council hereby approves the recommendation of the City Manager that the filing of a petition by ITC for a license to erect, maintain and operate a facility within the city as proposed by ITC is not permittable and would not be permitted by the City Council, and that the filing of an application by ITC and proceeding with the process required by the City of Dubuque Code of Ordinances for such a license would not be in the public interest.

Passed, approved and adopted this 15th day of June, 2015.

Roy D. Buol, Mayor

Attest:

Kevin S. Firnstahl, City Clerk

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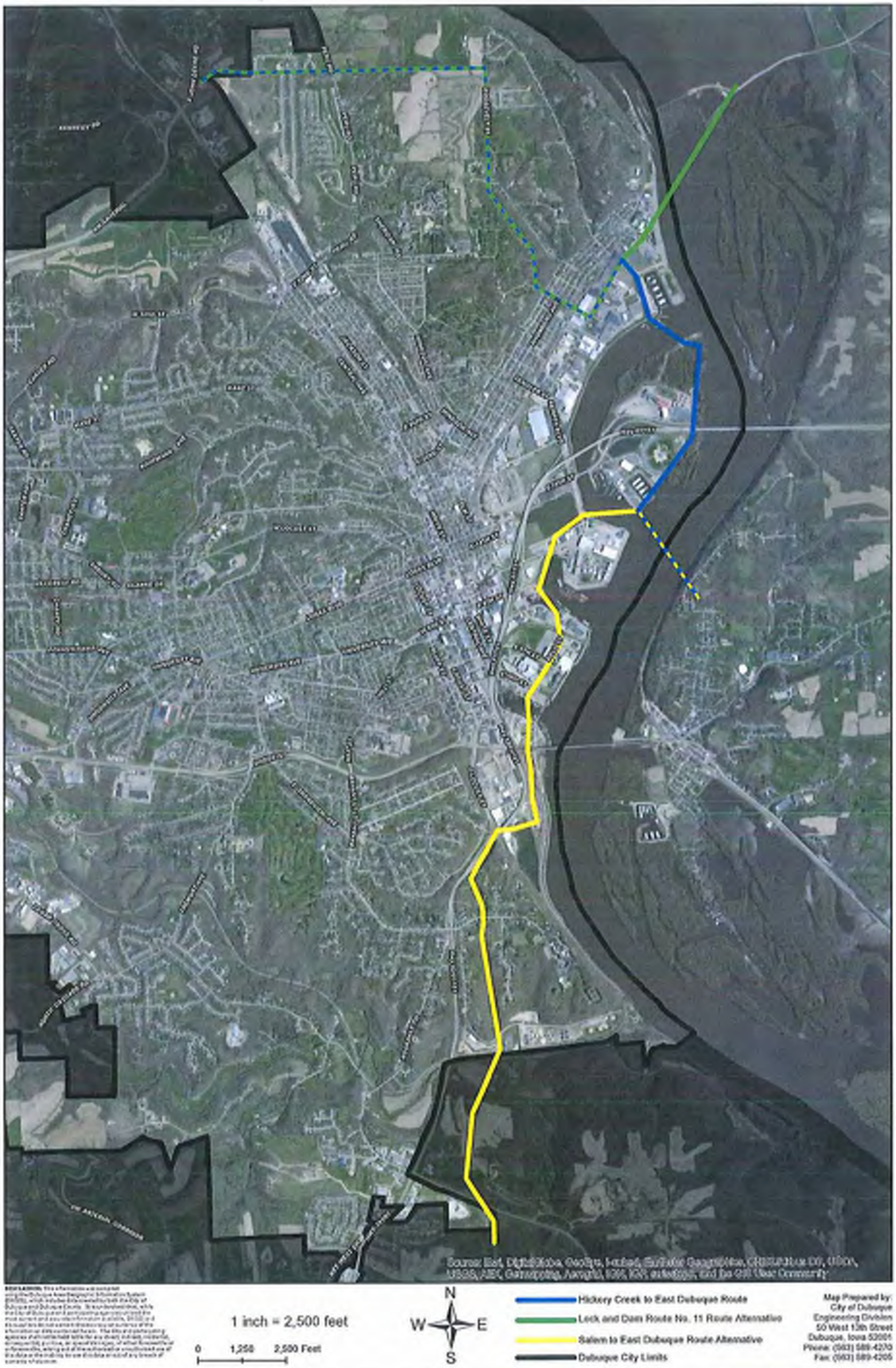
ITC Proposed Routes



Map Prepared by:
City of Dubuque
Engineering Division
50 West 13th Street
Dubuque, Iowa 52001
Phone: (563) 589-4270
Fax: (563) 589-4205

THE CITY OF DUBUQUE
Masterpiece on the Mississippi

Dubuque
All-America City
2007 • 2012 • 2013

MEMORANDUM

TO: Michael C. Van Milligen, City Manager

FROM: Laura Carstens, Planning Services Manager
Gus Psihoyos, City Engineer

SUBJECT: ITC Route Alternatives for Overhead Electric Transmission Facilities

DATE: June 10, 2015

INTRODUCTION

This memorandum provides a recommendation on the route alternatives for overhead electric transmission facilities proposed by ITC through the city of Dubuque. Enclosed are a map of the route alternatives, City Code Chapter 11-6 Procedure for Licensing Electric Transmission Line Companies, and a resolution.

BACKGROUND

City Code Section 11-6-3 requires an electric transmission line company to apply, via petition, for a license to erect, maintain and operate a facility within the city. The applicant must hold a public informational meeting prior to filing the petition. Section 11-6-5 requires the City Council to hold a public hearing when considering whether to grant, amend, extend, or renew a license. Section 11-6-7 sets forth location criteria. This section requires a transmission line to be at least two hundred fifty feet (250') from any dwelling or other building, except by agreement or when the line crosses or passes along a public highway or is located along a railroad right-of-way.

DISCUSSION

ITC has proposed three (3) route alternatives for a 345 kilovolt (KV) overhead electric transmission line as shown on the enclosed map. The Hickory Creek-East Dubuque Route Alternative is ITC's preferred route. City staff had the following comments and concerns on potential impacts for each route alternative:

1. Hickory Creek-East Dubuque Route Alternative (blue line on map)
    a. This route is near a planned water tower site on Roosevelt Street.
    b. This route will affect the most wetland acres.
    c. This route will affect residential properties (125 residences within 250 feet).

2. Lock and Dam No. 11 Route Alternative (green line on map)
    a. Sutton Public Pool and Eagle Point Water Plant are within 200 feet and 250 feet of this route.
    b. This route is near a planned water tower site on Roosevelt Street.
    c. This route will affect the highest number of residential properties (133 residences within 250 feet).
    d. This route will affect the highest number of woodland acres.
    e. This route is the only one which includes areas that are not currently occupied by overhead transmission facilities.
    f. This route will have obvious negative visual impacts on Eagle Point Park, one of the Midwest's most outstanding parks. Each year, the park hosts approximately 240,000 visitors and more than 1,200 events.

3. Salem-East Dubuque Route Alternative (yellow line on map)
    a. The National Mississippi River Museum and Aquarium is within 200 feet and 250 feet of this route.
    b. This route will affect the highest number of communication facilities.
    c. This route will affect the highest number of commercial properties.
    d. This route includes the highest number of streams and waterways crossed.
    e. This route will affect residential properties (18 residences within 250 feet).

RECOMMENDATION
Based on the minimum 250-foot distance between transmission lines and buildings in City Code Section 11-6-7 and on the identified impacts described above, City staff recommends that the City Council adopt the enclosed resolution which states that the filing of a petition by ITC and a formal public hearing process would not be in the public interest.

REQUESTED ACTION
The requested action is for the City Council to concur with the staff recommendation and adopt the resolution.

Enclosures

Prepared by Nate Kieffer and Laura Carstens

cc: Barry Lindahl, City Attorney
Steve Brown, Project Manager
Nate Kieffer, Land Surveyor, PLS

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APPENDIX D - EVALUATION OF UNDERGROUND TRANSMISSION INSTALLATION

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BURNS McDONNELL

Evaluation of Underground Transmission Installation

ITC

ITC Midwest LLC

Cardinal to Hickory Creek
345 kV Transmission Line
Project No. 74417

Preliminary Report – October 2015

Revision 10/2015

7097606v2

Evaluation of Underground Transmission Installation

prepared for

ITC Midwest LLC
Cardinal to Hickory Creek
345 kV Transmission Line
Cassville, Wisconsin

Project No. 74417

Preliminary Report – October 2015

Revision 10/2015

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

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EXECUTIVE SUMMARY

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
ATC	American Transmission Company
BGEPA	Bald and Golden Eagle Protection Act
BMcD	Burns & McDonnell Engineering Company Inc.
CWA	Clean Water Act
ESA	Endangered Species Act
ESRI	Environmental Systems Research Institute
FEMA	Federal Emergency Management Agency
FPVC	Fusible Polyvinyl Chloride Pipe
GIS	Geographic Information System
HDD	Horizontal Directional Drilling
HDPE	High Density Polyethylene
HPFF	High Pressure Fluid Filled
IDNR	Iowa Department of Natural Resources
IDOT	Iowa Department of Transportation
ITC	ITC Midwest, LLC
kcmil	Thousands of circular mils (area measurement)
kV	kilovolt
MBTA	Migratory Bird Treaty Act
MISO	Midwest Independent Service Operator
MVP	Multi-Value Project
NEPA	National Environmental Policy Act

Abbreviation	Term/Phrase/Name
NERC	North American Electric Reliability Corporation
NESC	National Electric Safety Code
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
NLCD	National Land Cover Dataset
NLEB	northern long-eared bat
NPDES	National Pollutant Discharge Elimination System
NRHP	National Registry of Historic Places
NWI	National Wetlands Inventory
PATON	Private Aids to Navigation
ROW	Right-of-Way
SHPO	State Historic Preservation Office
SWPPP	Storm Water Pollution Prevention Plan
UG	Underground
USACE	US Army Corps of Engineers
USFWS	United States Fish & Wildlife Service
XLPE	Cross Linked Polyethylene

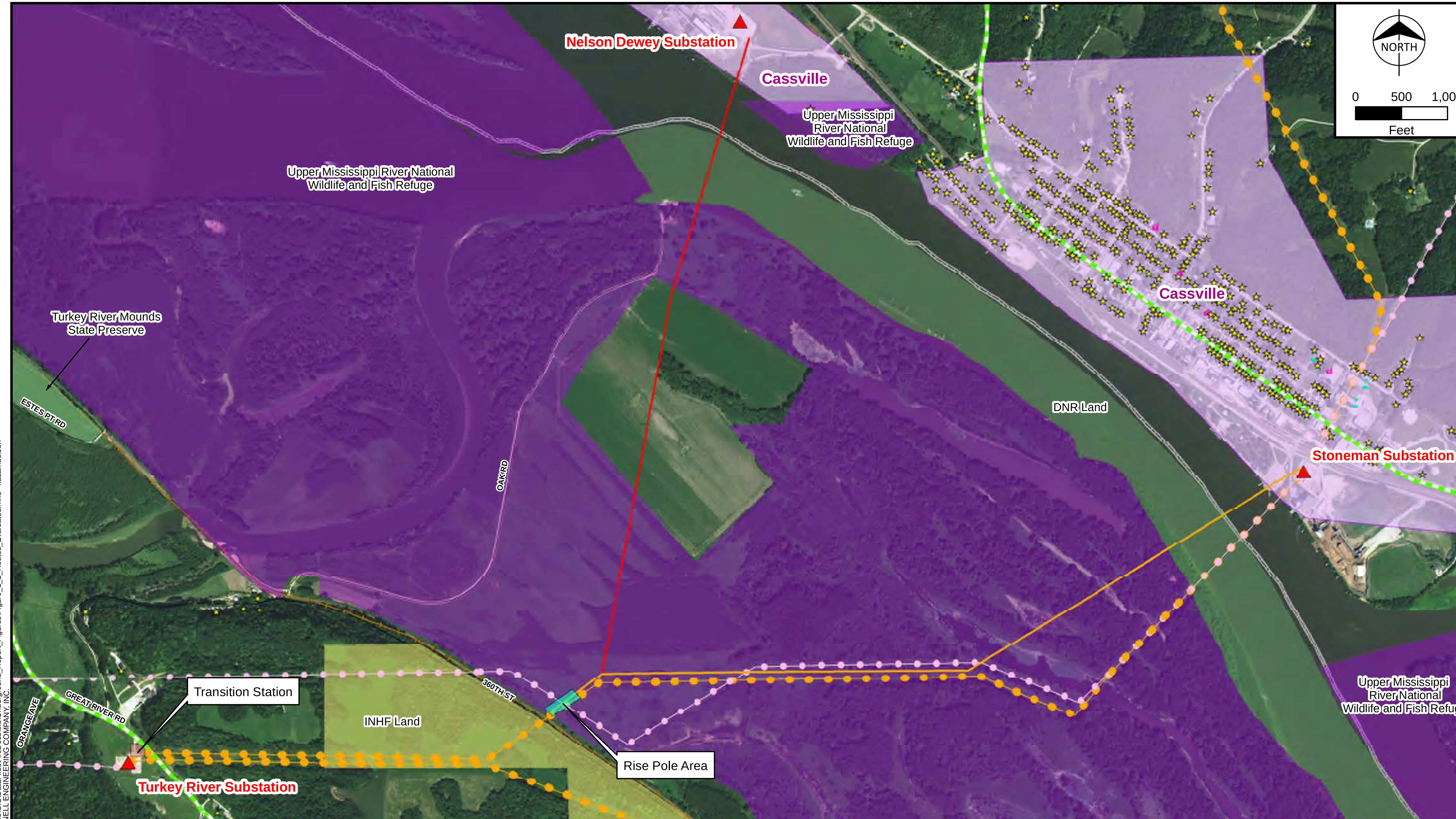
1.0 EXECUTIVE SUMMARY

ITC Midwest LLC (ITC) engaged Burns & McDonnell Engineering Company, Inc. (BMcD) to provide a feasibility study for two potential underground transmission line crossing locations of the Mississippi River and the abutting Upper Mississippi River National Wildlife and Fish Refuge (Refuge) managed by the United States Fish and Wildlife Service (USFWS). The evaluated underground crossing of the Refuge and River is part of the Cardinal to Hickory Creek 345 kV Transmission Line Project (the Project) and would contain both the newly-proposed 345 kV transmission line, as well as the existing 161 kV transmission line that is currently located within the Refuge and crosses the Mississippi River overhead. During ongoing consultations with USFWS, staff requested that an evaluation of underground alternatives be evaluated as part of the review and assessment of alternative crossing locations. USFWS staff requested that the analysis include options for undergrounding both the existing 161 kV line as well as the new proposed 345 kV line through the Refuge and underneath the Mississippi River. As such, preliminary costs and an overall assessment of an underground alternative is presented for a potential 161/345 kV configuration at two locations within the Refuge.

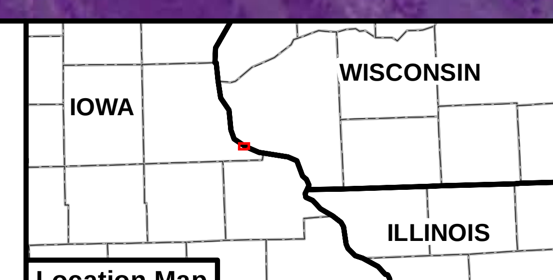
The routing scenario in this report assumes these transmission lines would originate at a new proposed Hickory Creek Substation in Dubuque County, south of the Turkey River Substation and would extend past either the Stoneman Substation (the Stoneman alternative) or the Nelson Dewey Substation (the Nelson Dewey alternative) near Cassville, Wisconsin.. The Project would continue farther into Wisconsin to an intermediate substation to be located near Montfort, Wisconsin, and onto the other project termini located at the Cardinal Substation just west of Madison, Wisconsin. This report summarizes the results of a preliminary evaluation of routing constraints, preliminary cable system design, construction considerations, and environmental impacts for a potential underground crossing of the Mississippi River and Refuge near Cassville, Wisconsin. As result of the location within the Refuge and the requirement to cross the Mississippi River, the Project must obtain Federal approvals from multiple Federal agencies which must complete environmental reviews under the National Environmental Policy Act (NEPA). The Project must also obtain state and local permits and approvals related to the Project.

1.1 Routes Evaluated

BMcD has identified two underground routes, identified as the Nelson Dewey and Stoneman crossing locations. These routes were identified as alternatives that would provide a direct underground route to Wisconsin. The Nelson Dewey underground crossing alternative would be placed in a new corridor. The Stoneman crossing alternative to the Stoneman Substation would utilize a portion of the existing overhead 161 kV corridor for placement of the underground alternative. The locations of the two routes were selected to minimize the impact on the environment and Refuge lands. These routes are shown below in Figure 1-1.



Nelson Dewey Underground Alternative
Stoneman Underground Alternative
Riser Pole Area
Transition Station Location
Existing 161-kV lines
Existing 69-kV lines
Existing Substation
Proposed Substation
Municipal Areas
County Boundary
House
Church
School
Cemetery
Tower
Active Railroads
Scenic Byways
INHF Land
DNR Land
USFWS Land



BURNS McDONNELL

Figure 1-1
Underground Routes Evaluated

Issued: 5-5-2015

Path: R:\ITC\74417_Hickory_Crk_Cassville\GIS\DataFiles\ArcDocs\old\Underground_Report_Figures\Figure_1_1_Routes_Evaluated.mxd kasamuelson

Source: IDNR; Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community; Energy Velocity; Clayton County; INHF; USFWS; ITC Midwest; Burns & McDonnell.

1.2 Cable System Design and Construction

BMcD has determined that, for the proposed 345 kV circuit, a two cable-per-phase, 3000 thousands of circular mils (area measurement) (kcmil) copper conductor cross-linked polyethylene (XLPE) cable system would be required to achieve the requested 2,342-amp circuit capacity. For the 161 kV circuit it is anticipated that a single 4000-kcmil copper conductor XLPE cable system would be required to meet the requested 1,600-amp line ratings. These cables, both the 345 kV and 161 kV, would be installed in a duct bank and manhole system for the portion of the route within the Refuge, and then transition to a horizontal directional drill (HDD) to cross under the Mississippi River. Typical cross sections for both configurations are shown below in Section 4.0. These configurations were chosen based on evaluations completed in Section 3.0 of this report. The proposed installation includes the civil installation of a spare 345 kV circuit for future use, to minimize refuge impacts at a later date. Primary considerations in the evaluation included, but were not limited to, production rate, estimated cost, easement requirements, disturbance during and after construction, and constructability.

1.3 Environmental Review

BMcD performed a desktop environmental review of the potential environmental and land use impacts that may result from the construction of two potential underground transmission line crossings of the Mississippi River and Refuge. The overview of potential impacts to surrounding resources included a general analysis of the potential impacts to wetlands; threatened, endangered, and special concern species; cultural and archeological resources; terrestrial habitats; migratory avian species; floodplains; and, lastly, issues relating to existing and planned land uses and access considerations for the proposed Project.

1.4 Cable System Reliability

Advancing cable system technology has led to designs that have service life and reliability relatively equal to their traditional overhead counterparts. Cable systems in general exhibit excellent reliability due to their relative immunity to weather related events such as wind, ice, or lightning. If an outage were to occur, however, underground lines would typically take substantially longer to repair and may require duct bank repair and or replacement. Additionally, the unique flood conditions in the Refuge could result in prolonged durations of time where the cable system would be inaccessible, should a repair or maintenance be required.

1.5 Cost of Proposed Installations

BMcD has developed preliminary construction cost estimates based on the routes, installation methods, and cable system(s) evaluated in Sections 3.0 through 6.0 of this report. These cost estimates are based on

RSMeans Heavy Construction Cost Data as well as past projects, budgetary quotes provided by vendors, and professional experience and judgment.

- Total cost estimates for the 345/161 kV Nelson Dewey crossing- $82.0 MM
- Total cost estimate for the 345/161 kV Stoneman crossing- $97.6 MM

More detailed breakdowns of these costs can be seen in Section 9.0 and Appendix B.

2.0 INTRODUCTION

ITC is currently in the process of designing and permitting the Cardinal to Hickory Creek 345 kV Transmission Line Project. The Project was developed as one of 17 Multi-Value Projects (MVPs) by the Midcontinent Independent System Operator (MISO), a Regional Transmission Organization that manages the transmission system across all or part of 15 U.S. states, including Iowa and Wisconsin. Referred to as one half of the MVP5 project, this portion of the MVP5 project would connect a new Hickory Creek Substation in Dubuque County to an intermediate substation near Montfort, Wisconsin, and then continue to the Cardinal Substation just west of Madison, Wisconsin. The Project has been developed to addresses reliability issues on the regional bulk transmission system; cost-effectively increases transfer capacity to enable additional renewable generation needed to meet state renewable portfolio standards, and supports the nation's changing energy mix; alleviates congestion on the transmission grid to reduce the overall cost of delivering energy; and, responds to public policy objectives aimed at enhancing the nation's transmission system and mitigating global climate change.

As part of Cardinal to Hickory Creek 345 kV Transmission Project, BMcD has been asked to evaluate and provide cost estimates for the option of installing the transmission lines, both the proposed 345 kV and existing 161 kV circuits, underground for the portion of the route within the Refuge and across the Mississippi River.

This study was performed to analyze the location(s) for an underground utility at the Nelson Dewey and Stoneman crossing locations near Cassville, Wisconsin. Each crossing location analysis included the undergrounding of a single 345 kV and single 161 kV transmission line, as well as a spare 345 kV circuit for future use.

This report is intended to summarize the following aspects of the proposed Project:

- Identify underground routes to cross the Refuge and the Mississippi River,
- Describe the cable systems necessary to fulfill the electrical system operating criteria,
- Evaluate the feasibility of various trenchless installation methods along the identified routes,
- Evaluate the environmental impact of the proposed underground installation,
- Evaluate the various aspects of reliability in cable systems, and how they would compare to a comparable overhead installation, and
- Generate preliminary construction cost estimates for the recommended installations.

3.0 UNDERGROUND CABLE SYSTEM OPERATING REQUIREMENTS

This section of the report identifies the electrical parameters and operating requirements that have been used for the preliminary engineering of the cable system.

It is important to note that an overhead to underground transition point (transition station) for the 345 kV transmission line would be required on the east and west side of the Refuge for either crossing location (see Section 4.0 and Figure 4-4 for more detail on the proposed location of the western transition station). The transition stations, while a necessary portion of the Project, are only discussed at a high level in this report. This report identifies a potential location for the western equipment and riser poles but does not focus on any existing topography concerns, access issues, existing environmental concerns, reliability risks, and long term maintenance issues. Should an underground option be selected for further consideration as a project alternative, further analysis would be done to determine the optimal location for the riser poles, as well as the eastern transition station in Wisconsin. Estimated costs associated with the transition stations have been included in the construction estimate portion of this report.

3.1 Cable System Technology

Currently there are two predominant cable system technologies used for underground transmission in the U.S. market. These systems are XLPE, which is a solid-dielectric-insulated cable system; and, a high-pressure fluid-filled (HPFF), which is a fluid-dielectric-insulated cable system. While there are significant differences and histories to both technologies, this report is focused on the potential impacts to the Mississippi River and the Refuge. Therefore, this report will not go into depth on the cable system differences and comparison of the two technologies.

For the purposes of this report, all cable systems and installation scenarios provided will be based on the XLPE technology. This is the cable technology that BMcD would recommend for this potential installation. The XLPE cable offers several advantages over the HPFF cables which have led to the recommendation of this specific cable technology. A short comparison of the two cable technologies is shown below in Table 3-1.

Table 3-1: Cable Technology Summary

Parameter	XLPE	HPFF
Available Conductor Size	1000-5000 kcmil (enameled conductor coating available for greater ampacity needs)	1000-3500 kcmil
Maintenance Requirements	Regular monitoring and inspection only	Fluid sampling and testing, pumping plant maintenance, cathodic protection system monitoring and maintenance.
Required Ancillary Systems	None	Pumping plant Cathodic protection
Cable Reel Lengths	1,500-3,000+ feet each	1,500-3,000 feet each
Environmental Concerns	Higher EMF than HPFF	Dielectric fluid release into Refuge or Mississippi River

3.2 Cable System Requirements and Assumptions

In order to complete the preliminary design of the proposed underground cable installation BMcD has used the following data for inputs to the cable system calculations and design.

3.2.1 Electrical Criteria

The following electrical criteria and assumptions were used for the preliminary design on the XLPE cable system.

Table 3-2: 345 kV Cable System Electrical Criteria

Parameter	Value	Notes
Nominal Voltage	345 kV	
Required Ampacity	2,342 Amps	Future civil installation to accommodate an additional circuit or increased ratings
Load Factor	0.75	Assumed
Max Conductor Temperature	90°C	AEIC/ICEA standard
Bonding Scheme	Single Point	

Table 3-3: 161 kV Cable System Electrical Criteria

Parameter	Value	Notes
Nominal Voltage	161 kV	
Required Ampacity	1,600 Amps	
Load Factor	0.75	Assumed
Max Conductor Temperature	90°C	AEIC/ICEA standard
Bonding Scheme	Single Point	

3.2.2 Installation Criteria

The following installation criteria and assumptions were used for the preliminary design for both the 345 kV and 161 kV XLPE cable systems (Table 3-4).

Table 3-4: Cable System Installation Criteria

Parameter	Value	Notes
Earth Thermal Resistivity	0.90°C-m/W	Assumed
Earth Ambient Temperature	20°C/15°C	Typical depth/max depth
Thermal Resistivity of Grout	0.80°C-m/W	Specified value
Thermal Resistivity of Concrete	0.65°C-m/W	Specified value
Maximum Anticipated Depth of Cover	45 feet	Based on preliminary trenchless analysis

4.0 PRELIMINARY CABLE SYSTEM DESIGN

In an effort to determine the installation size and installation scenarios, BMcD has completed preliminary cable system ampacity calculations and cable sizing. These calculations are based on the criteria and assumptions as listed in Section 3-2 above.

4.1 Cable and Duct Bank System

Utilizing Cymcap® ampacity software, BMcD has determined that a two cable-per-phase system (six total cables) would provide adequate capacity to meet the requested 345 kV ratings. However, in an effort to allow for future expandability and to avoid future impacts to the Refuge, it is recommended that the proposed installation include the civil portions (duct bank and manholes) for a third set of cables. This additional civil infrastructure provides additional redundancy and or expandability in the proposed system, allowing for additional cables that could be a separate circuit, or a third set of cables per phase to increase the capacity of the existing circuit at a later date.

For the undergrounding of the existing 161 kV circuit, BMcD determined that a single cable per phase system (three total cables) would provide adequate capacity to match the line rating of the overhead portion of the circuit. Unlike the 345 kV system, the 161 kV installation would not include provisions for future expansion. It is anticipated that any transmission expansion in this region would be at the 345 kV voltage class.

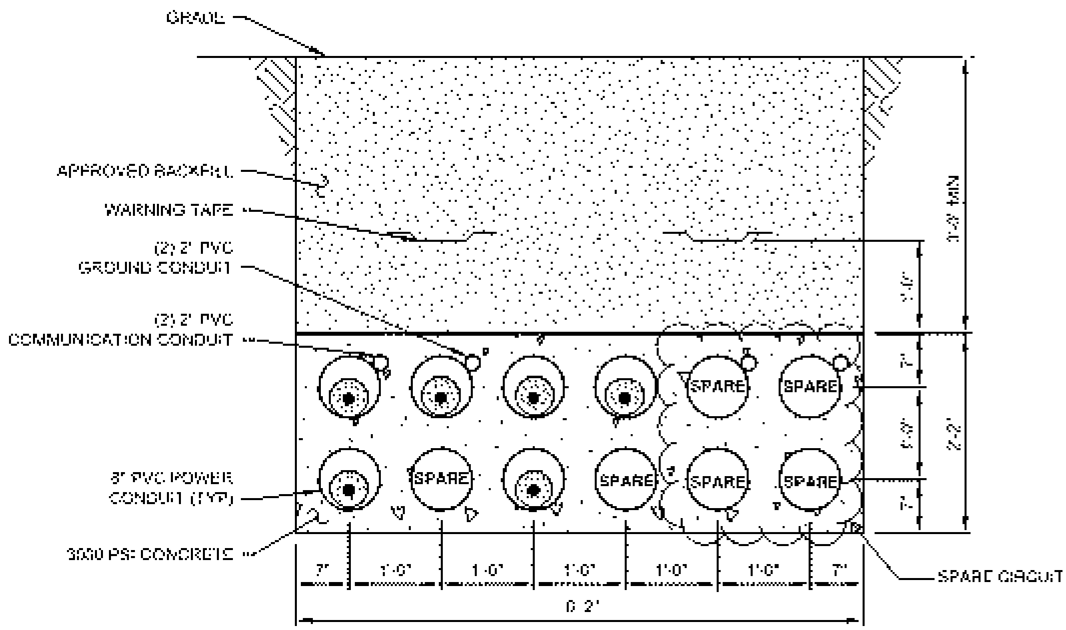
The proposed cable systems and installation conditions evaluated are listed below.

Table 4-1: 345 kV Ampacity Calculation Summary

Scenario	Duct Bank/Bore Configuration	Separation between Bores/Duct Banks	Depth of Cover	Cables Size	Ampacity Achieved (Amps [MVA])
River Crossing/Refuge HDD	3 X 36” Bores	20’	45’	2 X 3000 kcmil	2,430 [1,452]
Refuge Duct Bank	Single Duct Dank	N/A	5’	2 X 3000 kcmil	2,820 [1,685]

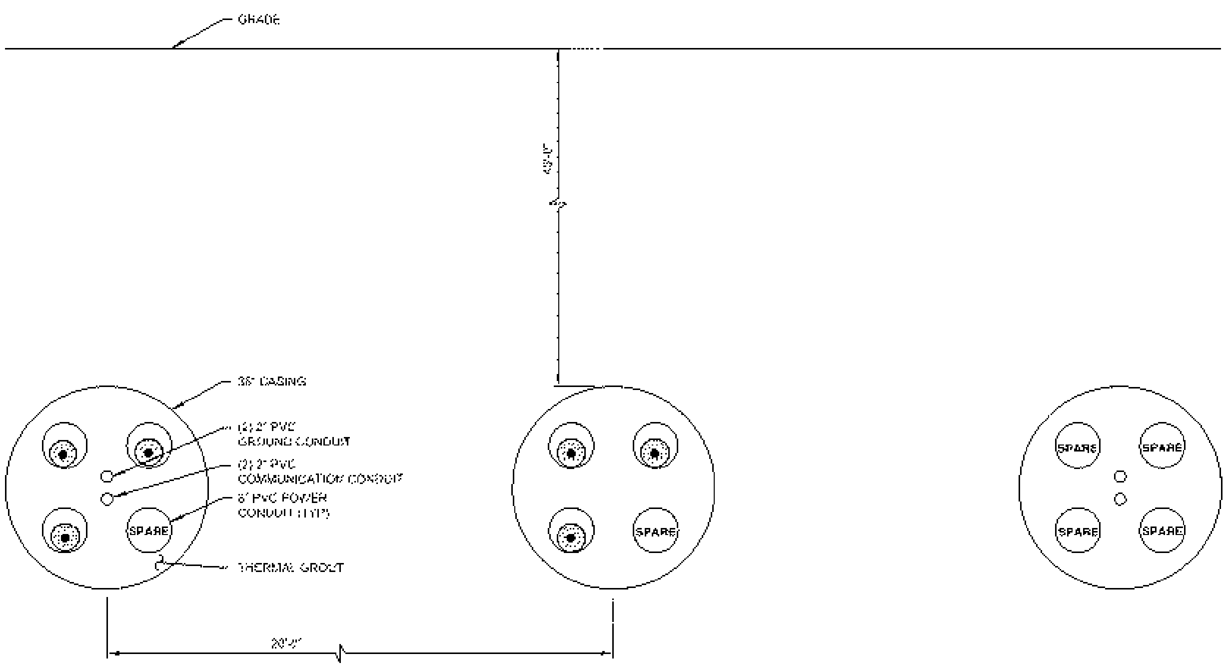
Detailed ampacity reports for the 345 kV cable system can be found in Appendix A. The ampacity calculations provided above for the 345 kV cable system are based on the following installation cross sections.

Figure 4-1: Typical 345 kV Duct Bank Cross Section



TYPICAL DUCT BANK INSTALLATION

Figure 4-2: Typical 345 kV HDD at River Crossing and Refuge Cross Section



TYPICAL TRENCHLESS INSTALLATION AT RIVER CROSSING

Table 4-2: 161 kV Ampacity Calculation Summary

Scenario	Duct Bank/Bore Configuration	Separation between Bores/Duct Banks	Depth of Cover	Cables Size	Ampacity Achieved (Amps [MVA])
River Crossing/Refuge HDD	1 X 36" Bores	20'	45'	1 X 4000 kcmil	1,640 [457]
Refuge Duct Bank	Single Duct Dank	N/A	5'	1 X 4000 kcmil	1,880 [524]

Detailed ampacity reports for the 161 kV cable system can be found in Appendix A.

The ampacity calculations provided above for the 161 kV cable system are based on the following installation cross sections.

Figure 4-3: Typical 161 kV Duct Bank Cross Section

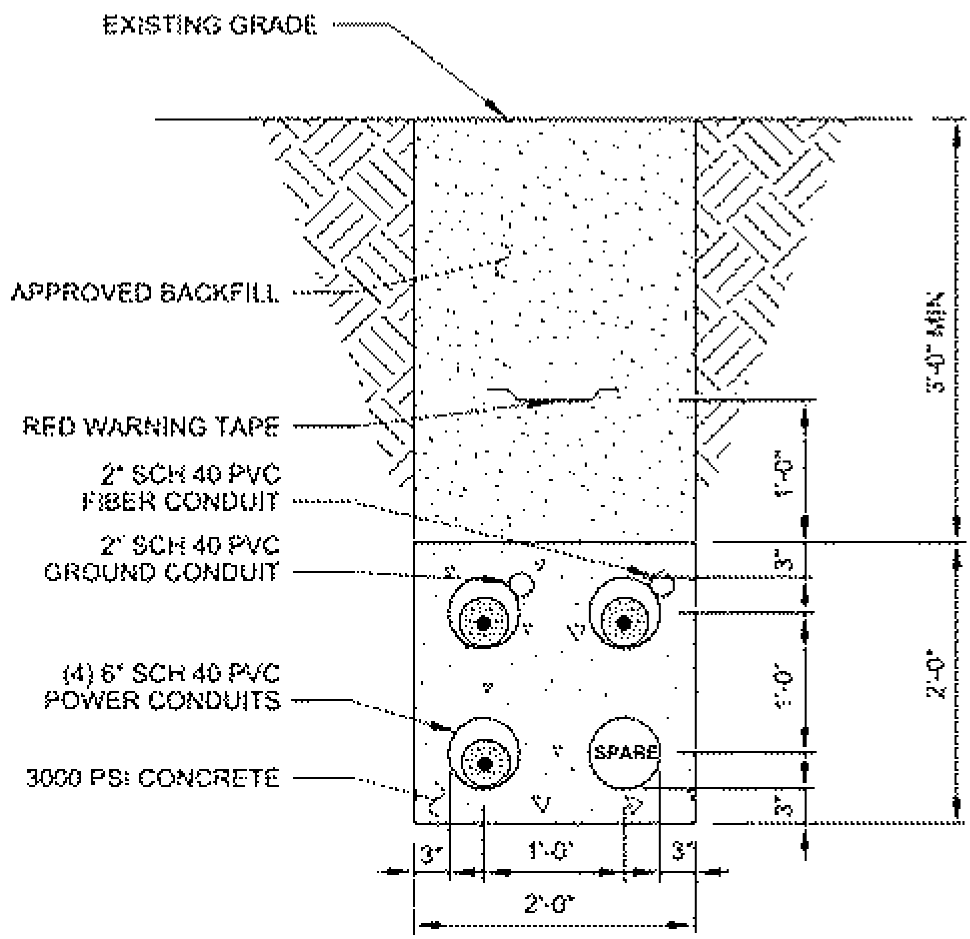
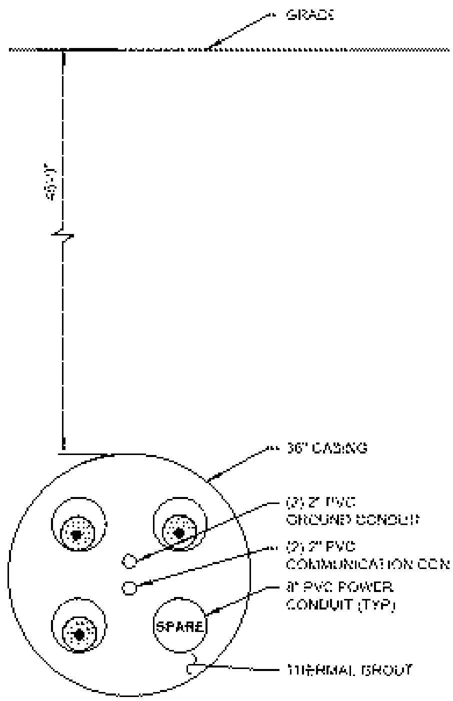


Figure 4-4: Typical 161 kV HDD at River Crossing and Refuge Cross Section

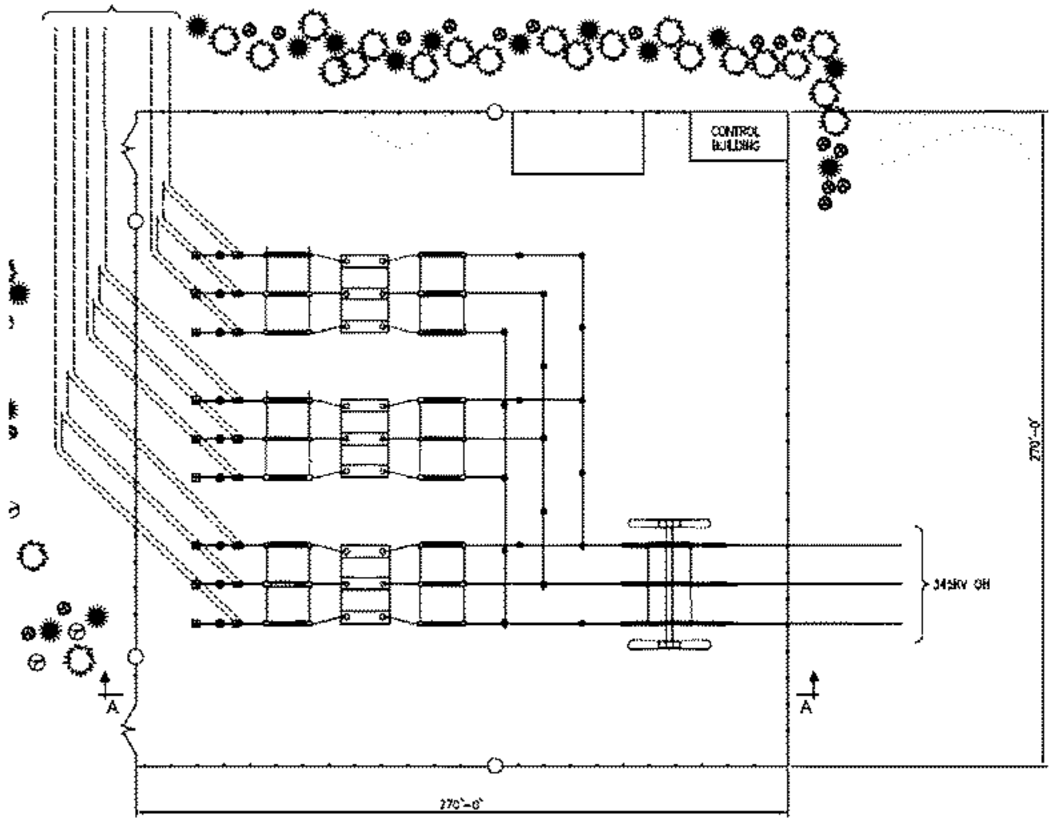


4.2 Transition Station

Due to the parameters of the Project, BMcD recommends the use of transition stations to increase reliability and operational flexibility of a large 345 kV transmission line comprised of both overhead and underground components. A 345 kV transmission line transition station is often utilized where a high capacity or critical bulk power underground transmission line is transitioned to an overhead transmission line. Generally, at the 161 kV voltage class, it is not necessary to utilize a transition station. The 161 kV circuit would simply utilize a transition structure (riser pole).

For purposes of this high-level study, it was estimated that a 345 kV collector bus transition station suitable for the proposed Project would have a general footprint of approximately 270 feet wide by 270 feet long, or approximately 1.7 acres (see Figure 4-5, below). However, based on the space requirements and proposed alignment of the transmission line for both the Nelson Dewey and Stoneman route options, BMcD recommends that a split location configuration of the transition station be used. In order to reduce the footprint on Refuge lands, the majority of the transition station equipment would be located off Refuge land near the existing Turkey River Substation, with only the riser poles being located on the western edge of the Refuge land.

Figure 4-5: Assumed 345 kV (3 Cables/Phase) Transition Station Layout

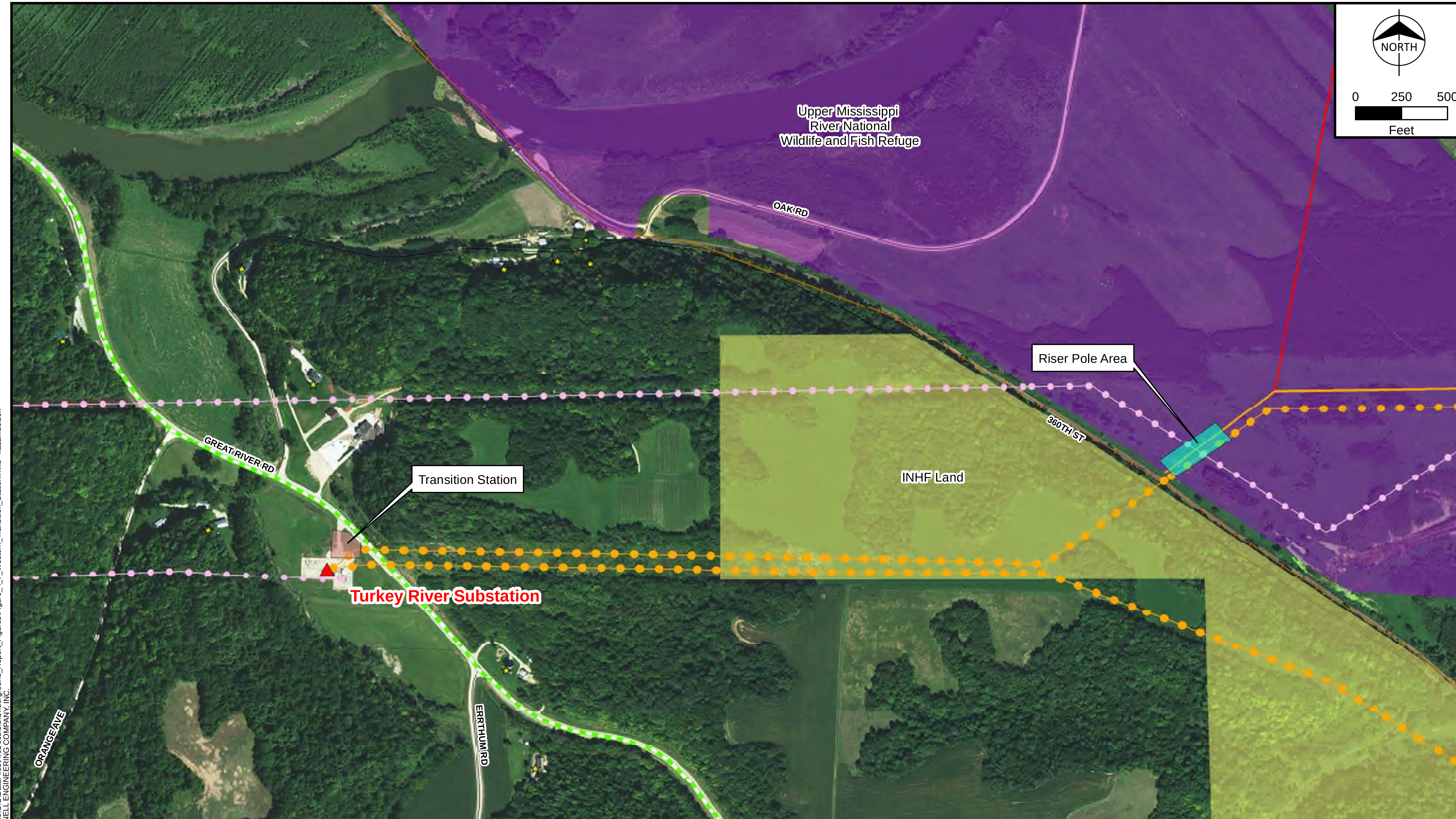


It is anticipated that for either route, the riser pole area will contain four riser poles consisting of the following:

- Three poles allocated for 345 kV (2 currently occupied with one spare pole for future expansion)
- A single pole for 161 kV

This general transition structure and configuration can be seen below in Figure 4-6 and Figure 4-7, respectively. Another transition station would be needed on the east bank of the Mississippi River; but the exact placement of that station has yet to be determined or evaluated.

Figure 4-6: Typical 161kV Transition Structure



Nelson Dewey Underground Alternative
Stoneman Underground Alternative
Riser Pole Area
Transition Station Location
Existing 161-kV lines
Existing 69-kV lines
Existing Substation
Proposed Substation
Municipal Areas
County Boundary
House
Church
School
Cemetery
Tower
Active Railroads
Scenic Byways
INHF Land
DNR Land
USFWS Land

BURNS McDONNELL

Figure 4-7
Preliminary Western Transition Station Location

Issued: 5-5-15

Path: R:\ITC\74417_Hickory_Crk_Cassville\GIS\DataFiles\ArcDocs\old\Underground_Report_Figures\Figure_4_7_Western_Transition_Station.mxd kasamuelson

Source: IDNR; Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community; Energy Velocity; Clayton County; INHF; USFWS; ITC Midwest; Burns & McDonnell.

Due to the required space within the Refuge, the steep grade to the west, and the presence of potential archeological sites near the bluff, the most practical preliminary western transition station location was determined to be a split arrangement with the breakers, relays, and other equipment located near the existing Turkey River Substation. The riser poles would be located on the western edge of the Refuge just east of the railroad tracks and within the existing 161 kV transmission line right-of-way (ROW). This approach would provide the increased reliability and operational flexibility of a transition station, while minimizing the impact to the Refuge by keeping the riser poles within the existing overhead ROW. Construction of the riser poles on this site would require approximately 1.0 acre. Land cover in the proposed riser pole area includes emergent wetlands; approximately 1.0 acre of emergent wetlands would be removed and permanently converted for construction of the riser pole area. Should an underground alternative be selected, the location of the western transition station would be reviewed further to verify the optimal location.

5.0 UNDERGROUND INSTALLATION REQUIREMENTS & ROUTING

As part of the feasibility study BMcD has evaluated various crossing installations and routing scenarios for both the Nelson Dewey and the Stoneman crossing options. This section of the report is intended to identify the installation requirements, routing constraints, and the final routes evaluated.

5.1 Installation Requirements

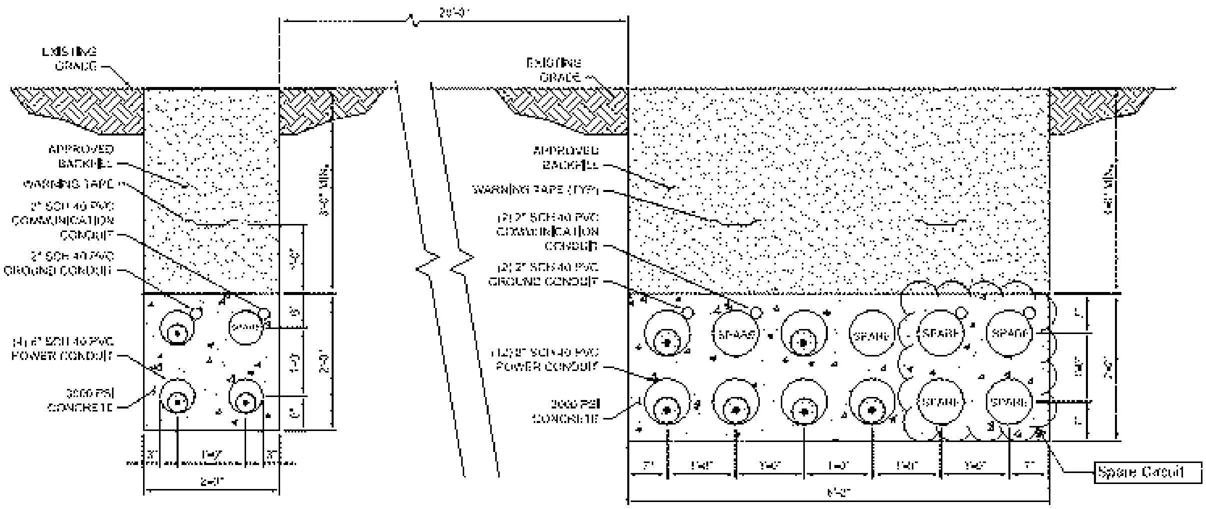
5.1.1 Refuge Installation

Outside the Mississippi River crossing itself, it is anticipated that the cables would be installed in either a duct-bank-and-manhole system or back-to-back HDD installations through the Refuge. Based on the requirements of the Project, it is anticipated that the necessary underground circuit can be carried in two different installation scenarios to the location of the potential Mississippi River crossing location. The first proposed configuration is a series of parallel HDD installations. These HDD installations would consist of three parallel 36-inch casings containing four 8-inch conduits each for the 345 kV circuit, with a fourth 36-inch casing containing four 8-inch conduits for the 161 kV circuit. Each casing would be spaced approximately 20 feet (on center) from one another with an anticipated maximum depth of approximately 45 feet. This is the configuration displayed above in Figure 4-2 and Figure 4-4..

The second installation configuration identified for the 345 kV cable system is a single duct bank consisting of twelve 8-inch Schedule 40 polyvinyl chloride (PVC) conduits, nine of which would have the ability to carry a three-cables-per-phase system. The remaining three 8-inch conduits would be used for spare conduits. In addition to the 8-inch conduits, four 2-inch conduits are required to carry the fiber optic cable for relaying and ground continuity conductor. This is the configuration displayed above in Figure 4-1.

The duct bank installation for the proposed 161 kV circuit is a single duct bank containing four 6-inch Schedule 40 polyvinyl chloride (PVC) conduits, three of which would have the ability to carry the single-cable-per-phase system. The remaining 6-inch conduit would be used for a spare conduit. In addition to the 6-inch conduits, two 2-inch conduits are required to carry the fiber optic cable for relaying and ground continuity conductor. This is the configuration displayed above in Figure 4-3. A composite of the 345 kV and 161 kV duct banks can be seen in Figure 5-1 below.

Figure 5-1: Typical 345 kV & 161 kV Duct Bank Cross Section



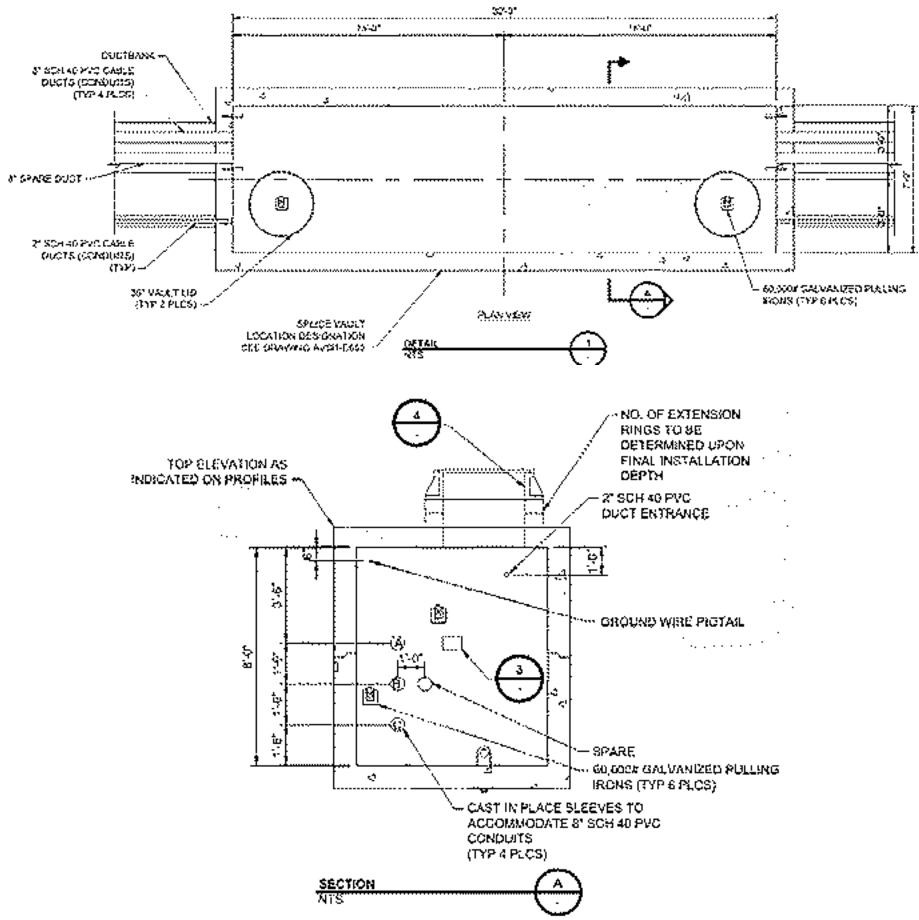
5.1.2 River Crossing

For the portion of the routes that are proposed to cross under the Mississippi River, the HDD (first) configuration outlined above in section 5.1.1 would be utilized. These HDD installations would consist of three parallel 36-inch casings containing four 8-inch conduits each for the 345 kV circuit, with a fourth 36-inch casing containing four 8-inch conduits for the 161 kV circuit. Each casing would be spaced approximately 20 feet (on center) from one another with an anticipated maximum depth of approximately 45 feet. This is the configuration displayed above in Figure 4-2 and Figure 4-4.

5.1.3 Splice Vaults

In addition to the duct bank or HDD installation(s), splice vaults would be required along each route, spaced at approximately 1,750 foot intervals. A typical 345 kV splice vault detail is shown below in Figure 5-2, with the 161 kV splice vault being equal, or slightly smaller in size. Each splice location will require a total of four splice vaults, three for the 345 kV system and one for the 161 kV system. This configuration allows for the maximum reliability and operational flexibility of the 345kV system. With the three separate splice vaults for the 345kV system, should a splice fail it will limit the potential damage to only the three cables located within that splice vault, allowing the system to maintain partial capacity on the remaining cables throughout the failure event and through the repair process. It is anticipated that the Nelson Dewey crossing alternative would require a total of five splice locations each containing four vaults (three for 345 kV and one for 161 kV) for a total of 20 vaults within the Refuge. For the Stoneman crossing alternative, the Project would also require five splice locations each containing four vaults (three for 345 kV and one for 161 kV) for a total of 20 vaults located within the existing overhead ROW (150 feet) within the Refuge.

Figure 5-2: Typical Splice Vault Detail



5.2 Routing Constraints

As part of this analysis, BMcD has been specifically asked to evaluate the feasibility and costs associated with undergrounding the new Cardinal to Hickory Creek 345 kV transmission line. In addition to this request, BMcD was asked to evaluate the relocation of the existing 161 kV overhead line to an underground installation. For the purposes of this report, it is assumed that the 345 kV and 161 kV underground installations would be in separate trenches, within the same corridor. This configuration does offer some operational diversity; should one circuit be impacted by an individual event, the other facility would likely remain relatively unaffected while avoiding two separate corridors through the Refuge.

Based on these parameters, BMcD reduced the routing options to those routes that utilize the existing 161 kV overhead corridor for the proposed 345 kV and 161 kV underground installations. This resulted in one routing option per crossing location.

For the Stoneman crossing option, the route is proposed to utilize the existing 161 kV overhead 150-foot ROW, with the exception where the route deviates from the existing 161 kV overhead transmission line at the point within the Refuge where the overhead line turns south. This was done because there are no suitable soils for boring equipment due to the presence of marshy wetlands around the existing line in that area. That location also lacked sufficient space to lay down the required drilling equipment.

5.3 Underground Routing Options

The preliminary routing options investigated as part of the feasibility study include:

Stoneman Crossing Alternative:

- Proposed 345 kV/161 kV underground crossing starting southeast of the town of Cassville and head west to the Stoneman Substation location then continuing west/southwest under the Mississippi River channel to the western river limits near the existing overhead alignment. From this location the route continues southwest slightly north of the current overhead alignment before rejoining the existing overhead alignment. From this location the route turns back west and extends within the overhead alignment to the limits of the Mississippi River Floodway at railroad tracks.
- Approximately 9,600 feet in total length.
- This route is shown in orange in Figure 1-1

Nelson Dewey Crossing Alternative:

- Proposed 345 kV/161 kV underground at southeast corner of Nelson Dewey Substation, head southwest to east bank of the Mississippi River and continue southwest under the channel to the existing western river limits near the Cassville Ferry Landing boat ramps. From this location the route continues to the southwest, in a straight alignment to the existing overhead transmission line corridor at the western limits of the Mississippi River Floodway at railroad tracks.
- Approximately 7,900 feet in total length
- This route is shown in red in Figure 1-1.

6.0 UNDERGROUND CONSTRUCTION AND INSTALLATION

This portion of the report discusses the various installation methodologies that could be utilized for each portion of the proposed underground route. This section has been subdivided into the land based (Refuge) portions of the route and those involving water crossings (Mississippi River).

6.1 Construction Methodology – Refuge Segments(s)

For the portion of the proposed route that is within Refuge lands and does not involve any water crossings, there are various methods of construction that could be used to install the proposed cable system. The two most common installation methods are outlined below. It is important to note that due to the close proximity of the Project to the Mississippi River, there is significant risk of flood/water related delays during construction. Since the Refuge area is within the floodplain, access for both construction and maintenance activities may be severely impacted during flood events.

6.1.1 Open Trench Construction

The most traditional and time/cost effective method of installing underground cable systems is the open-trench installation method. This method is also commonly referred to as the “cut and cover” or “open cut” construction. In this type of construction, a continuous trench of sufficient size to place and assemble the duct bank (cross section shown in Figure 5-1) is excavated along the entire route. The typical installation depth for open trench construction is approximately three to five feet of cover over the duct bank package. Following the excavation crew is a duct bank assembly crew that assembles the conduit package, places the conduit package in the trench, and encases the conduits in concrete. Once the concrete has cured, the trench is then backfilled with native soil or other approved materials. Following these activities, the electrical contractor would pull the cable into the conduits from the manhole locations.

This method of installation is the most efficient from a cost and time perspective, but also requires a construction alignment with continuous access for heavy construction equipment. This would result in a permanent access path or clearing area, approximately 35 to 50 feet wide, for the entirety of the cable system route. Additional area of approximately 50 by 150 feet would also be needed at the splice vault locations.

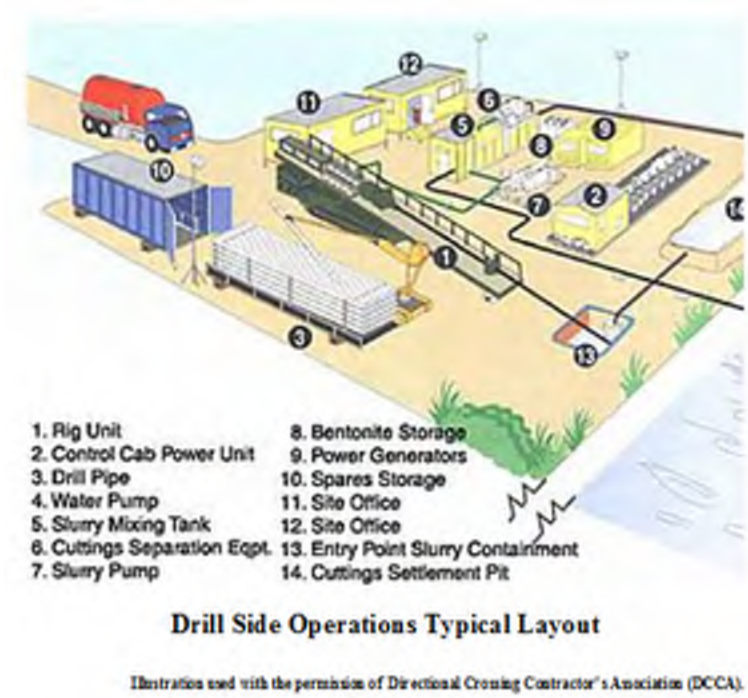
After installation and backfill of the trench, above grade maintenance may be necessary to prevent growth of large plants and/or trees with intrusive root systems that could damage the duct bank over time. Should an underground alternative be selected for further consideration, proposed re-vegetation activities would be developed in consultation with USFWS staff.

6.1.2 Trenchless Construction

The second identified method of installing underground cable systems is the HDD installation method. This method would employ back-to-back trenchless operations along the route with entry and exit sites coordinated with the manhole locations. This results in more of a point-to-point construction, with minimal at grade disturbance between the points.

In contrast to the open trench method where the construction space at the manholes is marginally larger than manhole footprint, the HDD construction method would require substantially larger staging areas at the manhole locations. In general, these staging locations would need to accommodate all of the drilling equipment and materials. A typical HDD staging area for both the sending and receiving ends can be seen in Figure 6-1.

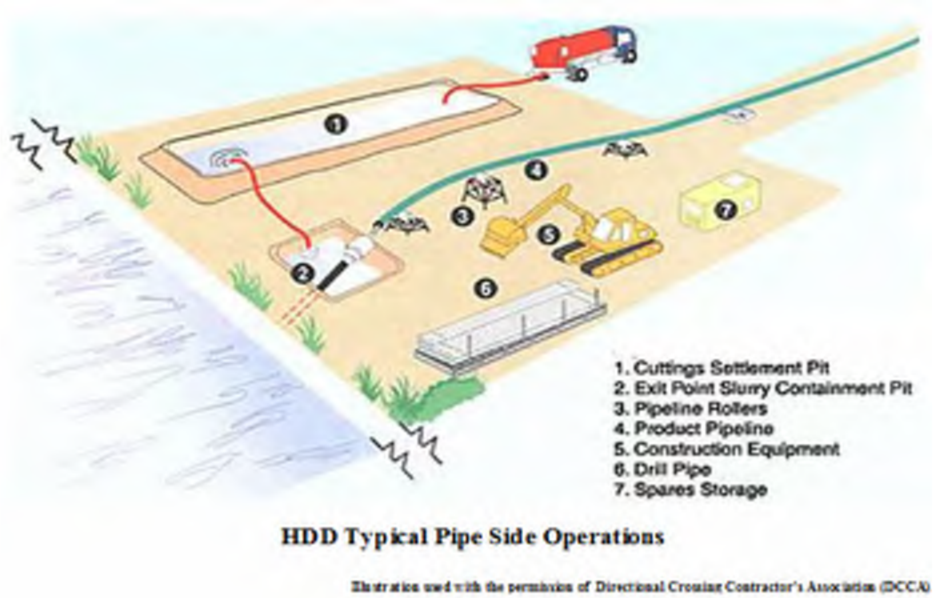
Figure 6-1: Typical HDD Drill Side Work Space



Based on the preliminary sizing of the drill equipment, it is anticipated that a large drill rig would be required to complete the proposed HDD installations. This size drill rig would typically require a 150 foot by 250 foot workspace on the drilling side.

The receiving side of a HDD operation is generally much smaller. Normally, a small crane or tracked excavator is required to remove and/or add drill stem as required for reaming operations. Reaming operations is a step in the HDD process to increase borehole size. Figure 6-2 below is a typical HDD receiving side set up. In some instances a smaller rig may be set up in this area to assist in reaming operations. Note in Figure 6-2 below the product pipe running out to right. In general practice, the product pipe is preassembled to reduce stopping of pull back operations. This is especially required when geologic conditions are unstable, or in squeezing clay to prevent pipe or drill stem failure during pull back operations. For example, for a 1,000-foot drill, 1,000 feet of pipe should ideally be assembled and ready for pull back when required. This requires a space 1,100 feet long by approximately 20 feet wide. If this space is not available, a substantial space should still be available to reduce the number of times required to stop and add pipe to a minimum.

Figure 6-2: Typical HDD Receiving Side Work Space



While this method of installation results in less at grade restoration, there still needs to be an access path to each manhole/drilling location for the delivery of equipment and materials, as well as maintenance activities. This would result in an access path or clearing area that would be approximately 25 to 40 feet wide for the entirety of the cable system route, with additional permanent area of approximately 50 by 150 feet at the splice vault locations. While similar to the open trench option for space requirements during construction, the major advantage of HDD is that the areas outside of the splice vault locations have a much smaller disturbance. Additionally, future vegetation control and maintenance are potentially reduced to an access road after construction activities have been completed. This is partially because repairs on HDD installations are typically too costly and difficult to attempt from the surface.

After installation, above grade maintenance may be necessary to prevent growth of large plants and/or trees with large or intrusive root systems that could damage the duct bank over time, similar to the open trench construction. However, with the additional depth of the installation, there may be more leniencies on the species of plants that would be allowed in the easement area when compared to open trench construction. Areas that are close to the splice vault locations (where the cable system is closer to the surface) would require more strict vegetative management to prevent root intrusion into the cables. Areas outside of these vaults would be constructed at a depth-to-cover of approximately 45 feet.

6.1.3 Construction Method Summary

Based on the two construction methodologies discussed above, BMcD has compiled a comparison table to highlight the differences in installation methods.

Table 6-1: Construction Method Comparison

Open Trench	Parameter	HDD
100-200 feet per day	**Production Rate**	50-75 feet per day
$$	**Installation Cost**	$$$$
Full length trench and construction vehicle access	**At Grade Installation Disturbance**	Access road and minimal excavation areas at vault locations
Limited use, access road maintenance and vegetation control	**After Construction Disturbance**	Limited use, access road maintenance and vegetation control
~80’ along duct bank & 50 x 150’ areas at vault locations	**Approximate Width of Easement During Construction**	~100’ along HDD & 100 x 200’ areas at vault locations
~45’ along duct bank & 50 x 150’ areas at splice vault locations	**Approximate Width of Easement After Construction**	~100’ along HDD & 50 x 150’ areas at splice vault locations

Based on the above discussed construction methodologies, BMcD recommends the use of the open-trench installations method where possible. The open-trench method allows for the fastest production rate, lower cost, and better future maintenance and or repair access. Although the open trench method would have a larger impact during the construction of the cable system, it would ultimately result in a smaller and less costly easement though the Refuge.

6.2 Construction Methodology – River Crossing Segment(s)

Several installation methods exist for crossing the Mississippi River, including the following:

- HDD, as discussed in Section 6.1.2;
- Microtunneling;
- Direct Pipe Method; and

- Laying or plow-type installation of the cable system on or immediately beneath the river bottom.

The installation method utilized will need to reduce construction impacts to the river and to allow the cable system to be installed below the zone of potential river scour (or dredging). Although each of the above installation methods is technically viable, we believe that HDD currently presents the most feasible solution, from the standpoint of anticipated construction risk, cost, the probable subsurface conditions (sand and gravel), and long-term operations and maintenance of the cable system.

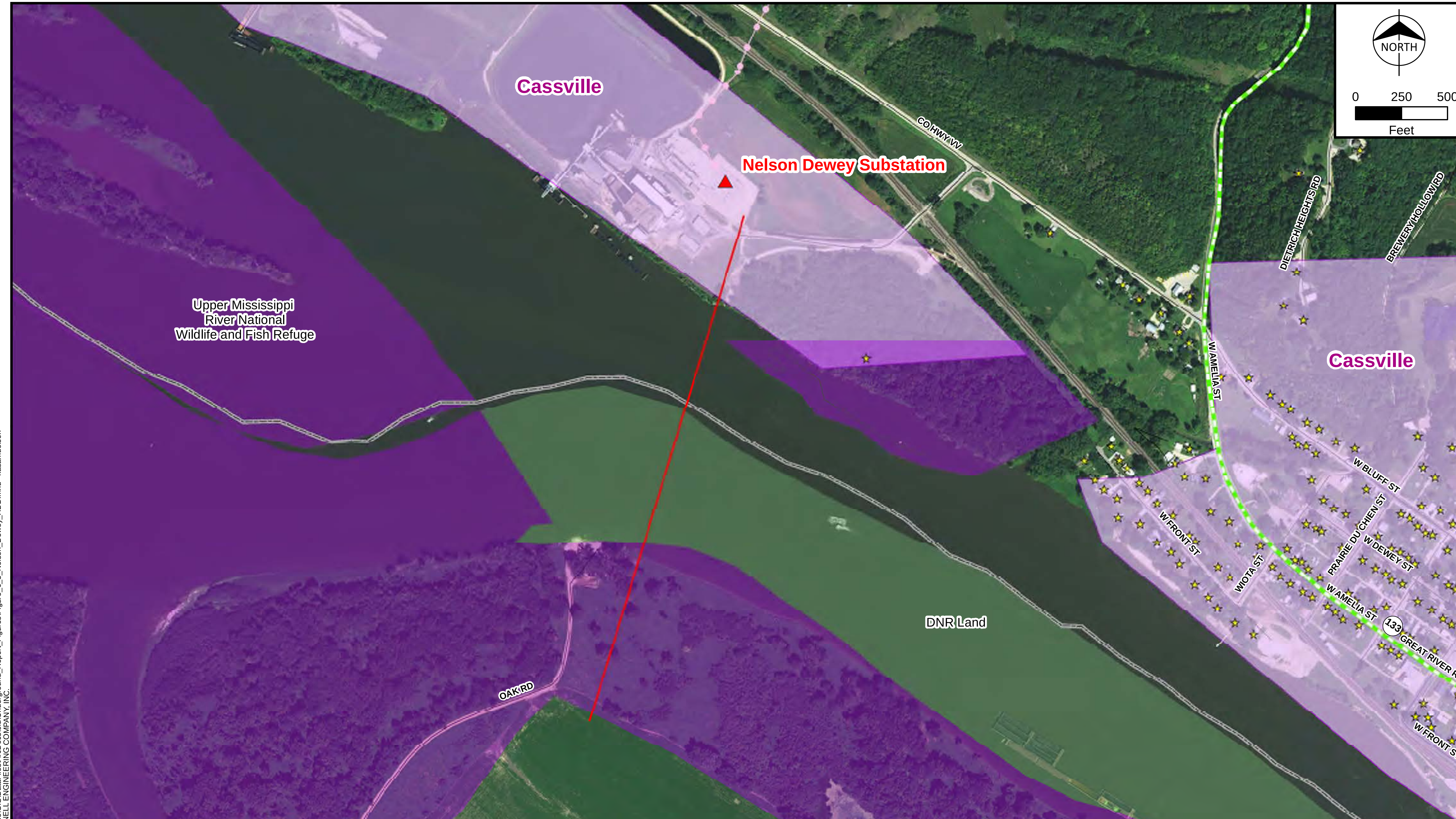
The approximate duct configuration for the Mississippi River crossing by means of HDD is shown in Figure 4-2 and Figure 4-4. This involves four (4) separate duct bundles, each installed in an outer carrier casing. For thermal purposes, the casing would need to consist of either high density polyethylene (HDPE), or fusible polyvinyl chloride (FPVC). The casing wall thickness and material requirements would ultimately depend on the length of the bore, the bore depth, and the bore geometry. To minimize construction risk, the side-to-side spacing between the casings would need to be at least 20 feet.

The approximate HDD bore depth below the river would need to be at least 45 feet. Maintaining this minimum depth would help reduce risk of inadvertent drill fluid loss (i.e., “frac-out”) to the Mississippi River and adjacent Refuge during construction. Note that this minimum depth would need to be evaluated during HDD design, following acquisition of site-specific geotechnical data. For each casing, a pilot hole would be drilled from a designated entry area below the Mississippi River to an exit area. The drill equipment and drill materials would be located at the entry area and the casing and duct at the exit area. For all of the identified options, the most viable entry area is probably located to the northeast of the Mississippi River. This would enable use of the open space located to the southwest of the river for casing and duct assembly and storage.

Once completed, the pilot hole would be enlarged by successive reaming passes to a diameter sufficient to accept the casing. At this stage, it is estimated that the reamed borehole diameter in each case would be approximately 48 inches. Following borehole preparation, the casing would be pulled into place. Note that all stages of HDD construction require circulation of drill fluid (water, bentonite, and polymer) through the borehole to cool the drill tools, remove drill cuttings, stabilize the hole, and lubricate the casing.

The approximate HDD alignment for the Nelson Dewey route Mississippi River crossing is shown in Figure 6-3. The plan length for this alignment is approximately 2,900 feet. BMcD anticipates that the installation forces involved with a bore of this length may permit either FPVC or HDPE be used for duct casing.

The approximate HDD alignment for the Stoneman crossing alternative is shown in Figure 6-4. The plan length for this alignment is approximately 4,200 feet. The installation forces involved with a bore of this length may require that FPVC be used for the duct casing rather than HDPE.



- Nelson Dewey Alternative HDD Alignment
- Riser Pole Area
- Transition Station Location
- Existing 161-kV lines
- Existing 69-kV lines
- Existing Substation
- Proposed Substation
- Municipal Areas
- County Boundary
- Active Railroads
- House
- Church
- School
- Cemetery
- Tower
- Scenic Byways
- INHF Land
- DNR Land
- USFWS Land

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Figure 6-3
Nelson Dewey Alternative Approximate HDD Alignment

Issued: 5-5-15

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Source: IDNR; Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community; Energy Velocity; Clayton County; INHF; USFWS; ITC Midwest; Burns & McDonnell.

Stoneman Alternative HDD Alignment	Existing 69-kV lines	County Boundary	School	INHF Land
Riser Pole Area	Existing Substation	Active Railroads	Cemetery	DNR Land
Transition Station Location	Proposed Substation	House	Tower	USFWS Land
Existing 161-kV lines	Municipal Areas	Church	Scenic Byways	

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Figure 6-4
Stoneman Alternative
Approximate HDD Alignment

Issued: 5-5-15

Path: R:\ITC\74417_Hickory_Crk_Cassville\GIS\DataFiles\ArcDocs\old\Underground_Report_Figures\Figure_6_4_Stoneman_HDD.mxd kasamuelson

Source: IDNR; Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community; Energy Velocity; Clayton County; INHF; USFWS; ITC Midwest; Burns & McDonnell.

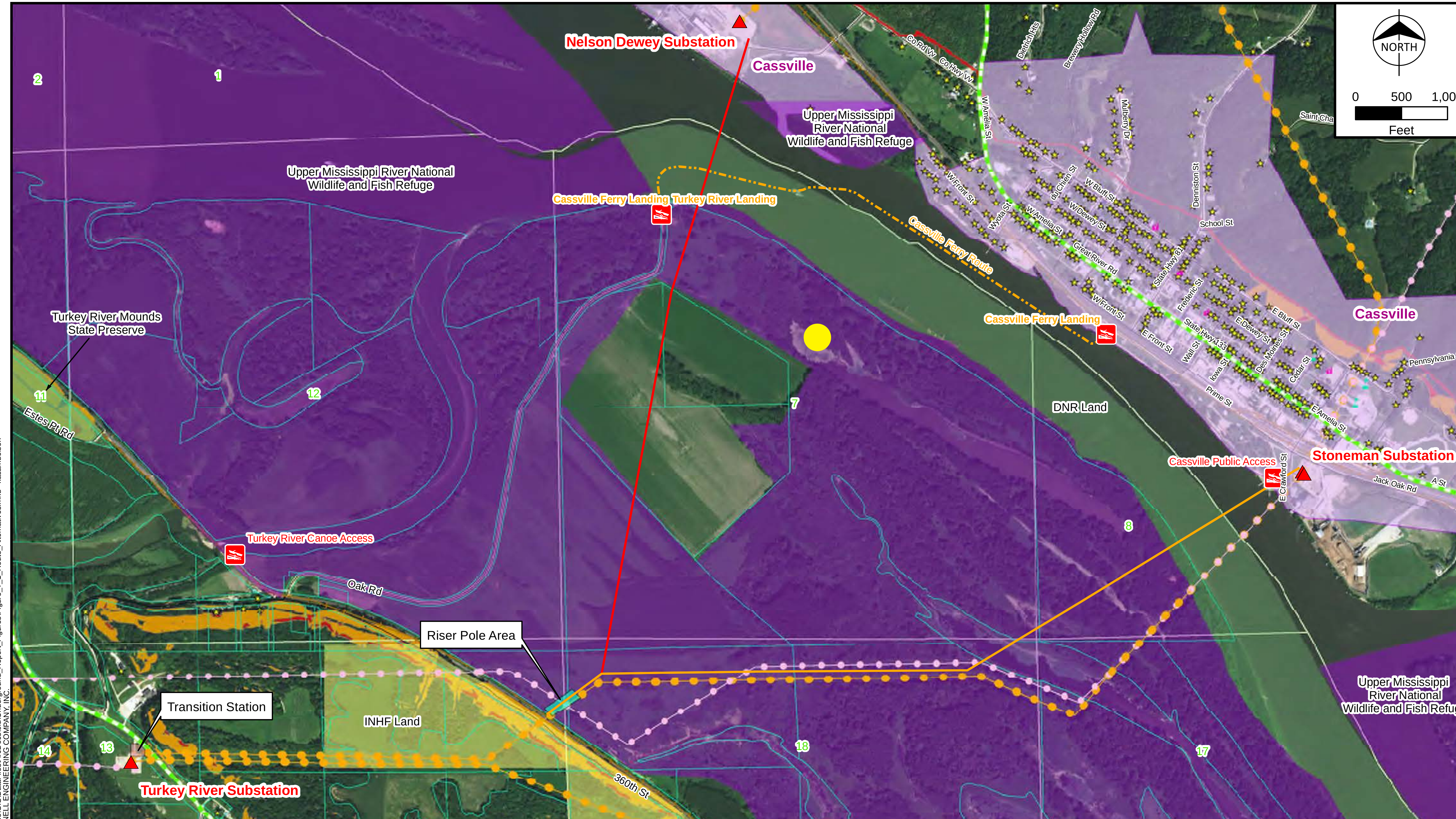
7.0 ENVIRONMENTAL REVIEW

BMcD completed a desktop environmental review of the potential impacts to natural resources in the vicinity of the proposed underground transmission alternatives. The proposed Project consists of the evaluation of two alternative underground transmission line crossing locations in Clayton County, Iowa, and Grant County, Wisconsin. Both alternative crossing locations would extend across the Refuge from Cassville, Wisconsin, and continue west to the Turkey River Substation in Clayton County, Iowa. The proposed Project would connect a new 345 kV transmission line from the proposed Hickory Creek Substation to the new American Transmission Company (ATC) Cardinal Substation near Madison, Wisconsin. Potential resources analyzed as part of this review included wetlands, threatened and endangered species, migratory birds, existing land uses, floodplains, as well as archeological and cultural resources. Although the Project will be in Iowa and Wisconsin, this report only investigated potential impacts in Iowa from the Turkey River Substation to the Wisconsin state line. Additional supplemental environmental impact data will be collected and analyzed for Wisconsin should the UG alternative be selected for additional analysis. Geographic Information System (GIS) data was collected from a variety of sources, including Environmental Systems Research Institute (ESRI), Iowa Department of Natural Resources (IDNR), National Hydrography Dataset (NHD), National Wetland Inventory, USFWS, National Land Cover Dataset (NLCD), the Iowa State Historic Preservation Office, Dubuque and Clayton counties, ITC, and BMcD.

The following review includes an analysis of resources found in proximity to the Mississippi River at the two proposed underground crossing locations (Figure 7-1). The Stoneman crossing alternative to the Stoneman Substation would extend approximately 9,600 feet from the eastern edge of the Town of Cassville on the east bank of the Mississippi River, to the west bank of Mississippi River in Iowa, and extending to an existing railroad crossing where the circuit would transition to an overhead configuration at the western edge of the Refuge. The north crossing to the Nelson Dewey Substation would be approximately 7,900 feet from the northwest section of the Nelson Dewey substation, to the east bank of Mississippi River and further onto the west bank of Mississippi River channel. The route then continues through Refuge land and a private parcel of land within the Refuge to an existing railroad crossing where the circuit would transition to an overhead configuration. Both crossing alternatives would utilize the same proposed location for the riser pole (Figure 4-4).

Post-construction ROW widths proposed for this Project would be approximately 45 feet for open trench and approximately 100 feet for HDD. For the Stoneman crossing alternative, this ROW width would be located within the existing 161 kV overhead line ROW mentioned in Section 6.0. The ROW of the existing overhead 161 kV line is 150 feet. Based on these estimates, up to approximately 10.7 acres of ROW within the Refuge would be necessary for the Stoneman crossing alternative if open trenching were utilized with HDD for the Mississippi River crossing; up to approximately 16.6 acres of ROW in the Refuge would be necessary if the HDD option were selected for the entire length of the underground line through the Refuge. The majority of the land proposed for ROW would be woody and emergent wetlands, as well as open water. For the Nelson Dewey crossing alternative, approximately 5.1 acres of Refuge land would be necessary for ROW use with the open trenching method with the HDD method for the Mississippi River crossing within the Refuge. If the HDD alternative were selected for the entire length of the Nelson Dewey crossing alternative, approximately 8.6 acres of Refuge land would be necessary for ROW. The potentially affected acres along the Nelson Dewey crossing alternative within the Refuge are mainly woody and emergent wetlands, open water, and a small area of cultivated lands. Hence, less ROW will be required for the Nelson Dewey Crossing alternative regardless of construction technique.

As mentioned is Section 4.0, riser poles are proposed to be located within Refuge boundaries. This would permanently convert approximately 1.0 acres of Refuge land for the base of the structures. In addition to these conversions, both crossing alternatives would require five splice locations each. Each of these facilities is 7,500 square feet in size. This would equate to an additional 0.86 acres permanently converted for the each crossing alternatives.



Nelson Dewey Underground Alternative	Municipal Areas	House	Active Railroads	INHF Land	Boat Landing or Canoe Access
Stoneman Underground Alternative	Parcels	Church	Cassville Ferry Route	DNR Land	**Percent Slope**
Existing 161-kV lines	PLSS Sections	School	Scenic Byways	USFWS Land	30 - 50
Existing 69-kV lines	Riser Pole Area	Cemetery	Historic Eagle Nest Location	Ferry Landing	> 50
Existing Substation	Transition Station Location	Tower			

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Figure 7-1
Route Alternatives Overview - Iowa

Issued: 5-5-15

Source: IDNR; Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community; Energy Velocity; Clayton County; INHF; USFWS; ITC Midwest; Burns & McDonnell.

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7.1 Potential Environmental Impacts of New Underground Installation

7.1.1 Wetlands

Wetlands are federally protected under Section 404 of the Clean Water Act (CWA). A wetland permit from the United States Army Corps of Engineers (USACE) is required when discharging dredged or fill material into jurisdictional waters of the United States, including wetlands. A permit and/or notification may also be required by the Clayton County Soil and Water Commission depending upon the location, size, and type of impact. Should the underground alternative be selected for further study, all applicable Wisconsin DNR (WDNR) permit and approvals will be obtained.

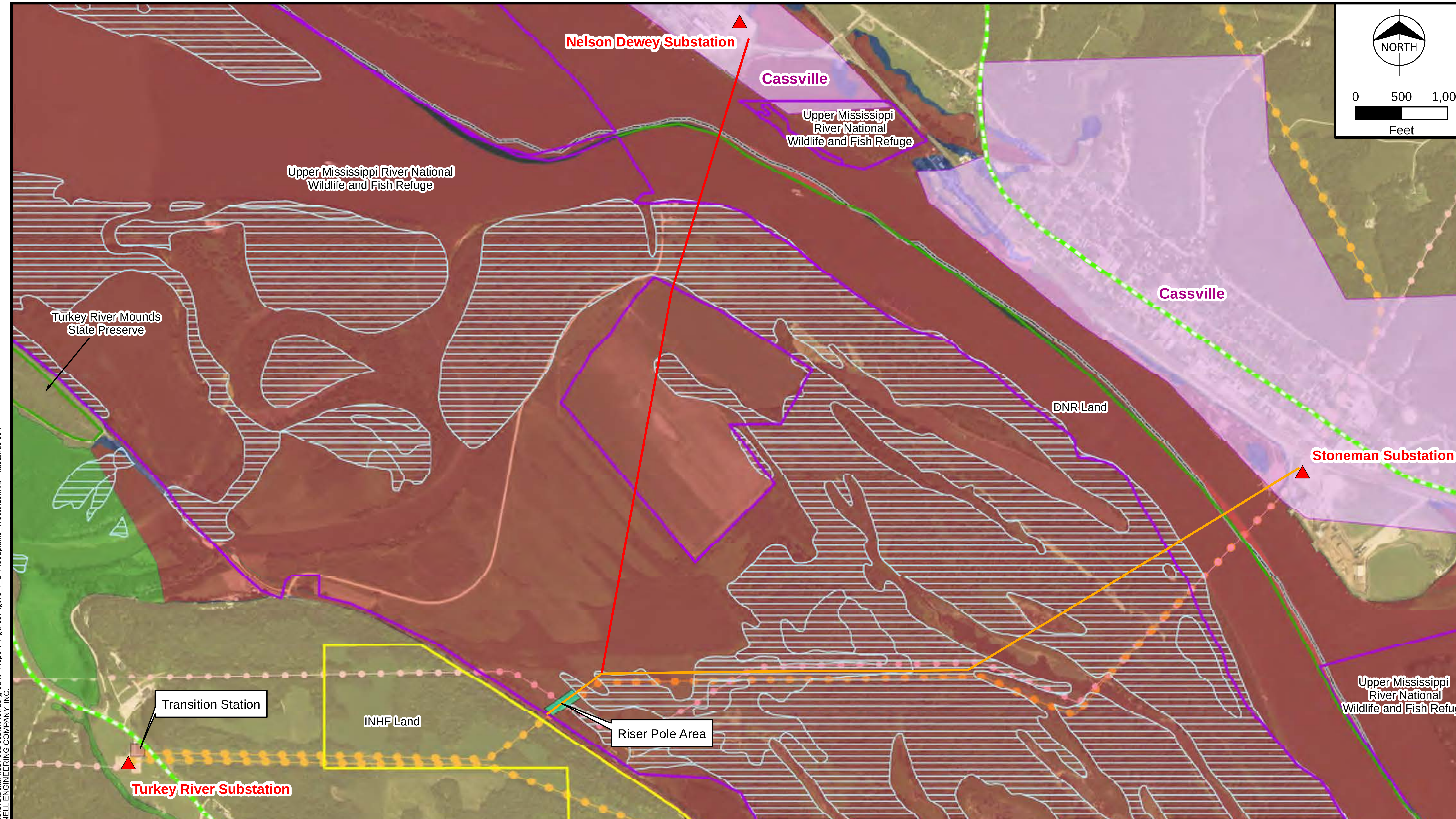
The USACE defines wetlands as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Generally, all three indicators (wetland vegetation, hydric soil, and wetland hydrology) must be present for an area to meet the definition of a wetland.

National Wetland Inventory (NWI) maps, produced by USFWS, are based on aerial photographs and Natural Resource Conservation Service (NRCS) soil surveys. These maps are the best available source of wetland data prior to completing field-verified wetland and waterbody surveys. According to the NWI maps, there are freshwater emergent wetlands and freshwater forested/shrub wetlands located throughout the Refuge area. While many of these wetlands occur on USFWS property and within the Refuge boundaries, a small portion of a wetland is located on private property (Figure 7-2).

Each of the two route options has wetlands within their respective evaluation corridors. The wetlands potentially impacted by the route options are primarily designated as freshwater forested/shrub wetlands and freshwater emergent wetlands. Riser poles would be required for both crossing scenarios and underground construction types. The riser poles would require the conversion of approximately 1.0 acre of land. The currently proposed riser poles are located within the Refuge on land classified as emergent wetland and a very small area of woody wetland. If an underground option were selected for this Project, further analysis would be done to determine the optimal location for the riser poles, as well as the eastern transition station in Wisconsin. The proposed eastern and western transition stations would be located outside of Refuge boundaries on the eastern side of the Mississippi River and at the Turkey River Substation, respectively. The land use in these areas would be permanently converted from their current use to accommodate the transition station and its associated facilities.

Both underground construction options would require splice vaults every 1,750 feet with a minimum cleared area of 7,500 square feet per vault location. Each vault location would be approximately 50 by 150 feet. It is anticipated that both alternatives would require a total of five splice locations each containing four vaults (three for 345 kV and one for 161 kV) for a total of 20 vaults within the Refuge. Although the actual location of these vaults are not known at this time, due to the presence of wetlands (Figure 7-2) in this area, it is likely a majority of the acreage required for vault constructions would occur in designated wetlands. These splice vaults would be required under both underground construction options. In addition, vegetation management areas would be required near these splice vault locations so that root incursion into the underground cable systems would be prohibited. ITC Midwest would work in conjunction with the USFWS to determine the appropriate re-vegetation plan for these areas. Due to the general depth of the proposed HDD option, it is likely that this underground construction option would require less vegetation management than the open trench construction method.

In comparing the two types of underground construction, the open trench method would require the excavation of a utility corridor through the entire Refuge, including wetland areas. Measures to avoid wetlands in the final alignment for construction would be employed; however, as a result of the extensive wetlands in this area, permanent wetland impacts would occur where vegetation removal is required. The open trench method would cross approximately 1,100 feet of wetlands under Nelson Dewey crossing alternative and approximately 7,000 feet of wetlands utilizing the Stoneman crossing alternative. The proposed HDD option would also require a new utility corridor through both the entire Refuge and wetland areas, but impacts to wetlands would be minor outside of the staging areas, as the HDD method would extend underneath wetland areas through the Refuge. However, vegetation management would be required in and around the riser pole and the splice vaults to allow for safe operation of the cable systems. In these areas, existing woody wetland vegetation, if present, would be permanently removed.



- Nelson Dewey Underground Alternative
- Stoneman Underground Alternative
- Riser Pole Area
- Transition Station Location
- Existing 161-kV lines
- Existing 69-kV lines
- Existing Substation
- Active Railroads
- Municipal Areas
- Scenic Byways
- NWI Wetland
- INHF Land
- DNR Land
- USFWS Land

FEMA Flood Zones

- 0.2 Percent Annual Chance Flood Hazard
- A
- AE
- AH
- Area Not Included
- X
- X Protected by Levee

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Figure 7-2
Wetlands and Floodplains

Issued: 5-5-15

Source: IDNR; Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community; Energy Velocity; NWI; INHF; USFWS; ITC Midwest; Burns & McDonnell.

Wetlands impacted by construction would be restored as required by the USACE and Wetlands Conservation Act; in addition, specific improvements would be discussed and reviewed by Refuge staff as part of the USFWS internal federal compliance requirements, including any required National Environmental Policy Act (NEPA) review.

The USACE may require wetland mitigation for conversion of forested wetlands to non-forested wetlands. Any required mitigation would be determined through consultation with USACE and the USFWS. ITC Midwest would obtain all appropriate permits and approvals from the USACE, IDNR, local government unit(s), and watershed districts (when necessary) for any actions determined to occur in wetlands.

7.1.2 Threatened and Endangered Species

Species listed as threatened and endangered in Iowa are protected under the Endangered Species Act (ESA) of 1973 and Chapter 481B of the Code of Iowa (Endangered Plants and Wildlife, enacted in 1975). Both the ESA and Chapter 481B of the Code of Iowa afford legal protection to those species and their habitats determined to meet the specified criteria for listing as either threatened or endangered. Additionally, the USFWS has oversight and jurisdiction of the Bald and Golden Eagle Protection Act (BGEPA) and Migratory Bird Treaty Act (MBTA).

There are a total of four federally-listed endangered species, three federally-listed threatened species, and one federally-listed proposed endangered species in Clayton County (Table 7-1). There are 27 state-listed endangered species and 42 state-listed threatened species in Clayton County (Table 7-2). Additionally, there are 38 special concern species within Clayton County (Table 7-3). Bald eagles and bald eagle habitat are located within the Project area and protected by the BGEPA and MBTA. Avian species protected by the MBTA use the Project area throughout the year.

Table 7-1: Federally-Listed Species in Clayton County, Iowa

Common Name	Scientific Name	Class	Federal Status	State Status
Higgin's-eye pearly mussel	*Lampsilis higginsii*	Freshwater Mussels	Endangered	Endangered
Iowa Pleistocene snail	*Discus macclintocki*	Snails	Endangered	Endangered
sheepnose mussel	*Plethobasus cyphyus*	Freshwater Mussels	Endangered	Endangered
spectaclecase	*Cumberlandia monodonta*	Freshwater Mussels	Endangered	Endangered

Common Name	Scientific Name	Class	Federal Status	State Status
northern wild monkshood	*Aconitum noveboracense*	Plants (Dicots)	Threatened	Threatened
prairie bush-clover	*Lespedeza leptostachya*	Plants (Dicots)	Threatened	Threatened
western prairie fringed orchid	*Platanthera praeclara*	Plants (Monocots)	Threatened	Threatened
northern long-eared bat	*Myotis septentrionalis*	Mammals	Threatened (effective May 4, 2015)	—

Avoidance of habitat utilized by these species is recommended to limit potential impacts. ITC Midwest would coordinate with IDNR, WDNR, and USFWS, as appropriate, to identify locations for endangered species and other rare and unique natural resources along the proposed alignment and concerning any recommendations to minimize, mitigate, or avoid impacts to protected species. As a result of the depth-to-cover of the proposed HDD alternative underlying the Mississippi River (the only option being considered for extending under the river channel), the Project is not likely to adversely affect the Higgin's-eye pearly mussel, the sheepnose mussle, the specteclecase, or the Iowa Pleistocene snail. Staging areas would be set back from the river and determined, in consultation with the USFWS, to limit potential impacts to resources in the immediate area. Appropriate sedimentation and erosion control measures would be determined as part of the required permitting compliance with Section 401 and 404 of the CWA in consultation with Refuge staff.

Habitat for the northern long-eared bat (NLEB) is found in proximity to the Project. Under each routing scenario, removal of vegetation is proposed for the necessary construction of Project facilities. In order to determine the potential likelihood for presence of this species, it is recommended that ITC Midwest conduct a habitat assessment to determine species presence within the Project vicinity. The habitat assessments would be conducted in conjunction with the USFWS and would follow the NLEB Guidance (USFWS 2014b)[1] and Appendix A provided in the Indiana bat Guidance (USFWS 2013, 2014a).[2,3]

[1] U.S. Fish and Wildlife Service (USFWS). 2014b. Northern Long-Eared Bat Interim Conference and Planning Guidance, USFWS Regions 2, 3, 4, 5, & 6, January 2014. 67 p.

[2] U.S. Fish and Wildlife Service (USFWS). 2013. 2013 Revised Range-Wide Indiana Bat Summer Survey Guidelines. May 2013. 40 p.

[3] U.S. Fish and Wildlife Service (USFWS). 2014a. 2014 Range-Wide Indiana Bat Summer Survey Guidelines, January 2014. 41 p.

The northern wild monkshood and western prairie fringed orchid are considered to be extremely rare plant species. Therefore, consultation with the USFWS would be recommended to determine the potential for habitat or presence within and adjacent to the proposed route alternatives through the Refuge. ITC Midwest would coordinate with IDNR and USFWS, as appropriate, to identify locations for threatened species and other rare and unique natural resources along the proposed alignment and concerning any recommendations to minimize, mitigate, or avoid impacts to protected species. Should an underground alignment be selected for further consideration, habitat assessments for protected species would be recommended to determine potential impacts to protected species and habitat in proximity to all the proposed alternative routes for the Project.

In general, the open trench method of construction would require additional conversion of lands compared to the HDD option. However, until the presence of these threatened species is determined, the specific impacts of each alternative on the species are unknown at this time.

Table 7-2: State-Listed Species in Clayton County, Iowa

Common Name	Scientific Name	Class	State Status	Federal Status
barn owl	*Tyto alba*	Birds	Endangered	—
blue giant hyssop	*Agastache foeniculum*	Plants (Dicots)	Endangered	—
bluff vertigo	*Vertigo meramecensis*	Snails	Endangered	—
bluntnose darter	*Etheostoma chlorosoma*	Fish	Endangered	—
bog bedstraw	*Galium labradoricum*	Plants (Dicots)	Endangered	—
Briarton Pleistoscene vertigo	*Vertigo brierensis*	Snails	Endangered	—
Canada plum	*Prunus nigra*	Plants (Dicots)	Endangered	—
cinnamon fern	*Osmunda cinnamomea*	Plants (Pteriodophytes)	Endangered	—
false mermaid-weed	*Floerkea proserpinacoides*	Plants (Dicots)	Endangered	—
frigid ambersnail	*Catinella gelida*	Snails	Endangered	—
Iowa Pleistocene vertigo	*Vertigo iowaensis*	Snails	Endangered	—
lake sturgeon	*Acipenser fulvescens*	Fish	Endangered	—
least darter	*Etheostoma microperca*	Fish	Endangered	—

Common Name	Scientific Name	Class	State Status	Federal Status
northern lungwort	*Mertensia paniculata*	Plants (Dicots)	Endangered	—
northern panic-grass	*Dichanthelium boreale*	Plants (Monocots)	Endangered	—
pistolgrip	*Tritogonia verrucosa*	Freshwater Mussels	Endangered	—
prickly rose	*Rosa acicularis*	Plants (Dicots)	Endangered	—
purple cliff-brake fern	*Pellaea atropurpurea*	Plants (Pteriodophytes)	Endangered	—
red-shouldered hawk	*Buteo lineatus*	Birds	Endangered	—
round pigtoe	*Pleurobema sintoxia*	Freshwater Mussels	Endangered	—
slender mountain-ricegrass	*Oryzopsis pungens*	Plants (Monocots)	Endangered	—
spotted skunk	*Spilogale putorius*	Mammals	Endangered	—
weed shiner	*Notropis texanus*	Fish	Endangered	—
yellow sandshell	*Lampsilis teres*	Freshwater Mussels	Endangered	—
American brook lamprey	*Lampetra appendix*	Fish	Threatened	—
black redhorse	*Moxostoma duquesnei*	Fish	Threatened	—
Blanding's turtle	*Emydoidea blandingii*	Reptiles	Threatened	—
bog birch	*Betula pumila*	Plants (Dicots)	Threatened	—
bog willow	*Salix pedicellaris*	Plants (Dicots)	Threatened	—
bunchberry	*Cornus canadensis*	Plants (Dicots)	Threatened	—
burbot	*Lota lota*	Fish	Threatened	—
butterfly	*Ellipsaria lineolata*	Freshwater Mussels	Threatened	—
common musk turtle	*Sternotherus odoratus*	Reptiles	Threatened	—
creeper	*Strophitus undulatus*	Freshwater Mussels	Threatened	—
glandular wood fern	*Dryopteris intermedia*	Plants (Pteriodophytes)	Threatened	—

Common Name	Scientific Name	Class	State Status	Federal Status
golden saxifrage	*Chrysosplenium iowense*	Plants (Dicots)	Threatened	—
grass pickerel	*Esox americanus*	Fish	Threatened	—
green violet	*Hybanthus concolor*	Plants (Dicots)	Threatened	—
Henslow's sparrow	*Ammodramus henslowii*	Birds	Threatened	—
Hooker's orchid	*Platanthera hookeri*	Plants (Monocots)	Threatened	—
Hubricht's vertigo	*Vertigo hubrichti*	Snails	Threatened	—
jeweled shooting star	*Dodecatheon amethystinum*	Plants (Dicots)	Threatened	—
kidney-leaf white violet	*Viola renifolia*	Plants (Dicots)	Threatened	—
leathery grape fern	*Botrychium multifidum*	Plants (Pteriodophytes)	Threatened	—
low sweet blueberry	*Vaccinium angustifolium*	Plants (Dicots)	Threatened	—
Midwest Pleistocene vertigo	*Vertigo hubrichti hubrichti*	Snails	Threatened	—
mudpuppy	*Necturus maculosus*	Amphibians	Threatened	—
nodding onion	*Allium cernuum*	Plants (Monocots)	Threatened	—
northern black currant	*Ribes hudsonianum*	Plants (Dicots)	Threatened	—
oak fern	*Gymnocarpium dryopteris*	Plants (Pteriodophytes)	Threatened	—
ornate box turtle	*Terrapene ornata*	Reptiles	Threatened	—
pinesap	*Monotropa hypopithys*	Plants (Dicots)	Threatened	—
purple wartyback	*Cyclonaias tuberculata*	Freshwater Mussels	Threatened	—
rock clubmoss	*Lycopodium porophilum*	Plants (Pteriodophytes)	Threatened	—
rosy twisted stalk	*Streptopus roseus*	Plants (Monocots)	Threatened	—
showy lady's slipper	*Cypripedium reginae*	Plants (Monocots)	Threatened	—
spotted coralroot	*Corallorhiza maculata*	Plants (Monocots)	Threatened	—
tree clubmoss	*Lycopodium dendroideum*	Plants (Pteriodophytes)	Threatened	—
twinflower	*Linnaea borealis*	Plants (Dicots)	Threatened	—

Common Name	Scientific Name	Class	State Status	Federal Status
twinleaf	*Jeffersonia diphylla*	Plants (Dicots)	Threatened	—
variable Pleistocene vertigo	*Vertigo hubrichti variabilis*	Snails	Threatened	—
velvet leaf blueberry	*Vaccinium myrtilloides*	Plants (Dicots)	Threatened	—
western sand darter	*Ammocrypta clara*	Fish	Threatened	—
yellow trout-lily	*Erythronium americanum*	Plants (Monocots)	Threatened	—

7.1.2.1 Special Concern Species

There are 38 concern species within Clayton County (Table 7-3). Special concern species are species that have suspected issues of status or distribution, but where such concerns have not been documented. These species are not protected by the state laws for the protection of endangered species. Some special concern species are protected under other state and federal laws, however. Measures to limit potential impacts to special concern species, if applicable, would be discussed and coordinated with the IDNR and USFWS as part of the required environmental review for the Project, should an underground alternative be selected for further consideration.

Table 7-3: Species of Concern in Clayton County, Iowa

Common Name	Scientific Name	Class	State Status	Federal Status
alderleaf buckthorn	*Rhamnus alnifolia*	Plants (Dicots)	Special Concern	—
bald eagle	*Haliaeetus leucocephalus*	Birds	Special Concern	—
balsam fir	*Abies balsamea*	Plants (Gymnosperms)	Special Concern	—
bog bluegrass	*Poa paludigena*	Plants (Monocots)	Special Concern	—
carey sedge	*Carex careyana*	Plants (Monocots)	Special Concern	—
Columbine dusky wing	*Erynnis lucilius*	Insects	Special Concern	—
crowfoot clubmoss	*Lycopodium digitatum*	Plants (Pteriodophytes)	Special Concern	—
drooping bluegrass	*Poa languida*	Plants (Monocots)	Special Concern	—
dwarf scouring-rush	*Equisetum scirpoides*	Plants (Pteriodophytes)	Special Concern	—
earleaf foxglove	*Tomanthera auriculata*	Plants (Dicots)	Special Concern	—

Common Name	Scientific Name	Class	State Status	Federal Status
flat top white aster	*Aster pubentior*	Plants (Dicots)	Special Concern	—
frost grape	*Vitis vulpina*	Plants (Dicots)	Special Concern	—
grape-stemmed clematis	*Clematis occidentalis*	Plants (Dicots)	Special Concern	—
grass pink	*Calopogon tuberosus*	Plants (Monocots)	Special Concern	—
hedge nettle	*Stachys aspera*	Plants (Dicots)	Special Concern	—
ledge spikemoss	*Selaginella rupestris*	Plants (Pteriodophytes)	Special Concern	—
limestone oak fern	*Gymnocarpium robertianum*	Plants (Pteriodophytes)	Special Concern	—
low bindweed	*Calystegia spithamaea*	Plants (Dicots)	Special Concern	—
meadow bluegrass	*Poa wolfii*	Plants (Monocots)	Special Concern	—
mountain maple	*Acer spicatum*	Plants (Dicots)	Special Concern	—
mountain ricegrass	*Oryzopsis asperifolia*	Plants (Monocots)	Special Concern	—
muskroot	*Adoxa moschatellina*	Plants (Dicots)	Special Concern	—
northern adder's-tongue	*Ophioglossum pusillum*	Plants (Pteriodophytes)	Special Concern	—
ovate spikerush	*Eleocharis ovata*	Plants (Monocots)	Special Concern	—
pearly everlasting	*Anaphalis margaritacea*	Plants (Dicots)	Special Concern	—
pugnose minnow	*Opsopoeodus emiliae*	Fish	Special Concern	—
rough bedstraw	*Galium asprellum*	Plants (Dicots)	Special Concern	—
sage willow	*Salix candida*	Plants (Dicots)	Special Concern	—
Saskatoon service-berry	*Amelanchier alnifolia*	Plants (Dicots)	Special Concern	—
sedge	*Carex cephalantha*	Plants (Monocots)	Special Concern	—
shadbush	*Amelanchier sanguinea*	Plants (Dicots)	Special Concern	—
snowberry	*Symphoricarpos albus*	Plants (Dicots)	Special Concern	—
Solomon's seal	*Polygonatum pubescens*	Plants (Monocots)	Special Concern	—
spurge	*Euphorbia commutate*	Plants (Dicots)	Special Concern	—
summer grape	*Vitis aestivalis*	Plants (Dicots)	Special Concern	—

Common Name	Scientific Name	Class	State Status	Federal Status
tall cotton grass	*Eriophorum angustifolium*	Plants (Monocots)	Special Concern	—
upland boneset	*Eupatorium sessilifolium*	Plants (Dicots)	Special Concern	—
valerian	*Valeriana edulis*	Plants (Dicots)	Special Concern	—

7.1.2.2 Unique Habitats

The Project area includes several areas that included the presence of known algific slopes. This landform, also known as a cold air slope, is very rare and is only found in the 'Driftless Area' of Iowa, Wisconsin, Illinois, and Minnesota. In Iowa, this area, also known as the Paleozoic Plateau, occurs in the extreme northeast portion of the state. Algific slopes stay cool on hot summer days as a result of their geologic and topographical formation. This unique habitat is home to a number of unique species found nowhere else in Iowa (Iowa Natural Heritage Foundation 2014).[4] During consultation efforts undertaken for the Project, correspondence with the USFWS was initiated to determine the potential for this resource near the proposed Project facilities. Based on a review of USFWS data, the results indicated that there were no known algific slopes within a potential 200 foot evaluation corridor of any proposed alternative segment through the Refuge. The closest area to the underground alternatives that includes algific talus slopes is located approximately 4,000 feet to the southeast of the Stoneman crossing alternative.

The areas where the proposed Mississippi River crossing locations are located are within Pool 11 of the Mississippi River; this pool is recognized by the USFWS as having excellent mussel bed habitat. This pool, among others in the Refuge, is crucial habitat for the Higgins-eye pearly mussel as well as other mussel species (USFWS 2006). However, as indicated above in Section 7.1.2.1, the Project is not likely to adversely affect Higgins-eye pearly mussel habitat as a result of locating the HDD cable system at a depth of approximately 45 feet under the river channel. In addition, the staging area for the HDD cable system extending under the Mississippi River would be set back to allow for sufficient depth to avoid this habitat. The potential for erosion and sedimentation would be limited through compliance with Section 401 and 404 of the CWA in consultation with Refuge staff.

[4] Iowa Natural Heritage Foundation 2014. An ecosystem frozen in time. Available: http://www.inhf.org/ec13-algific-slopes.cfm. Accessed May 2014.

7.1.2.3 Migratory Birds

The Refuge is utilized by many different species of migratory bird species throughout the year. The Refuge is part of the Mississippi Flyway, a main corridor or path for migrating birds traveling north or south during migration seasons. This flyway is composed of the states of Alabama, Arkansas, Indiana, Illinois, Iowa, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Ohio, Tennessee, and Wisconsin, as well as the Canadian provinces of Saskatchewan, Manitoba, and Ontario. It is estimated that 40 percent of North American waterfowl use the Mississippi Flyway during their migration (USFWS 2006[5]). The USFWS has established closed areas to provide waterfowl opportunities to feed and to rest without disturbance from human activities. This seclusion allows waterfowl an opportunity to molt, preen, pair bond, and store fat, all of which help to build healthier populations of waterfowl (2006).

There is a variety of migratory waterfowl that utilize the Refuge. There are seven species that use the Mississippi Flyway that are on the USFWS Region 3 Resource Conservation Priority List: lesser snow geese, Canada geese, wood ducks, mallards, blue-winged teals, canvasbacks, and the lesser scaup (USFWS 2006). In addition to these species, the area is a critical migration corridor for tundra swans, ring-necked duck, and hooded merganser. There is also a variety of songbirds (including numerous species of landbirds and passerines), colonial nesting birds (such as black terns and great blue herons), marsh birds (such as rails and bitterns), and raptors (such as eagles and vultures) that utilize habitats within the Refuge (2006).

Waterfowl populations can fluctuate from year to year in the Refuge due to a variety of factors such as food scarcity and weather. Biologists have been conducting waterfowl population surveys within the Refuge since the 1920s to estimate both the number of birds as well as overall species diversity. In order to achieve optimal bird distribution, the Refuge aims to provide food resources in areas where birds are not disturbed. The challenges facing management of the Refuge today include the need to provide this secure resting and feeding habitat for migratory waterfowl, as well as hunting opportunities for the waterfowl within the Refuge. In the Upper Mississippi River National Wildlife and Fish Refuge Comprehensive Plan the USFWS notes that disturbance can have a detrimental impact on the development of young birds. Things such as power boats, low-flying airplanes, helicopters, canoes, swimming visitors, hiking, and car traffic and the associated noise can cause this disturbance (USFWS 2006).

[5] USFWS. 2006. Upper Mississippi River National Wildlife and Fish Refuge Comprehensive Plan. http://www.fws.gov/midwest/planning/uppermiss/CCP/CCP.pdf. Accessed May 2014.

During construction activities under both options, there would be short-term impacts to migratory avian species that utilize areas of the flyway that are being proposed for construction. The presence of cranes and other heavy equipment would emit noise, fugitive dust, and exhaust pollutants that may result in the temporary avoidance of the area by avian and terrestrial species that currently utilize these habitats. Potential impacts to avian species could also be limited through construction timing, where applicable and/or required. If feasible, major construction activities could be planned to occur outside of peak migration periods. Additional measures to reduce the potential for additional avian impacts would be discussed in continued consultation with USFWS.

7.1.3 Land Cover and Land Use

The majority of this portion of the Project is managed by the USFWS and is part of the Refuge. In the vicinity of the Refuge, there are areas of open water, developed open space, low intensity development, deciduous forest, grassland/herbaceous area, pasture/hay fields, cultivated crops, woody wetlands, and emergent herbaceous wetlands. There are several residences near an active vineyard operation close to the Turkey River Substation location. The Promiseland Winery and Vineyard is the only known commercial business near the alternative routes. There is a small private parcel that is located within (and enclosed by) the Refuge boundaries which is currently crossed by the Nelson Dewey crossing alternative; this area is currently used for cultivated crops. In addition, there is another smaller private parcel that parallels the rail line on the western edge of the Refuge just north of the Nelson Dewey alignment. There is also a parcel of land managed by the Iowa Natural Heritage Foundation that would be crossed by the Stoneman crossing alternative.

To minimize any undue impacts to land cover in the vicinity of the Refuge, alteration of land cover would be limited to that necessary for safe operation of the line or as part of necessary construction activities. ITC Midwest would coordinate with USFWS and other applicable agencies to identify measures to avoid disturbance to the areas within the Refuge. Further additional measures would be developed with the USFWS to avoid migration of invasive species into any Refuge lands prior to clearing. Any disturbed areas would be restored. ITC Midwest would limit vehicle traffic to the extent practical to roads and pathways along the ROW.

In the agricultural areas and private parcels along the route, ITC Midwest would inform landowners of the timing of clearing and construction activities. Depending on the timing of construction and the alternative selected, some crop damage may occur. Areas that are currently utilized for agricultural purposes would not be able to be farmed after construction of the underground transmission line.

The scenic views of the Refuge attract hundreds of visitors each year for a variety of activities, such as hiking and boating. As a result of the topography of the area, some construction activities would likely be visible from vantage points around the Refuge, but would be limited to major construction activities. Visual evidence of underground transmission infrastructure through the Refuge would include the splice vault locations along the buried cable corridor, as well as the riser pole area, access roads to reach both the vault locations and the riser pole area. The transition station itself would also be visible, but would be located at the Turkey River Substation. Permanent vegetation removal would be required at these locations and would be evident from elevated views surrounding the Refuge.

It is anticipated that both crossing alternatives would require a total of five splice locations each containing four vaults (three for 345 kV and one for 161 kV) for a total of 20 vaults within the Refuge for either crossing alternative. At each of these locations, the transmission line would need to be slightly closer to the surface grade. This proximity may affect soil composition and seed germination in the surrounding vegetation due to possible heat transfer when the conductors are a shorter distance away. A proposed re-vegetation plan to address this issue would be developed in consultation with the USFWS.

7.1.4 Floodways/Floodplains

The Federal Emergency Management Agency (FEMA) designates areas that are likely to experience flooding in a 100-year storm event. Since the Project is in such close proximity to the Mississippi River, much of the segments are in Zone AE or X. Zone AE includes areas subject to inundation of floodwater by the 1-percent annual chance flood event, also known as a 100-year floodplain (FEMA 2014). [6]

The segments in Zone X have moderate risk within the 0.2-percent-annual-chance (or 500-year) floodplain. Zone X also includes areas of 1-percent-annual-chance flooding where average depths are less than 1 foot and areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, both of which present a moderate risk of flood. Outside of the 100-year and 500-year floodplains, there is minimal risk of floods. The segments through Zone X are those that are on the bluffs above the Mississippi. This area is over 200 feet higher in elevation than those areas in the 100-year floodplain closer to the river. There may be fewer impacts to floodplain areas if the HDD method is utilized compared to the open trench option depending on differences in the amount and location of staging areas in relation to the specific route alignment. In general, the open trench would potentially

[6] FEMA. 2014. Definition of FEMA Flood Zones. https://msc.fema.gov/webapp/wcs/stores/servlet/info?storeId=10001&catalogId=10001&langId=-1&content=floodZones&title=FEMA%2520Flood%2520Zone%2520Designations. Accessed May 2014.

require more of a construction footprint within the floodplain during construction, but may result in a reduced permanent impact in terms of permanent ROW compared to the HDD method.

Approximately half of the route would need to be placed within FEMA-designated 100-year floodplains. ITC Midwest would file a joint floodplain permit application with the IDNR floodplain development program, the IDNR sovereign lands program, and the USACE. The proposed Project is not anticipated to cause a potential reduction in floodflows or reduction in flood storage volumes in the vicinity of the Refuge. The infrastructure required to operate the underground 161 and 345 kV cable systems within the floodplain would be limited in size, but would result in the permanent conversion of land designated as floodplain within the different prescribed rights-of-way for each construction method.

7.1.5 Cultural Resources

An assessment of cultural and archeological resources in the surrounding area was done in order to incorporate the potential impact on these existing resources into the route analysis. These sites include archaeological sites listed on the National Register of Historic Places (NRHP) as well as other recorded sites. Data was obtained from the Iowa State Historic Preservation Office (SHPO). This initial investigation was based on the area in which alternative routes would be developed. The Nelson Dewey crossing alternative would cross in proximity to one mound group, thought to be from the Woodland period. This mound group has only been investigated through archival research and thus its integrity is unknown. If an underground alternative were chosen, the location would need to be verified and its integrity investigated with SHPO consultation prior to start of construction activities. This site has not been evaluated to determine its National Register Eligibility Recommendation. The Stoneman crossing alternative would have two archeological resources within the projected ROW width. According to data obtained from the Iowa SHPO, these two resources were burial mounds that were previously destroyed. There were no known historical structures identified within 1,000 feet of any alternative route. Overall, within the Refuge, there have been 108 archaeological, geomorphological, history, and research investigations which have produced over 129,000 artifacts (USFWS 2006).

During construction, avoidance would be the primary mitigation approach to these resources. Avoidance of resources, historic or prehistoric, may include minor adjustments to Project design and designation of environmentally sensitive areas to be left undisturbed by the Project. BMcD recommends archeological monitoring during construction of the transmission line or the development of an unanticipated discoveries plan be put in place, which would outline the specific steps ITC Midwest would take if cultural resources were to be found, particularly human remains. If cultural resources are discovered during construction, any construction activity would be halted in that location. The SHPO should be notified and appropriate measures would be implemented to protect any discovered resources. Additionally, if any unmarked burials, human remains, or grave goods are discovered during construction, they should be reported to the County Coroner and local law enforcement and construction activities would cease in that area. If these burials, human remains, or grave goods are determined to not be a recent case, the State Archaeologist should be notified and mitigation measures would be developed between ITC Midwest and the State Archaeologist to assist in protecting the resource while determining appropriate options for the Project. Additionally, ITC Midwest and the other Project owners will conduct tribal consultation efforts the overall Cardinal-Hickory Creek Project and will eventually include future discussions and/or meetings with Native American tribes who have an historical interest in this area of the Mississippi River.

7.1.6 Existing or Planned Development

There are several areas with existing or planned development in the general vicinity of the proposed route alternatives. The Nelson Dewey crossing alternative would be near the launch for the Cassville Car Ferry, a passenger ferry between Cassville, Wisconsin, and Oak Road in Clayton County, Iowa. Construction of the Nelson Dewey crossing alternative may disrupt the ferry service as temporary closures of Oak Road might be required during trenching and installation of the underground transmission line. Also, depending on the crossing location selected, required construction activities near the Mississippi River may disrupt normal operations of the ferry. Should this location be selected, ITC Midwest would work with the ferry operators to identify feasible construction timing that would assist in limiting potential impacts to this transportation resource.

There is an active Canadian Pacific railroad that extends northwest to southeast along the Mississippi River that would need to be crossed under by either alternative. Potential boring activities at the site may require disruption of normal rail traffic through the area. Coordination with the Iowa Department of Transportation (IDOT) would be required to obtain and to submit all applicable permits associated with crossing railroad rights-of-way in addition to coordination with Canadian Pacific Railroad.

Both routes would be in close proximity to the aforementioned existing winery and vineyard near the Turkey River Substation (Section 6.1.3). The Promiseland Winery offers wine tastings, music, and bottles of wine for purchase. The winery also hosts community events in their facility. Construction noise from the underground transmission line and associated facilities may impact visitor experience at the winery, especially outdoor activities that occur on the site. There may also be a disruption of normal traffic flow along the Great River Road due to construction activities.

The Great River Road, a National Scenic Byway, would also be crossed by both route alternatives. ITC Midwest would coordinate with the IDOT to determine any applicable conditions required for transmission infrastructure near and across a scenic byway.

7.1.7 Navigation Considerations

There are a number of barges, boats, and other river vessels that utilize the Mississippi River channel near the potential underground transmission crossing. Construction timing would be coordinated with the U.S. Coast Guard to avoid potential impacts to Private Aids to Navigation (PATON) in this portion of the Mississippi River. Closures of the Mississippi River channel near the crossing may be required during construction activities. These closures would need to be coordinated by ITC Midwest, the USFWS, the USACE, and the United States Coast Guard in terms of the planned duration and extent of the navigation considerations on the river.

Periodic maintenance of all transmission facilities would be required. Maintenance of the overhead lines could result in potential short-term adjustments to maritime navigation in the immediate vicinity of the required maintenance activities. Impacts to navigation aids on the Mississippi River are not anticipated as a result of operation of either underground construction scenario or crossing location. Significant delays to maritime traffic on the Mississippi River are not anticipated to result from either construction activities or ongoing maintenance. USACE has authority under Section 10 of River and Harbors Act of 1899 for a potential underground crossing of the Mississippi River.

7.1.8 Access Considerations

ITC Midwest would evaluate construction access opportunities by identifying existing transmission line rights-of-way, roads, or trails that run parallel or perpendicular to the transmission line. Where feasible, ITC Midwest intends to traverse the ROW acquired for the Project to access construction areas. This method of access would minimize impacts to landowners and adjacent properties. In some situations, private field roads, trails, or fields must be used to gain access to areas for construction. Where no current access is available or existing access is inadequate to cross roadway ditches or other features, new access roads may be constructed. Permission from landowners and/or land managers would be obtained prior to using any of these areas to access the ROW for construction. Where necessary to accommodate heavy construction equipment, including cranes, cement trucks, and hole-drilling equipment, existing roads may be upgraded or new roads may be constructed. If new roads must be constructed, in addition to permission from landowners, ITC Midwest would also obtain permissions necessary from the local road authority. During construction activities, ITC Midwest would work with appropriate road authorities to utilize proper maintenance procedures of roadways traversed by construction equipment.

Some soil conditions will require that construction mats be placed along the ROW or at trenching/boring location to minimize soil disturbances. These mats can also be used to provide access across sensitive areas to minimize impacts including soil compaction, rutting, or damage to plant species. Crews would attempt to minimize ground disturbance whenever feasible during ROW and substation site clearing for, and construction of, the Project. Although attempts to minimize potential impacts would be made, areas would be disturbed during the normal course of work. Once construction is completed in an area, disturbed areas would be restored in consultation with the USFWS to their original condition to the maximum extent feasible.

On private parcels, after construction activities have been completed, a representative of ITC Midwest would contact the property owner to discuss any damage that has occurred as a result of the Project. This contact may not occur until after ITC Midwest has started restoration activities. If, during the course of construction of the Project, crops, fences, or drain tile have been damaged, ITC Midwest would repair damages or reimburse the landowner to repair the damages. Measures to limit the potential impact to Refuge lands would be developed in conjunction with the USFWS as part of the ongoing consultation for this Project.

Ground-level vegetation disturbed or removed from the ROW during construction of the Project would naturally reestablish to pre-construction conditions. Areas where significant soil compaction or other disturbance from construction activities occur would require additional assistance in reestablishing the vegetation stratum and controlling soil erosion. Various best management practices to be used during the construction of the Project would be identified in the Storm Water Pollution Prevention Plan (SWPPP) that would be prepared when ITC Midwest applies for an National Pollutant Discharge Elimination System (NPDES) permit, but some commonly-used methods to control soil erosion are erosion control blankets with embedded seeds, including those with biodegradable netting, where feasible; silt fences; and, straw bales.

Another aspect of restoration relates to the roads used to access staging areas, construction sites, splice vault locations, and the riser poles. These access roads would vary in width from 25 to 40 feet for HDD access and 35 to 50 feet for open trench access. The roads used for maintaining the splice vault location could be narrower, while those used during construction and to access the riser poles would be closer to 35 feet. After construction activities have completed, ITC Midwest would work with township, city, and county transportation agencies in order that roads used for purposes of access during construction would be returned to either the condition they were in, or better, before ROW clearing began. ITC Midwest would meet with township road supervisors, city road personnel, or county highway departments to address any issues that arise during construction to work to restore roadways, if necessary, after construction is completed.

7.1.9 Federal and State Permits and Approvals

ITC Midwest would coordinate with various agencies that have jurisdiction over the lands and waters within the Project area, including the US Coast Guard, the USFWS, IDNR, WDNR, and the USACE, throughout the permitting and construction process. Additional Wisconsin state approvals would be required for an underground alternative at this location. Should an underground alternative be further investigated as an option for this Project, additional detailed information would be provided regarding applicable Wisconsin permits and approvals for such a Project.

The Proposed Project would require action from applicable federal and IA agencies with jurisdiction under the following:

- National Environmental Policy Act
- U.S. Fish and Wildlife Service - Special Use Permit, Endangered Species Act, Bald and Golden Eagle Protection Act, Migratory Bird Treaty Act
- U.S. Army Corps of Engineers - Section 404 and 401, Clean Water Act
- U.S. Environmental Protection Agency – Spill Prevention, Control, and Countermeasure Plan (SPCC)
- Section 106 of the National Historic Preservation Act (NHPA)
- U.S. Department of Agriculture Rural Utility Service Compliance (lead federal agency yet to be determined)
- U.S. Army Corps of Engineers - Section 10, Rivers And Harbors Act
- U.S. Federal Aviation Administration – Part 7460 Review
- IDNR Sovereign Lands and Rivers Permit
- IDOT Utility Accommodation Permit

7.1.10 Continuing Maintenance Requirements

ITC Midwest and other utilities design transmission lines and substations to operate for decades while requiring minimal maintenance, particularly in the first few years of operation. Substantial work on an existing transmission line is typically only required after it has been exposed to the elements for a long period of time (55, or more, years) or after a storm event has caused damage to the transmission line.

A typical transmission line last approximately 50 years, depending on the design and materials used. For this Project, future utility plans would be developed to include a potential repair or rebuild at this specific location, rather than retiring or abandoning the line. Transmission infrastructure has very few mechanical elements and is designed and constructed to withstand weather extremes typical for the region. With the exception of severe weather, transmission lines rarely fail. Protective relaying equipment would automatically take these facilities out of service when a fault is sensed on the system, and these interruptions are usually only momentary. Outages necessary for scheduled maintenance are also infrequent. Because of these general operational characteristics, the average annual availability of transmission infrastructure is in excess of 99 percent.

The primary cost associated with the operation and maintenance of a transmission line is the cost of inspections, usually done semi-annually by helicopter with a forester, vegetation planner, and line inspector; annually by ground with a forester; and once every four years by ground with a line inspector. Annual operating and maintenance costs for transmission lines in Iowa and the surrounding states vary depending upon the setting, the amount of vegetation management necessary, storm damage occurrences, structure types, materials used, and the transmission line's age.

Substations also require a certain amount of maintenance to keep them functioning in accordance with accepted operating parameters, ITC Midwest procedures, North American Reliability Corporation (NERC) reliability standard requirements, and the National Electric Safety Code (NESC). Transformers, circuit breakers, control buildings, batteries, relay equipment, and other substation equipment need to be serviced periodically to maintain operability. The fenced area must also be kept free of vegetation and proper drainage must be maintained.

8.0 CABLE SYSTEM RELIABILITY

This section is intended to briefly discuss and outline various aspects of reliability in cable systems and how they would compare to a comparable overhead installation. This section includes discussion on items such as weather impacts, potential for damage due to human activities in the area, and estimated repair times for both underground and overhead options.

8.1 Outage Events

Generally underground transmission systems are a reliable method of power transmission. Due to the cables being placed underground, they are impervious to many weather related events such as high winds, ice accumulation, lightning damage, or other debris (i.e., tree limbs) damaging the circuit. Outages on underground transmission cables are primarily caused by dig-ins (i.e., cable damage and fault due to excavation in the vicinity of the underground line). Due to this particular Project being located in a Refuge, that risk should be significantly lower than many other areas where excavations occur more regularly, such as streets or within public ROW.

Most failure events that do not involve a dig-in would not require any replacement of duct bank conduit or manholes; therefore, there would typically be no excavation or damage to the refuge land during the repair. For the majority of instances, these cable failure events that do not involve a dig in would be attributed to the failure of accessories such as terminations and splices. To repair a failure of this type, the cable and/or splice would be removed and replaced and the conduit inspected with a remote video device. If there were a failure that required conduit and/or manhole repairs, it would likely be caused by a dig-in event. In this case Refuge lands would already be disturbed.

Should the failure occur within a trenchless (HDD) installation, the cable would be removed and re-pulled after a video inspection of the conduit to verify the conduit integrity. Should there be significant damage to the conduit this conduit would be abandoned and the replacement cable would utilize the spare conduit within the proposed HDD installation.

One additional concern for an underground cable installation in a flood prone area such as the Refuge would be a washout or destabilization of the supporting soils. Unlike an overhead transmission structure that has a deep foundation or piles to support it, duct banks are traditionally an unreinforced concrete structure that relies on the earth below it for support. While various things (such as a reinforced mud mat supported on piles) can be done to create a structural member under the duct bank to resist differential settlement and other issues associated with a washout, they can be very costly and time consuming during construction. This scenario involving a large scale washout or soil destabilization would be the only type of event that could potentially result in a common mode failure between the 161 kV and 345 kV circuits. Again, due to the very low probability of this type of event, and the physical separation between the 161 kV and 345 kV circuits the likelihood of a single event common mode failure should be considered very low.

8.2 Outage Durations

The main reliability concern with underground cable system compared to overhead cable systems is the length of the outage in the event of a cable failure. With overhead transmission, the line can generally be placed back into service in a relatively short amount of time, typically less than a day or even a matter of seconds in a re-close situation, thus increasing the line's availability for transmitting load. When there is a fault on an underground line, the line may be out of service for a significant amount of time, more than two weeks and up to six months, depending on the type of failure and how quickly it can be located and repaired. Due to the Refuge's semi-regular flooding, this duration could be extended significantly due to access limitations. Additionally, it is not typical to re-close on a circuit that contains a section of underground cable.

The main reason for very long repair times on underground installations is due to the manufacture of new cable and accessories and the time it would take to get such necessary material and qualified personnel to perform the repair work. Because of these longer outage times, an underground cable system has a lower circuit availability compared to an overhead line. This could be managed by keeping lengths of cable and spare equipment on hand, however this poses a potential budgetary impact.

8.3 Cable Technology Reliability

While XLPE cables systems have a low intrinsic failure rate because of stringent factory quality control and testing, splices and terminations are susceptible to failure because of their field assembly. Most utilities in North America rely on the cable system manufacturer to provide skilled workers and special tools to perform splices, terminations, and repairs on XLPE transmission cables.

As XLPE systems are becoming more prevalent and more installations are completed throughout the world, manufacturers are improving the material quality and installation practices continually. This has led to the latest generation of XLPE cable systems being much more reliable than past generations. XLPE cable systems are now designed to have a service life of 40 years or greater, much like other transmission infrastructure components.

The manufacturing process for extruded cables is of critical importance in ensuring a reliable end product. Manufacturers minimize insulation contamination by using super clean insulation compounds, transporting and storing the compounds in sealed facilities, and screening out contaminants at the extruder head.

The three basic cable accessories for extruded dielectric cables are splices, terminations, and sheath bonding materials. Pre-fabricated or pre-molded splices are commonly used to join extruded dielectric cables. During the splicing operation, the insulation and shields are removed from the conductor and the insulation is penciled. The conductor ends are then joined by a compression splice or exothermic welding. Once the conductors have been joined, the pre-molded or prefabricated joint is slid over the connection into its final resting location and covered with watertight shrink wraps and/or membranes. An advantage of these types of splices is that many of the parts can be factory tested prior to field installation.

Terminations are available for extruded dielectric cable to allow transitions to overhead lines or above ground equipment. Termination bodies are typically made of porcelain or polymer and include skirts to minimize the probability of external flashovers due to contamination. For the 345 kV and 161 kV voltage class the terminations would be a wet-type, or oil-filled termination. This means that after the cable insulation and the terminations, interior walls would be filled with high dielectric strength oil to aid in electric field dissipation within the termination.

Another important component of a XLPE cable system is the grounding/bonding of the cable shield/sheath. An underground distribution system typically has the shield grounded at each splice and termination. Grounding at each splice and terminations, while effective at reducing standing sheath voltages, causes circulating currents to be developed on the cable shield resulting in additional heating in the cable and lower ampacity. The way to maximize the ampacity of an underground cable is to eliminate the circulating currents. This is accomplished with underground transmission cables by using special bonding methods such as single-point and cross-bonding. These methods eliminate or reduce the amount of current which would flow on the cable shield, resulting in no additional, or limited additional, heating and ultimately a higher ampacity.

Maintenance should be performed regularly so the cables will operate with uninterrupted service. Inspections are recommended to occur every six to eighteen months. Typical major components to be checked for XLPE cable systems are terminators, vaults, arresters, and link boxes. Although there are various methods of checking the condition and maintenance of the above items, the primary method of inspection is visual. Vault inspections, where worker entry is required, should only be performed when an outage is taken on the circuit for safety reasons.

8.4 Cable System Operation & Maintenance

Underground line is relatively easy to operate and maintain although it can be more difficult to troubleshoot and repair under certain failure conditions. Maintenance procedures for XLPE systems include various items such as visual and/or operational inspections of the cable terminations, manholes, and temperature monitoring system inspection and testing.

With proper maintenance, the design life of an underground line is approximately 40 years. Underground lines are susceptible to outages resulting from dig in's and cable, splice or equipment failure.

XLPE cable requires little maintenance since it is usually installed in a duct bank. Duct inspections are performed in conjunction with routine manhole inspections. Furthermore, ducts are seldom cleaned unless a new circuit or grounding is being installed. Unless environmental conditions dictate more frequent inspections, a yearly manhole inspection is generally sufficient to examine cable sheaths, protective jackets, joint casings, cable neutrals, and general physical condition of the manhole. Terminations should also be visually checked on a yearly basis to determine if the system is operating properly.

9.0 UNDERGROUND CONSTRUCTION COST ESTIMATE

BMcD has developed preliminary construction cost estimates bases on the routes, installation methods, and cable system(s) determined in Sections 3 through 6 of this report. These cost estimates are based on RSMeans Heavy Construction Cost Data as well as past projects, budgetary quotes provided by vendors, and professional experience and judgment.

These estimates are based on the following assumptions:

- Costs are provided in 2014 dollars, escalated to 2020
- No costs for contaminated soils disposal included
- No costs for existing utility relocation included
- No traffic control costs included
- No state, local, federal, or import taxes included
- No permitting costs included
- Civil costs based on average production rate of 100 feet per day (duct bank portion)
- Civil costs based on average depth of cover of 3.9 feet (duct bank portion)
- Civil costs based on an assumed HDD length of 2900/4200 feet
- No rock removal costs included
- Transition Station Costs
  - Property Acquisition
  - Soil Investigation
  - Site Work
  - Structural Foundations
  - Termination Structures
  - Raceway
  - Grounding
  - Bus/Conductor (4000 Amp Capacity)
  - Switching/Breakers (4000 Amp Capacity)
  - Capacitor/Reactor Banks ($5MM per ITC request)
  - Engineering (material & labor)
  - Construction (material & labor)
  - Testing (material & labor)
- Costs adjusted to Lancaster, WI city cost index (CCI)

Table 9-1: Nelson Dewey Crossing Alternative 345 kV Cost Summary

SUMMARY OF COSTS	UNIT	MATERIAL COST	LABOR COST	TOTAL COST
UNDERGROUND CABLE SYSTEM & ACCESSORIES	LOT	$ 25,000,000.00	$ 6,800,000.00	$ 31,800,000.00
CIVIL WORKS	LOT	$ 12,900,000.00	$ 14,100,000.00	$ 27,000,000.00
ENGINEERING	LOT	$ -	$ 1,700,000.00	$ 1,700,000.00
PROJECT TOTAL	**LOT**	**$ 37,900,000.00**	**$ 22,600,000.00**	**$ 60,500,000.00**
PROJECT TOTAL	COST / MILE	$ 25,330,632.91	$ 15,104,810.13	$ 40,435,443.04

Table 9-2: Stoneman Crossing Alternative 345 kV Cost Summary

SUMMARY OF COSTS	UNIT	MATERIAL COST	LABOR COST	TOTAL COST
UNDERGROUND CABLE SYSTEM & ACCESSORIES	LOT	$ 26,200,000.00	$ 7,000,000.00	$ 33,200,000.00
CIVIL WORKS	LOT	$ 17,600,000.00	$ 18,400,000.00	$ 36,000,000.00
ENGINEERING	LOT	$ -	$ 2,000,000.00	$ 2,000,000.00
PROJECT TOTAL	**LOT**	**$ 43,800,000.00**	**$ 27,400,000.00**	**$ 71,200,000.00**
PROJECT TOTAL	COST / MILE	$ 25,984,719.10	$ 16,255,280.90	$ 42,240,000.00

Table 9-3: Nelson Dewey Crossing Alternative 161 kV Cost Summary

SUMMARY OF COSTS	UNIT	MATERIAL COST	LABOR COST	TOTAL COST
UNDERGROUND CABLE SYSTEM & ACCESSORIES	LOT	$ 7,700,000.00	$ 1,300,000.00	$ 9,000,000.00
CIVIL WORKS	LOT	$ 5,600,000.00	$ 7,000,000.00	$ 12,600,000.00
ENGINEERING	LOT	$ -	$ 700,000.00	$ 700,000.00
PROJECT TOTAL	**LOT**	**$ 13,300,000.00**	**$ 9,000,000.00**	**$ 22,300,000.00**
PROJECT TOTAL	COST / MILE	$ 8,889,113.92	$ 6,015,189.87	$ 14,904,303.80

Table 9-4: Stoneman Crossing Alternative 161 kV Cost Summary

SUMMARY OF COSTS	UNIT	MATERIAL COST	LABOR COST	TOTAL COST
UNDERGROUND CABLE SYSTEM & ACCESSORIES	LOT	$ 8,700,000.00	$ 1,600,000.00	$ 10,300,000.00
CIVIL WORKS	LOT	$ 7,100,000.00	$ 8,200,000.00	$ 15,300,000.00
ENGINEERING	LOT	$ -	$ 800,000.00	$ 800,000.00
PROJECT TOTAL	**LOT**	**$ 15,800,000.00**	**$ 10,600,000.00**	**$ 26,400,000.00**
PROJECT TOTAL	COST / MILE	$ 9,373,483.15	$ 6,288,539.33	$ 15,662,022.47

Detailed cost breakdowns can be seen in Appendix B.

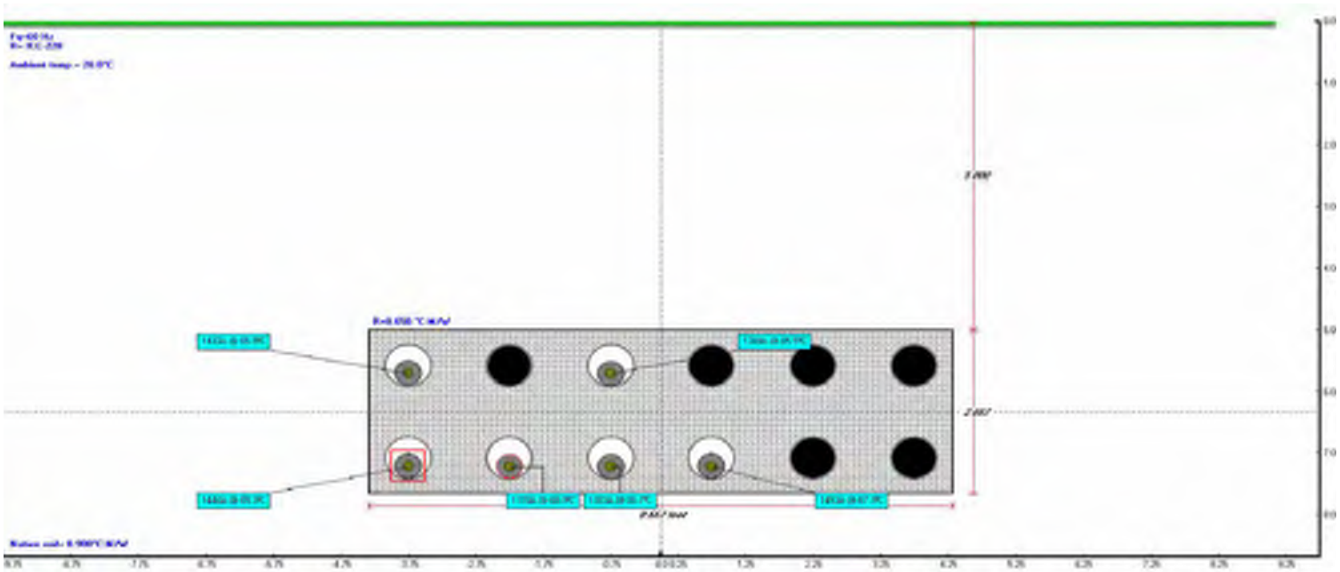
APPENDIX A - AMPACITY CALCULATIONS

Summary Results

CYMCAP 6.2 rev. 5.3

Study: Temporary
Execution: ITC Mississippi 2
Date: 5/19/2014
Frequency: 60 Hz
Conductor Resistances: IEC-228
Fraction of conductor current returning through sheath for single phase cables: 0

Installation Type: Duct Bank		
Parameter	**Unit**	**Value**
Ambient Soil Temperature at Installation Depth	°C	20
Thermal Resistivity of Native Soil	°C.m/W	0.9
Duct Bank Width	ft	8.667
Duct Bank Height	ft	2.667
Duct Bank X Center	ft	0
Duct Bank Y Center	ft	6.333
Thermal Resistivity of Duct Bank	°C.m/W	0.65



Summary Results

Solution converged

Cable No.	Cable Type	Circuit No.	Feeder ID	Phase	Location X[ft]	Location Y[ft]	Load Factor [p.u.]	Temperature [°C]	Ampacity [A]
1	1	1	<Undefined>	A	-3.75	5.713	0.75	85.9	1433.3
2	1	1	<Undefined>	B	-3.75	7.213	0.75	89.3	1439.5
3	1	1	<Undefined>	C	-2.25	7.213	0.75	88	1369.6
4	1	1	<Undefined>	A	-0.75	5.713	0.75	85.5	1389.4
5	1	1	<Undefined>	B	-0.75	7.213	0.75	88.7	1383.2
6	1	1	<Undefined>	C	0.75	7.213	0.75	87.3	1453

Summary Results

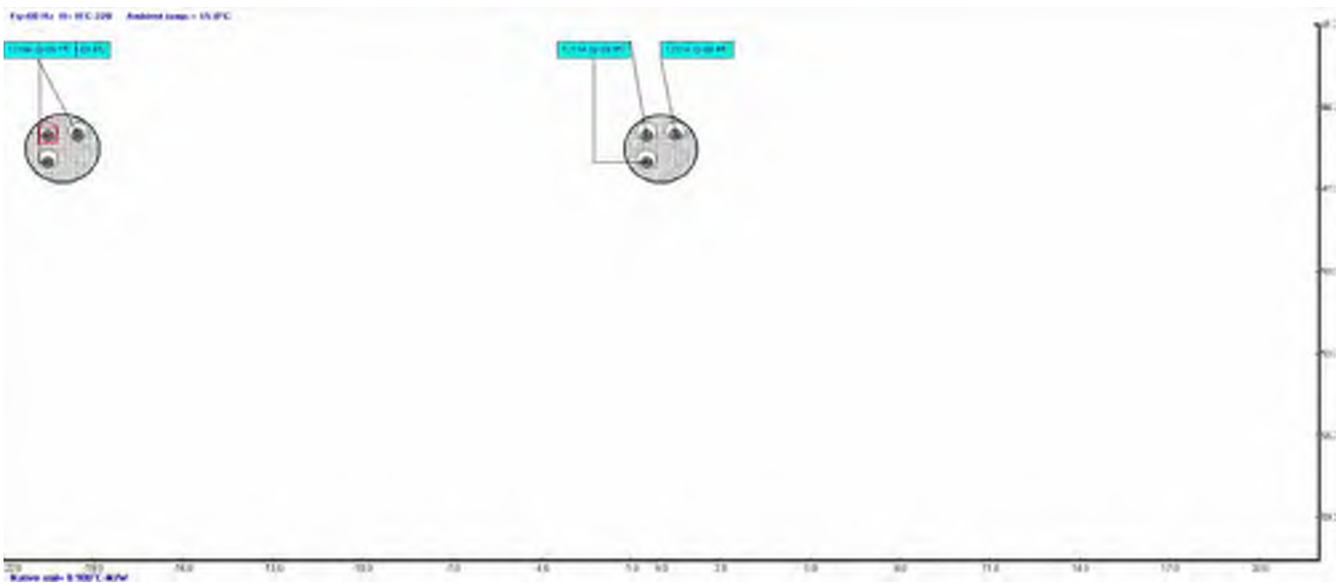
CYMCAP 6.2 rev. 5.3

Study: Temporary
Execution: ITC Mississippi
Date: 4/28/2014
Frequency: 60 Hz
Conductor Resistances: IEC-228

Fraction of conductor current returning through sheath for single phase cables: 0

Installation Type: Multiple Duct Banks Backfills		
Parameter	**Unit**	**Value**
Ambient Soil Temperature at Installation Depth	°C	15
Thermal Resistivity of Native Soil	°C.m/W	0.9

Layers		Dimensions [ft]				Type	Thermal Resistivity [°C.m/W]
No.	Name	X Center	Y Center	Width	Height		
1	NSTD DB2	0	46.25	2.5	2.5	Casing	0.8
2	NSTD DB3	-20	46.25	2.5	2.5	Casing	0.8



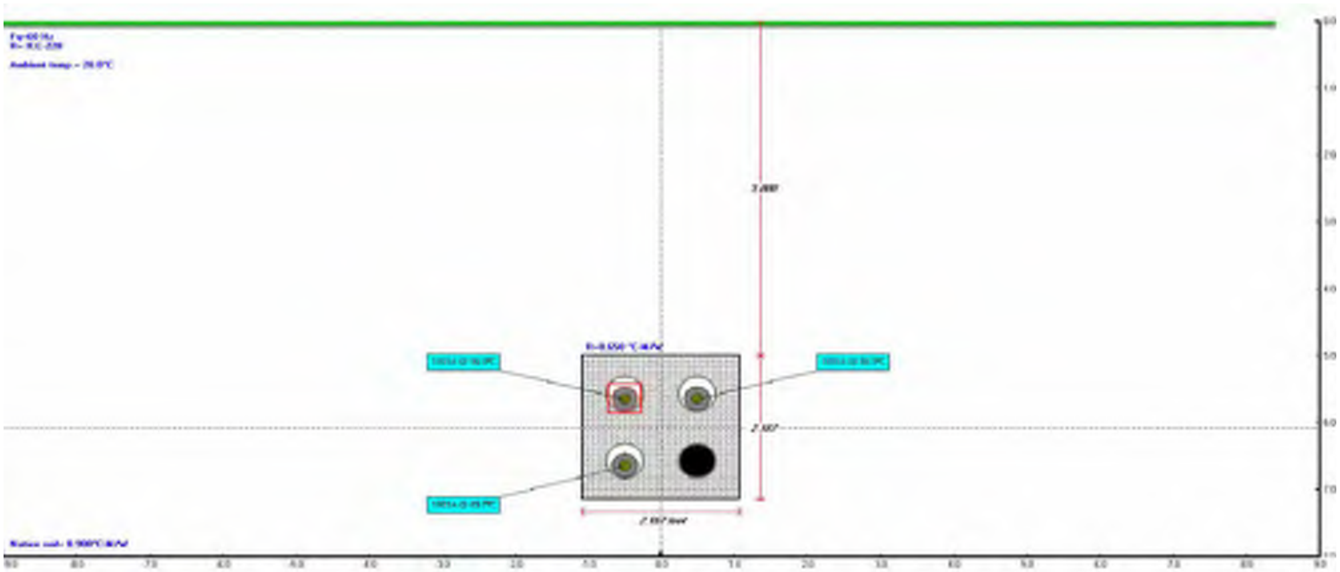
Summary Results									
Solution converged									
Cable No.	Cable Type	Circuit No.	Feeder ID	Phase	Location		Load Factor	Temperature	Ampacity
					X[ft]	Y[ft]	[p.u.]	[°C]	[A]
1	1	1	<Undefined>	A	-20.5	45.75	0.75	90	1218.5
2	1	1	<Undefined>	B	-19.5	45.75	0.75	89.4	1218.5
3	1	1	<Undefined>	C	-20.5	46.75	0.75	89.1	1218.5
4	1	2	<Undefined>	A	-0.5	45.75	0.75	89.9	1211.4
5	1	2	<Undefined>	B	0.5	45.75	0.75	88.4	1211.4
6	1	2	<Undefined>	C	-0.5	46.75	0.75	89	1211.4
									2429.9

Summary Results

CYMCAP 6.2 rev. 5.3

Study: Temporary
Execution: ITC Mississippi 4
Date: 1/6/2015
Frequency: 60 Hz
Conductor Resistances: IEC-228
Fraction of conductor current returning through sheath for single phase cables: 0

Installation Type: Duct Bank		
Parameter	**Unit**	**Value**
Ambient Soil Temperature at Installation Depth	°C	20
Thermal Resistivity of Native Soil	°C.m/W	0.9
Duct Bank Width	ft	2.167
Duct Bank Height	ft	2.167
Duct Bank X Center	ft	0
Duct Bank Y Center	ft	6.083
Thermal Resistivity of Duct Bank	°C.m/W	0.65



Summary Results

Solution converged

Cable No.	Cable Type	Circuit No.	Feeder ID	Phase	Location		Load Factor	Temperature	Ampacity
					X[ft]	Y[ft]	[p.u.]	[°C]	[A]
1	1	1	<Undefined>	A	-0.5	5.647	0.75	90	1881.2
2	1	1	<Undefined>	B	0.5	5.647	0.75	88.9	1881.2
3	1	1	<Undefined>	C	-0.5	6.647	0.75	89.7	1881.2

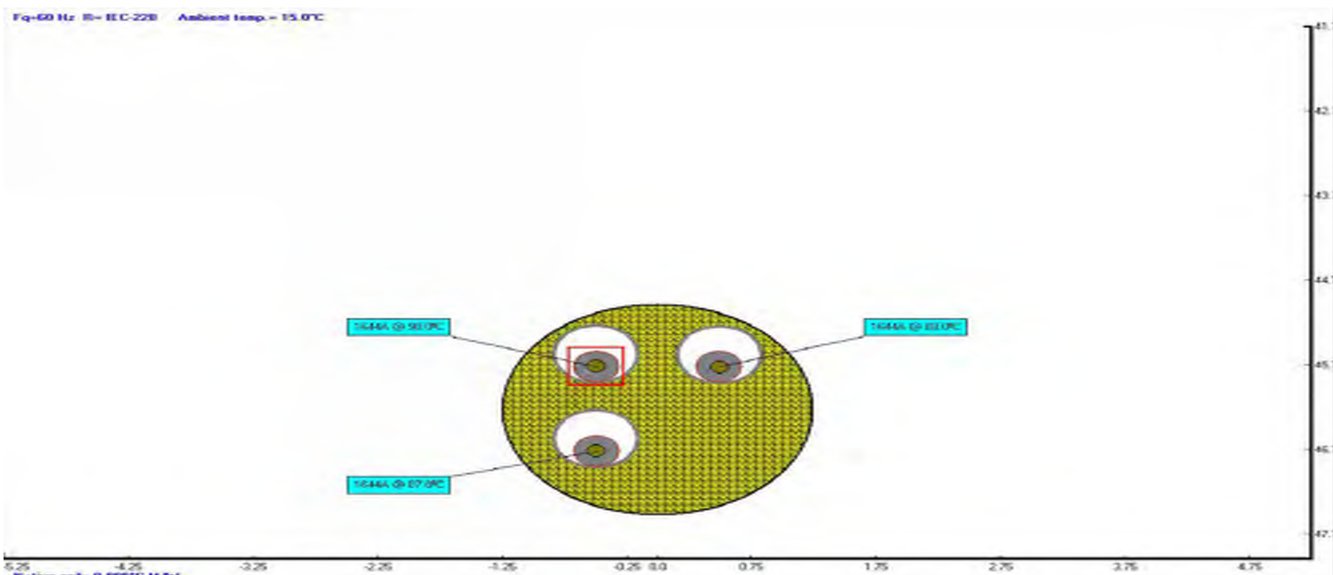
Summary Results

CYMCAP 6.2 rev. 5.3

Study: Temporary
Execution: ITC Mississippi 3
Date: 1/6/2015
Frequency: 60 Hz
Conductor Resistances: IEC-228

Fraction of conductor current returning through sheath for single phase cables: 0

Installation Type: Multiple Duct Banks Backfills							
Parameter						Unit	Value
Ambient Soil Temperature at Installation Depth						°C	15
Thermal Resistivity of Native Soil						°C.m/W	0.9
Layers		Dimensions [ft]				Type	Thermal Resistivity [°C.m/W]
No.	Name	X Center	Y Center	Width	Height		
1	NSTD DB2	0	46.25	2.5	2.5	Casing	0.8



Summary Results									
Solution converged									
Cable No.	Cable Type	Circuit No.	Feeder ID	Phase	Location		Load Factor	Temperature	Ampacity
					X[ft]	Y[ft]	[p.u.]	[°C]	[A]
1	1	1	<Undefined>	A	-0.5	45.75	0.75	90	1644.1
2	1	1	<Undefined>	B	0.5	45.75	0.75	88	1644.1
3	1	1	<Undefined>	C	-0.5	46.75	0.75	87.8	1644.1

APPENDIX B - COST ESTIMATES

PROJECTED ESTMIATE OF PROJECT COST

CLIENT NAME: ITC
PROJECT NAME: Nelson - Dewey UG Route
ROUTE LENGTH (ft): 7,900
ROUTE LENGTH (mile): 1.50

VOLTAGE CLASS: 161 kV
CABLE SIZE/TYPE: 4000 kcmil XLPE
NUMBER OF CIRCUITS: 1
NUMBER OF CABLES PER 1

PREPARED BY N. Rochel 1/6/2015
CHECKED BY N. Scott 1/6/2015

UNDERGROUND CABLE SYSTEM & ACCESSORIES

ITEM NO.	ITEM	UNIT	QUANTITY	MATERIAL UNIT PRICE	MATERIAL COST	LABOR UNIT PRICE	LABOR COST	TOTAL COST
U01	161 kV 4000 kcmil XLPE Cable	L.F.	24,570	$ 191.40	$ 4,702,698.00	$ 13.92	$ 342,014.40	$ 5,044,712.40
U02	Spare 161 kV 4000 kcmil XLPE Cable	L.F.	2,000	$ 191.40	$ 382,800.00	$ -	$ -	$ 382,800.00
U03	161 kV Open Air Terminators	Ea.	5	$ 11,600.00	$ 58,000.00	$ 17,400.00	$ 87,000.00	$ 145,000.00
U04	Spare 161 kV Open Air Terminators	Ea.	2	$ 11,600.00	$ 23,200.00	$ -	$ -	$ 23,200.00
U05	161 kV GIS Terminators	Ea.	0	$ -	$ -	$ -	$ -	$ -
U06	Spare 161 kV GIS Terminators	Ea.	0	$ -	$ -	$ -	$ -	$ -
U07	Cable Splice	Ea.	15	$ 10,440.00	$ 156,600.00	$ 17,400.00	$ 261,000.00	$ 417,600.00
U08	Spare Cable Splice	Ea.	1	$ 10,440.00	$ 10,440.00	$ -	$ -	$ 10,440.00
U09	Lightning Arrester	Ea.	5	$ 1,160.00	$ 5,800.00	$ 580.00	$ 2,900.00	$ 8,700.00
U10	Spare Lightning Arrester	Ea.	1	$ 1,160.00	$ 1,160.00	$ -	$ -	$ 1,160.00
U11	Ground Continuity Conductor	L.F.	8,190	$ 5.01	$ 41,054.83	$ 4.83	$ 39,521.66	$ 80,576.50
U12	Link Box Without SVL's	Ea.	6	$ 4,176.00	$ 25,056.00	$ 8,120.00	$ 48,720.00	$ 73,776.00
U13	Link Box With SVL's	Ea.	6	$ 5,568.00	$ 33,408.00	$ 7,656.00	$ 45,936.00	$ 79,344.00
U14	Fiber Optic/Communications System	L.F.	8,190	$ 5.69	$ 46,635.56	$ 4.27	$ 34,976.67	$ 81,612.24
U15	Temperature Monitoring System	L.S.	0	$ -	$ -	$ -	$ -	$ -
U16	Traffic Control	L.S.	1	$ -	$ -	$ -	$ -	$ -
U17	Transition Station	Ea.	0	$ -	$ -	$ -	$ -	$ -
U18	Other (Provide a Description)	Ea.	0	$ -	$ -	$ -	$ -	$ -
U19	Admin / Mob / De-Mob by Contractor (Electrical)	L.S.	1	$ -	$ -	$ 63,489.21	$ 63,489.21	$ 63,489.21
				SUBTOTAL	**$ 5,486,852.40**		**$ 925,557.95**	**$ 6,412,410.34**
			CONTINGENCY	40.00%	**$ 2,194,740.96**		**$ 370,223.18**	**$ 2,564,964.14**
				TOTAL	**$ 7,681,593.35**		**$ 1,295,781.13**	**$ 8,977,374.48**

POWER CABLE DUCT SIZE: 6
NUMBER OF POWER CABLE DUCTS: 4
NUMBER OF OTHER DUCTS: 4
TYPICAL DUCT BANK DIMENSIONS: 24 in Wide X 24 in High

CIVIL WORKS

ITEM NO.	ITEM	UNIT	QUANTITY	MATERIAL UNIT PRICE	MATERIAL COST	LABOR UNIT PRICE	LABOR COST	TOTAL COST
C01	Trench Excavation	L.F.	4,860	$ 27.11	$ 131,770.27	$ 100.53	$ 488,575.80	$ 620,346.07
C02	Rock Excavation (Trench)	L.F.	4,860	$ -	$ -	$ -	$ -	$ -
C03	Duct Bank	L.F.	4,860	$ 46.15	$ 224,289.00	$ 100.62	$ 489,013.20	$ 713,302.20
C04	Fluidized Thermal Backfill (FTB)	L.F.	4,860	$ -	$ -	$ -	$ -	$ -
C05	Native Soil Backfill	L.F.	4,860	$ -	$ -	$ 19.87	$ 96,568.20	$ 96,568.20
C06	Pavement Restoration	L.F.	0	$ -	$ -	$ -	$ -	$ -
C07	Steel Plating	L.F.	0	$ -	$ -	$ -	$ -	$ -
C08	Traffic Signal Loop Detector Repair	Ea.	0	$ -	$ -	$ -	$ -	$ -
C09	Splice Vaults	Ea.	5	$ 37,882.91	$ 189,414.55	$ -	$ -	$ 189,414.55
C10	Splice Vault Excavation	Ea.	5	$ 14,223.09	$ 71,115.45	$ 33,022.14	$ 165,110.70	$ 236,226.15
C11	Rock Excavation (Vault)	Ea.	5	$ -	$ -	$ -	$ -	$ -
C12	Grounding System (civil)	L.S.	1	$ 29,566.08	$ 29,566.08	$ 29,566.08	$ 29,566.08	$ 59,132.16
C13	Communication Handholes	Ea.	5	$ 4,380.16	$ 21,900.80	$ 6,570.24	$ 32,851.20	$ 54,752.00
C14	Conduit Proofing (Civil)	L.S.	1	$ 23,652.87	$ 23,652.87	$ 165,570.05	$ 165,570.05	$ 189,222.92
C15	Substation Termination Structures	Ea.	3	$ 10,619.08	$ 31,857.24	$ 12,277.74	$ 36,833.22	$ 68,690.46
C16	OH to UG Termination Structures	Ea.	2	$ 137,975.04	$ 275,950.08	$ 102,933.76	$ 205,867.52	$ 481,817.60
C17	Clearing and Grubbing	L.F.	3,500	$ 13.66	$ 47,810.00	$ 16.03	$ 56,105.00	$ 103,915.00
C18	Loam and Seed	S.F.	175,000	$ 0.28	$ 49,000.00	$ 0.28	$ 49,000.00	$ 98,000.00
C19	Horizontal Directional Drill	L.F.	2,900	$ 801.79	$ 2,325,191.00	$ 658.83	$ 1,910,607.00	$ 4,235,798.00
C20	Jack & Bore	L.F.	0	$ -	$ -	$ -	$ -	$ -
C21	Traffic Control, Flagger & Police (Civil)	L.S.	0	$ -	$ -	$ -	$ -	$ -
C22	Construction Staking	L.F.	7,900	$ -	$ -	$ 1.63	$ 12,877.00	$ 12,877.00
C23	Contaminated Material Testing	L.F.	7,900	$ 2.19	$ 17,301.00	$ 19.72	$ 155,788.00	$ 173,089.00
C24	Contaminated Material Disposal	L.S.	0	$ -	$ -	$ -	$ -	$ -
C25	Utility Relocation (known and unknown)	L.S.	0	$ -	$ -	$ -	$ -	$ -
C26	Dewatering	L.S.	1	$ 532,351.17	$ 532,351.17	$ 982,736.26	$ 982,736.26	$ 1,515,087.42
C27	Other (Provide a Description)	Ea.	0	$ -	$ -	$ -	$ -	$ -
C28	Other (Provide a Description)	Ea.	0	$ -	$ -	$ -	$ -	$ -
C29	Admin/Mob/De-Mob by Contractor (Civil)	L.S.	1	$ -	$ -	$ 88,482.39	$ 88,482.39	$ 88,482.39
				SUBTOTAL	**$ 3,971,169.50**		**$ 4,965,551.61**	**$ 8,936,721.12**
			CONTINGENCY	**40.00%**	**$ 1,588,467.80**		**$ 1,986,220.65**	**$ 3,574,688.45**
				TOTAL	**$ 5,559,637.31**		**$ 6,951,772.26**	**$ 12,511,409.56**

SUMMARY OF COSTS	UNIT	MATERIAL COST	LABOR COST	TOTAL COST
UNDERGROUND CABLE SYSTEM & ACCESSORIES	LOT	$ 7,700,000.00	$ 1,300,000.00	$ 9,000,000.00
CIVIL WORKS	LOT	$ 5,600,000.00	$ 7,000,000.00	$ 12,600,000.00
ENGINEERING	LOT	$ -	$ 700,000.00	$ 700,000.00
PROJECT TOTAL	**LOT**	**$ 13,300,000.00**	**$ 9,000,000.00**	**$ 22,300,000.00**
PROJECT TOTAL	**COST / MILE**	**$ 8,889,113.92**	**$ 6,015,189.87**	**$ 14,904,303.80**

Note: The individual unit rates provide a preliminary estimate of the associated costs prior to design. The unit rates may vary in construction bids and during construction due to placement of the contractors profit and contingency. The unit rates have been increased in an effort to anticipate unforeseen conditions and unknown market fluctuations. Although the unit rates may vary, the overall cost per mile is within the industry standard level of accuracy.

PROJECTED ESTMIATE OF PROJECT COST

CLIENT NAME:	ITC	VOLTAGE CLASS:	161 kV			
PROJECT NAME:	Nelson - Dewey UG Route	CABLE SIZE/TYPE:	4000 kcmil XLPE			
ROUTE LENGTH (ft):	7,900	NUMBER OF CIRCUITS:	1	PREPARED BY	N. Rochel	1/6/2015
ROUTE LENGTH (mile):	1.5	NUMBER OF CABLES PER PHASE:	1	CHECKED BY	N. Scott	1/6/2015

POWER CABLE DUCT SIZE:	6	NUMBER OF OTHER DUCTS:	4
NUMBER OF POWER CABLE DUCTS:	4	TYPICAL DUCT BANK DIMENSIONS:	24 in Wide X 24 in High

MAJOR ASSUMPTIONS

1) Unit Costs Based Upon 3% Escalation, Per Year from 2015 to 2020 for a Total of 16% Escalation
2) Contaminated Material Disposal based upon 0% of Total Civil Cost
3) Utility Relocations based upon 0% of Total Civil Cost
4) Traffic Control based upon assumed 0% of Route Length
5) Unit Costs based upon CCI (Combined) = 0.944
6) Unit Costs based upon Tax = 0%
7) Civil Costs based upon an average trenching excavation of 100 feet per day
8) Civil Costs based upon an average duct bank depth of cover of 3.9 feet
9) Civil Costs based upon an assumed Horizontal Directional Drill Length of 2900 feet
10) Civil Costs based upon an assumed Jack and Bore Length of 0 feet
11) Rock Removal based upon 0% of Civil Excavation Length

PROJECTED ESTMIATE OF PROJECT COST

CLIENT NAME: ITC
PROJECT NAME: Nelson Dewey Route
ROUTE LENGTH (ft): 7,900
ROUTE LENGTH (mile): 1.50

VOLTAGE CLASS: 345 kV
CABLE SIZE/TYPE: 3000 kcmil XLPE
NUMBER OF CIRCUITS: 1
NUMBER OF CABLES PER 2

PREPARED BY N. Rochel 10/10/2014
CHECKED BY N. Scott 10/10/2014

Burns & McDonnell SINCE 1898

UNDERGROUND CABLE SYSTEM & ACCESSORIES

ITEM NO.	ITEM	UNIT	QUANTITY	MATERIAL UNIT PRICE	MATERIAL COST	LABOR UNIT PRICE	LABOR COST	TOTAL COST
U01	345 kV 3000 kcmil XLPE Cable	L.F.	49,140	$ 110.20	$ 5,415,228.00	$ 13.92	$ 684,028.80	$ 6,099,256.80
U02	Spare 345 kV 3000 kcmil XLPE Cable	L.F.	2,000	$ 110.20	$ 220,400.00	$ -	$ -	$ 220,400.00
U03	345 kV Open Air Terminators	Ea.	12	$ 20,880.00	$ 250,560.00	$ 11,600.00	$ 139,200.00	$ 389,760.00
U04	Spare 345 kV Open Air Terminators	Ea.	2	$ 20,880.00	$ 41,760.00	$ -	$ -	$ 41,760.00
U05	345 kV GIS Terminators	Ea.	0	$ -	$ -	$ -	$ -	$ -
U06	Spare 345 kV GIS Terminators	Ea.	0	$ -	$ -	$ -	$ -	$ -
U07	Cable Splice	Ea.	30	$ 17,400.00	$ 522,000.00	$ 11,600.00	$ 348,000.00	$ 870,000.00
U08	Spare Cable Splice	Ea.	1	$ 17,400.00	$ 17,400.00	$ -	$ -	$ 17,400.00
U09	Lightning Arrester	Ea.	12	$ 1,740.00	$ 20,880.00	$ 580.00	$ 6,960.00	$ 27,840.00
U10	Spare Lightning Arrester	Ea.	1	$ 1,740.00	$ 1,740.00	$ -	$ -	$ 1,740.00
U11	Ground Continuity Conductor	L.F.	16,380	$ 10.03	$ 164,219.33	$ 9.65	$ 158,086.66	$ 322,305.98
U12	Link Box Without SVL's	Ea.	13	$ 4,176.00	$ 54,288.00	$ 8,120.00	$ 105,560.00	$ 159,848.00
U13	Link Box With SVL's	Ea.	13	$ 5,568.00	$ 72,384.00	$ 7,656.00	$ 99,528.00	$ 171,912.00
U14	Fiber Optic/Communications System	L.F.	8,190	$ 5.69	$ 46,635.56	$ 4.27	$ 34,976.67	$ 81,612.24
U15	Temperature Monitoring System	L.S.	0	$ -	$ -	$ -	$ -	$ -
U16	Traffic Control	L.S.	1	$ -	$ -	$ -	$ -	$ -
U17	Transition station	Ea.	2	$ 3,500,000.00	$ 7,000,000.00	$ 1,000,000.00	$ 2,000,000.00	$ 9,000,000.00
U18	Reactive Compensation	Ea.	1	$ 4,000,000.00	$ 4,000,000.00	$ 1,000,000.00	$ 1,000,000.00	$ 5,000,000.00
U19	Admin / Mob / De-Mob by Contractor (Electrical)	L.S.	1	$ -	$ -	$ 224,038.35	$ 224,038.35	$ 224,038.35
				SUBTOTAL	**$ 17,827,494.89**		**$ 4,800,378.48**	**$ 22,627,873.37**
			CONTINGENCY	40.00%	**$ 7,130,997.96**		**$ 1,920,151.39**	**$ 9,051,149.35**
				TOTAL	**$ 24,958,492.85**		**$ 6,720,529.87**	**$ 31,679,022.72**

POWER CABLE DUCT SIZE: 8
NUMBER OF POWER CABLE DUCTS: 12

NUMBER OF OTHER DUCTS: 4
TYPICAL DUCT BANK DIMENSIONS: 105 in Wide X 33 in High

CIVIL WORKS

ITEM NO.	ITEM	UNIT	QUANTITY	MATERIAL UNIT PRICE	MATERIAL COST	LABOR UNIT PRICE	LABOR COST	TOTAL COST
C01	Trench Excavation	L.F.	4,860	$ 27.16	$ 132,001.58	$ 139.94	$ 680,108.40	$ 812,109.98
C02	Rock Excavation (Trench)	L.F.	4,860	$ -	$ -	$ -	$ -	$ -
C03	Duct Bank	L.F.	4,860	$ 213.96	$ 1,039,845.60	$ 345.36	$ 1,678,449.60	$ 2,718,295.20
C04	Fluidized Thermal Backfill (FTB)	L.F.	4,860	$ -	$ -	$ -	$ -	$ -
C05	Native Soil Backfill	L.F.	4,860	$ -	$ -	$ 64.57	$ 313,810.20	$ 313,810.20
C06	Pavement Restoration	L.F.	0	$ -	$ -	$ -	$ -	$ -
C07	Steel Plating	L.F.	0	$ -	$ -	$ -	$ -	$ -
C08	Traffic Signal Loop Detector Repair	Ea.	0	$ -	$ -	$ -	$ -	$ -
C09	Splice Vaults	Ea.	15	$ 37,882.91	$ 568,243.65	$ -	$ -	$ 568,243.65
C10	Splice Vault Excavation	Ea.	15	$ 14,223.09	$ 213,346.35	$ 33,022.14	$ 495,332.10	$ 708,678.45
C11	Rock Excavation (Vault)	Ea.	15	$ -	$ -	$ -	$ -	$ -
C12	Grounding System (civil)	L.S.	1	$ 88,698.24	$ 88,698.24	$ 88,698.24	$ 88,698.24	$ 177,396.48
C13	Communication Handholes	Ea.	5	$ 4,380.16	$ 21,900.80	$ 6,570.24	$ 32,851.20	$ 54,752.00
C14	Conduit Proofing (Civil)	L.S.	1	$ 47,305.73	$ 47,305.73	$ 331,140.10	$ 331,140.10	$ 378,445.83
C15	Substation Termination Structures	Ea.	3	$ 10,619.08	$ 31,857.24	$ 12,277.74	$ 36,833.22	$ 68,690.46
C16	OH to UG Termination Structures	Ea.	0	$ -	$ -	$ -	$ -	$ -
C17	Clearing and Grubbing	L.F.	3,500	$ 13.66	$ 47,810.00	$ 16.03	$ 56,105.00	$ 103,915.00
C18	Loam and Seed	S.F.	175,000	$ 0.28	$ 49,000.00	$ 0.28	$ 49,000.00	$ 98,000.00
C19	Horizontal Directional Drill	L.F.	2,900	$ 2,310.18	$ 6,699,522.00	$ 1,905.10	$ 5,524,790.00	$ 12,224,312.00
C20	Jack & Bore	L.F.	0	$ -	$ -	$ -	$ -	$ -
C21	Traffic Control, Flagger & Police (Civil)	L.S.	0	$ -	$ -	$ -	$ -	$ -
C22	Construction Staking	L.F.	7,900	$ -	$ -	$ 1.63	$ 12,877.00	$ 12,877.00
C23	Contaminated Material Testing	L.F.	7,900	$ 2.19	$ 17,301.00	$ 19.72	$ 155,788.00	$ 173,089.00
C24	Contaminated Material Disposal	L.S.	0	$ -	$ -	$ -	$ -	$ -
C25	Utility Relocation (known and unknown)	L.S.	0	$ -	$ -	$ -	$ -	$ -
C26	Dewatering	L.S.	1	$ 208,540.00	$ 208,540.00	$ 379,682.40	$ 379,682.40	$ 588,222.40
C27	Other (Provide a Description)	Ea.	0	$ -	$ -	$ -	$ -	$ -
C28	Other (Provide a Description)	Ea.	0	$ -	$ -	$ -	$ -	$ -
C29	Admin/Mob/De-Mob by Contractor (Civil)	L.S.	1	$ -	$ -	$ 190,008.38	$ 190,008.38	$ 190,008.38
				SUBTOTAL	**$ 9,165,372.19**		**$ 10,025,473.83**	**$ 19,190,846.02**
			CONTINGENCY	**40.00%**	**$ 3,666,148.88**		**$ 4,010,189.53**	**$ 7,676,338.41**
				TOTAL	**$ 12,831,521.06**		**$ 14,035,663.37**	**$ 26,867,184.43**

SUMMARY OF COSTS	UNIT	MATERIAL COST	LABOR COST	TOTAL COST
UNDERGROUND CABLE SYSTEM & ACCESSORIES	LOT	$ 25,000,000.00	$ 6,800,000.00	$ 31,800,000.00
CIVIL WORKS	LOT	$ 12,900,000.00	$ 14,100,000.00	$ 27,000,000.00
ENGINEERING	LOT	$ -	$ 1,700,000.00	$ 1,700,000.00
PROJECT TOTAL	**LOT**	**$ 37,900,000.00**	**$ 22,600,000.00**	**$ 60,500,000.00**
PROJECT TOTAL	**COST / MILE**	**$ 25,330,632.91**	**$ 15,104,810.13**	**$ 40,435,443.04**

Note: The individual unit rates provide a preliminary estimate of the associated costs prior to design. The unit rates may vary in construction bids and during construction due to placement of the contractors profit and contingency. The unit rates have been increased in an effort to anticipate unforeseen conditions and unknown market fluctuations. Although the unit rates may vary, the overall cost per mile is within the industry standard level of accuracy.

PROJECTED ESTMIATE OF PROJECT COST

CLIENT NAME:	ITC	VOLTAGE CLASS:	345 kV			
PROJECT NAME:	Nelson Dewey Route	CABLE SIZE/TYPE:	3000 kcmil XLPE			
ROUTE LENGTH (ft):	7,900	NUMBER OF CIRCUITS:	1	PREPARED BY	N. Rochel	10/10/2014
ROUTE LENGTH (mile):	1.5	NUMBER OF CABLES PER PHASE:	2	CHECKED BY	N. Scott	10/10/2014

POWER CABLE DUCT SIZE:	8	NUMBER OF OTHER DUCTS:	4
NUMBER OF POWER CABLE DUCTS:	12	TYPICAL DUCT BANK DIMENSIONS:	105 in Wide X 33 in High

MAJOR ASSUMPTIONS

1) Unit Costs Based Upon 3% Escalation, Per Year from 2015 to 2020 for a Total of 16% Escalation
2) Contaminated Material Disposal based upon 0% of Total Civil Cost
3) Utility Relocations based upon 0% of Total Civil Cost
4) Traffic Control based upon assumed 0% of Route Length
5) Unit Costs based upon CCI (Combined) = 0.944
6) Unit Costs based upon Tax = 0%
7) Civil Costs based upon an average trenching excavation of 100 feet per day
8) Civil Costs based upon an average duct bank depth of cover of 3.9 feet
9) Civil Costs based upon an assumed Horizontal Directional Drill Length of 2900 feet
10) Civil Costs based upon an assumed Jack and Bore Length of 0 feet
11) Rock Removal based upon 0% of Civil Excavation Length

PROJECTED ESTMIATE OF PROJECT COST

Burns & McDonnell SINCE 1898

CLIENT NAME: ITC	VOLTAGE CLASS: 161 kV		
PROJECT NAME: Stoneman Route	CABLE SIZE/TYPE: 4000 kmcil XLPE		
ROUTE LENGTH (ft): 8,900	NUMBER OF CIRCUITS: 1	PREPARED BY N. Rochel	1/6/2015
ROUTE LENGTH (mile): 1.69	NUMBER OF CABLES PER 1	CHECKED BY N. Scott	1/6/2015

UNDERGROUND CABLE SYSTEM & ACCESSORIES

ITEM NO.	ITEM	UNIT	QUANTITY	MATERIAL UNIT PRICE	MATERIAL COST	LABOR UNIT PRICE	LABOR COST	TOTAL COST
U01	161 kV 4000 kmcil XLPE Cable	L.F.	27,690	$ 191.40	$ 5,299,866.00	$ 13.92	$ 385,444.80	$ 5,685,310.80
U02	Spare 161 kV 4000 kmcil XLPE Cable	L.F.	2,000	$ 191.40	$ 382,800.00	$ -	$ -	$ 382,800.00
U03	161 kV Open Air Terminators	Ea.	6	$ 11,600.00	$ 69,600.00	$ 17,400.00	$ 104,400.00	$ 174,000.00
U04	Spare 161 kV Open Air Terminators	Ea.	2	$ 11,600.00	$ 23,200.00	$ -	$ -	$ 23,200.00
U05	161 kV GIS Terminators	Ea.	0	$ -	$ -	$ -	$ -	$ -
U06	Spare 161 kV GIS Terminators	Ea.	0	$ -	$ -	$ -	$ -	$ -
U07	Cable Splice	Ea.	18	$ 10,440.00	$ 187,920.00	$ 17,400.00	$ 313,200.00	$ 501,120.00
U08	Spare Cable Splice	Ea.	1	$ 10,440.00	$ 10,440.00	$ -	$ -	$ 10,440.00
U09	Lightning Arrester	Ea.	6	$ 1,160.00	$ 6,960.00	$ 580.00	$ 3,480.00	$ 10,440.00
U10	Spare Lightning Arrester	Ea.	1	$ 1,160.00	$ 1,160.00	$ -	$ -	$ 1,160.00
U11	Ground Continuity Conductor	L.F.	9,230	$ 5.01	$ 46,268.14	$ 4.83	$ 44,540.29	$ 90,808.43
U12	Link Box Without SVL's	Ea.	7	$ 4,176.00	$ 29,232.00	$ 8,120.00	$ 56,840.00	$ 86,072.00
U13	Link Box With SVL's	Ea.	7	$ 5,568.00	$ 38,976.00	$ 7,656.00	$ 53,592.00	$ 92,568.00
U14	Fiber Optic/Communications System	L.F.	9,230	$ 5.69	$ 52,557.54	$ 4.27	$ 39,418.15	$ 91,975.69
U15	Temperature Monitoring System	L.S.	0	$ -	$ -	$ -	$ -	$ -
U16	Traffic Control	L.S.	1	$ -	$ -	$ -	$ -	$ -
U17	Transition Station	Ea.	0	$ -	$ -	$ -	$ -	$ -
U18	Other (Provide a Description)	Ea.	0	$ -	$ -	$ -	$ -	$ -
U19	Admin / Mob / De-Mob by Contractor (Electrical)	L.S.	1	$ -	$ -	$ 71,498.95	$ 71,498.95	$ 71,498.95
				SUBTOTAL	**$ 6,148,979.68**		**$ 1,072,414.19**	**$ 7,221,393.88**
			CONTINGENCY	40.00%	**$ 2,459,591.87**		**$ 428,965.68**	**$ 2,888,557.55**
				TOTAL	**$ 8,608,571.56**		**$ 1,501,379.87**	**$ 10,109,951.43**

POWER CABLE DUCT SIZE: 6 | NUMBER OF OTHER DUCTS: 4

NUMBER OF POWER CABLE DUCTS: 4 | TYPICAL DUCT BANK DIMENSIONS: 24 in Wide X 24 in High

CIVIL WORKS

ITEM NO.	ITEM	UNIT	QUANTITY	MATERIAL UNIT PRICE	MATERIAL COST	LABOR UNIT PRICE	LABOR COST	TOTAL COST
C01	Trench Excavation	L.F.	4,532	$ 27.11	$ 122,877.13	$ 100.53	$ 455,601.96	$ 578,479.09
C02	Rock Excavation (Trench)	L.F.	4,532	$ -	$ -	$ -	$ -	$ -
C03	Duct Bank	L.F.	4,532	$ 46.15	$ 209,151.80	$ 100.62	$ 456,009.84	$ 665,161.64
C04	Fluidized Thermal Backfill (FTB)	L.F.	4,532	$ -	$ -	$ -	$ -	$ -
C05	Native Soil Backfill	L.F.	4,532	$ -	$ -	$ 19.87	$ 90,050.84	$ 90,050.84
C06	Pavement Restoration	L.F.	0	$ -	$ -	$ -	$ -	$ -
C07	Steel Plating	L.F.	0	$ -	$ -	$ -	$ -	$ -
C08	Traffic Signal Loop Detector Repair	Ea.	0	$ -	$ -	$ -	$ -	$ -
C09	Splice Vaults	Ea.	6	$ 37,882.91	$ 227,297.46	$ -	$ -	$ 227,297.46
C10	Splice Vault Excavation	Ea.	6	$ 14,223.09	$ 85,338.54	$ 33,022.14	$ 198,132.84	$ 283,471.38
C11	Rock Excavation (Vault)	Ea.	6	$ -	$ -	$ -	$ -	$ -
C12	Grounding System (civil)	L.S.	1	$ 35,479.30	$ 35,479.30	$ 35,479.30	$ 35,479.30	$ 70,958.60
C13	Communication Handholes	Ea.	6	$ 4,380.16	$ 26,280.96	$ 6,570.24	$ 39,421.44	$ 65,702.40
C14	Conduit Proofing (Civil)	L.S.	1	$ 27,595.01	$ 27,595.01	$ 193,165.06	$ 193,165.06	$ 220,760.07
C15	Substation Termination Structures	Ea.	3	$ 10,619.08	$ 31,857.24	$ 12,277.74	$ 36,833.22	$ 68,690.46
C16	OH to UG Termination Structures	Ea.	2	$ 137,975.04	$ 275,950.08	$ 102,933.76	$ 205,867.52	$ 481,817.60
C17	Clearing and Grubbing	L.F.	3,290	$ 14.53	$ 47,803.70	$ 17.05	$ 56,094.50	$ 103,898.20
C18	Loam and Seed	S.F.	164,500	$ 0.28	$ 46,060.00	$ 0.28	$ 46,060.00	$ 92,120.00
C19	Horizontal Directional Drill	L.F.	4,200	$ 801.79	$ 3,367,518.00	$ 658.83	$ 2,767,086.00	$ 6,134,604.00
C20	Jack & Bore	L.F.	0	$ -	$ -	$ -	$ -	$ -
C21	Traffic Control, Flagger & Police (Civil)	L.S.	0	$ -	$ -	$ -	$ -	$ -
C22	Construction Staking	L.F.	8,900	$ -	$ -	$ 1.63	$ 14,507.00	$ 14,507.00
C23	Contaminated Material Testing	L.F.	8,900	$ 2.19	$ 19,491.00	$ 19.72	$ 175,508.00	$ 194,999.00
C24	Contaminated Material Disposal	L.S.	0	$ -	$ -	$ -	$ -	$ -
C25	Utility Relocation (known and unknown)	L.S.	0	$ -	$ -	$ -	$ -	$ -
C26	Dewatering	L.S.	1	$ 506,463.31	$ 506,463.31	$ 935,008.39	$ 935,008.39	$ 1,441,471.70
C27	Other (Provide a Description)	Ea.	0	$ -	$ -	$ -	$ -	$ -
C28	Other (Provide a Description)	Ea.	0	$ -	$ -	$ -	$ -	$ -
C29	Admin/Mob/De-Mob by Contractor (Civil)	L.S.	1	$ -	$ -	$ 107,339.89	$ 107,339.89	$ 107,339.89
				SUBTOTAL	**$ 5,029,163.53**		**$ 5,812,165.80**	**$ 10,841,329.33**
			CONTINGENCY	**40.00%**	**$ 2,011,665.41**		**$ 2,324,866.32**	**$ 4,336,531.73**
				TOTAL	**$ 7,040,828.94**		**$ 8,137,032.13**	**$ 15,177,861.06**

SUMMARY OF COSTS	UNIT	MATERIAL COST	LABOR COST	TOTAL COST
UNDERGROUND CABLE SYSTEM & ACCESSORIES	LOT	$ 8,700,000.00	$ 1,600,000.00	$ 10,300,000.00
CIVIL WORKS	LOT	$ 7,100,000.00	$ 8,200,000.00	$ 15,300,000.00
ENGINEERING	LOT	$ -	$ 800,000.00	$ 800,000.00
PROJECT TOTAL	**LOT**	**$ 15,800,000.00**	**$ 10,600,000.00**	**$ 26,400,000.00**
PROJECT TOTAL	**COST / MILE**	**$ 9,373,483.15**	**$ 6,288,539.33**	**$ 15,662,022.47**

Note: The individual unit rates provide a preliminary estimate of the associated costs prior to design. The unit rates may vary in construction bids and during construction due to placement of the contractors profit and contingency. The unit rates have been increased in an effort to anticipate unforeseen conditions and unknown market fluctuations. Although the unit rates may vary, the overall cost per mile is within the industry standard level of accuracy.

PROJECTED ESTMIATE OF PROJECT COST

CLIENT NAME:	ITC	VOLTAGE CLASS:	161 kV		
PROJECT NAME:	Stoneman Route	CABLE SIZE/TYPE:	4000 kmcil XLPE		
ROUTE LENGTH (ft):	8,900	NUMBER OF CIRCUITS:	1	PREPARED BY N. Rochel	1/6/2015
ROUTE LENGTH (mile):	1.69	NUMBER OF CABLES PER PHASE:	1	CHECKED BY N. Scott	1/6/2015

POWER CABLE DUCT SIZE:	6	NUMBER OF OTHER DUCTS:	4
NUMBER OF POWER CABLE DUCTS:	4	TYPICAL DUCT BANK DIMENSIONS:	24 in Wide X 24 in High

MAJOR ASSUMPTIONS

1) Unit Costs Based Upon 3% Escalation, Per Year from 2015 to 2020 for a Total of 16% Escalation
2) Contaminated Material Disposal based upon 0% of Total Civil Cost
3) Utility Relocations based upon 0% of Total Civil Cost
4) Traffic Control based upon assumed 0% of Route Length
5) Unit Costs based upon CCI (Combined) = 0.944
6) Unit Costs based upon Tax = 0%
7) Civil Costs based upon an average trenching excavation of 100 feet per day
8) Civil Costs based upon an average duct bank depth of cover of 3.9 feet
9) Civil Costs based upon an assumed Horizontal Directional Drill Length of 4200 feet
10) Civil Costs based upon an assumed Jack and Bore Length of 0 feet
11) Rock Removal based upon 0% of Civil Excavation Length

PROJECTED ESTMIATE OF PROJECT COST

CLIENT NAME:	ITC	VOLTAGE CLASS:	345 kV
PROJECT NAME:	Stoneman Route	CABLE SIZE/TYPE:	3000 kcmil XLPE
ROUTE LENGTH (ft):	8,900	NUMBER OF CIRCUITS:	1
ROUTE LENGTH (mile):	1.69	NUMBER OF CABLES PER	2

PREPARED BY N. Rochel 10/10/2014
CHECKED BY N. Scott 10/10/2014

UNDERGROUND CABLE SYSTEM & ACCESSORIES

ITEM NO.	ITEM	UNIT	QUANTITY	MATERIAL UNIT PRICE	MATERIAL COST	LABOR UNIT PRICE	LABOR COST	TOTAL COST
U01	345 kV 3000 kcmil XLPE Cable	L.F.	55,380	$ 110.20	$ 6,102,876.00	$ 13.92	$ 770,889.60	$ 6,873,765.60
U02	Spare 345 kV 3000 kcmil XLPE Cable	L.F.	2,000	$ 110.20	$ 220,400.00	$ -	$ -	$ 220,400.00
U03	345 kV Open Air Terminators	Ea.	12	$ 20,880.00	$ 250,560.00	$ 11,600.00	$ 139,200.00	$ 389,760.00
U04	Spare 345 kV Open Air Terminators	Ea.	2	$ 20,880.00	$ 41,760.00	$ -	$ -	$ 41,760.00
U05	345 kV GIS Terminators	Ea.	0	$ -	$ -	$ -	$ -	$ -
U06	Spare 345 kV GIS Terminators	Ea.	0	$ -	$ -	$ -	$ -	$ -
U07	Cable Splice	Ea.	36	$ 17,400.00	$ 626,400.00	$ 11,600.00	$ 417,600.00	$ 1,044,000.00
U08	Spare Cable Splice	Ea.	1	$ 17,400.00	$ 17,400.00	$ -	$ -	$ 17,400.00
U09	Lightning Arrester	Ea.	12	$ 1,740.00	$ 20,880.00	$ 580.00	$ 6,960.00	$ 27,840.00
U10	Spare Lightning Arrester	Ea.	1	$ 1,740.00	$ 1,740.00	$ -	$ -	$ 1,740.00
U11	Ground Continuity Conductor	L.F.	18,460	$ 10.03	$ 185,072.58	$ 9.65	$ 178,161.15	$ 363,233.73
U12	Link Box Without SVL's	Ea.	13	$ 4,176.00	$ 54,288.00	$ 8,120.00	$ 105,560.00	$ 159,848.00
U13	Link Box With SVL's	Ea.	13	$ 5,568.00	$ 72,384.00	$ 7,656.00	$ 99,528.00	$ 171,912.00
U14	Fiber Optic/Communications System	L.F.	9,230	$ 5.69	$ 52,557.54	$ 4.27	$ 39,418.15	$ 91,975.69
U15	Temperature Monitoring System	L.S.	0	$ -	$ -	$ -	$ -	$ -
U16	Traffic Control	L.S.	1	$ -	$ -	$ -	$ -	$ -
U17	Transition Station	Ea.	2	$ 3,500,000.00	$ 7,000,000.00	$ 1,000,000.00	$ 2,000,000.00	$ 9,000,000.00
U18	Reactive Compensation	Ea.	1	$ 4,000,000.00	$ 4,000,000.00	$ 1,000,000.00	$ 1,000,000.00	$ 5,000,000.00
U19	Admin / Mob / De-Mob by Contractor (Electrical)	L.S.	1	$ -	$ -	$ 234,036.35	$ 234,036.35	$ 234,036.35
				SUBTOTAL	**$ 18,646,318.12**		**$ 4,991,353.26**	**$ 23,637,671.37**
			CONTINGENCY	40.00%	**$ 7,458,527.25**		**$ 1,996,541.30**	**$ 9,455,068.55**
				TOTAL	**$ 26,104,845.36**		**$ 6,987,894.56**	**$ 33,092,739.92**

POWER CABLE DUCT SIZE: 8
NUMBER OF POWER CABLE DUCTS: 12
NUMBER OF OTHER DUCTS: 4
TYPICAL DUCT BANK DIMENSIONS: 105 in Wide X 33 in High

CIVIL WORKS

ITEM NO.	ITEM	UNIT	QUANTITY	MATERIAL UNIT PRICE	MATERIAL COST	LABOR UNIT PRICE	LABOR COST	TOTAL COST
C01	Trench Excavation	L.F.	4,532	$ 27.16	$ 123,092.83	$ 139.94	$ 634,208.08	$ 757,300.91
C02	Rock Excavation (Trench)	L.F.	4,532	$ -	$ -	$ -	$ -	$ -
C03	Duct Bank	L.F.	4,532	$ 213.96	$ 969,666.72	$ 345.36	$ 1,565,171.52	$ 2,534,838.24
C04	Fluidized Thermal Backfill (FTB)	L.F.	4,532	$ -	$ -	$ -	$ -	$ -
C05	Native Soil Backfill	L.F.	4,532	$ -	$ -	$ 64.57	$ 292,631.24	$ 292,631.24
C06	Pavement Restoration	L.F.	0	$ -	$ -	$ -	$ -	$ -
C07	Steel Plating	L.F.	0	$ -	$ -	$ -	$ -	$ -
C08	Traffic Signal Loop Detector Repair	Ea.	0	$ -	$ -	$ -	$ -	$ -
C09	Splice Vaults	Ea.	18	$ 37,882.91	$ 681,892.38	$ -	$ -	$ 681,892.38
C10	Splice Vault Excavation	Ea.	18	$ 14,223.09	$ 256,015.62	$ 33,022.14	$ 594,398.52	$ 850,414.14
C11	Rock Excavation (Vault)	Ea.	18	$ -	$ -	$ -	$ -	$ -
C12	Grounding System (civil)	L.S.	1	$ 106,437.89	$ 106,437.89	$ 106,437.89	$ 106,437.89	$ 212,875.78
C13	Communication Handholes	Ea.	6	$ 4,380.16	$ 26,280.96	$ 6,570.24	$ 39,421.44	$ 65,702.40
C14	Conduit Proofing (Civil)	L.S.	1	$ 55,190.01	$ 55,190.01	$ 386,330.12	$ 386,330.12	$ 441,520.13
C15	Substation Termination Structures	Ea.	3	$ 10,619.08	$ 31,857.24	$ 12,277.74	$ 36,833.22	$ 68,690.46
C16	OH to UG Termination Structures	Ea.	0	$ -	$ -	$ -	$ -	$ -
C17	Clearing and Grubbing	L.F.	3,290	$ 14.53	$ 47,803.70	$ 17.05	$ 56,094.50	$ 103,898.20
C18	Loam and Seed	S.F.	164,500	$ 0.28	$ 46,060.00	$ 0.28	$ 46,060.00	$ 92,120.00
C19	Horizontal Directional Drill	L.F.	4,200	$ 2,310.18	$ 9,702,756.00	$ 1,905.10	$ 8,001,420.00	$ 17,704,176.00
C20	Jack & Bore	L.F.	0	$ -	$ -	$ -	$ -	$ -
C21	Traffic Control, Flagger & Police (Civil)	L.S.	0	$ -	$ -	$ -	$ -	$ -
C22	Construction Staking	L.F.	8,900	$ -	$ -	$ 1.63	$ 14,507.00	$ 14,507.00
C23	Contaminated Material Testing	L.F.	8,900	$ 2.19	$ 19,491.00	$ 19.72	$ 175,508.00	$ 194,999.00
C24	Contaminated Material Disposal	L.S.	0	$ -	$ -	$ -	$ -	$ -
C25	Utility Relocation (known and unknown)	L.S.	0	$ -	$ -	$ -	$ -	$ -
C26	Dewatering	L.S.	1	$ 501,875.64	$ 501,875.64	$ 926,488.43	$ 926,488.43	$ 1,428,364.07
C27	Other (Provide a Description)	Ea.	0	$ -	$ -	$ -	$ -	$ -
C28	Other (Provide a Description)	Ea.	0	$ -	$ -	$ -	$ -	$ -
C29	Admin/Mob/De-Mob by Contractor (Civil)	L.S.	1	$ -	$ -	$ 254,439.30	$ 254,439.30	$ 254,439.30
				SUBTOTAL	**$ 12,568,419.99**		**$ 13,129,949.26**	**$ 25,698,369.25**
			CONTINGENCY	**40.00%**	**$ 5,027,367.99**		**$ 5,251,979.70**	**$ 10,279,347.70**
				TOTAL	**$ 17,595,787.98**		**$ 18,381,928.97**	**$ 35,977,716.95**

SUMMARY OF COSTS	UNIT	MATERIAL COST	LABOR COST	TOTAL COST
UNDERGROUND CABLE SYSTEM & ACCESSORIES	LOT	$ 26,200,000.00	$ 7,000,000.00	$ 33,200,000.00
CIVIL WORKS	LOT	$ 17,600,000.00	$ 18,400,000.00	$ 36,000,000.00
ENGINEERING	LOT	$ -	$ 2,000,000.00	$ 2,000,000.00
PROJECT TOTAL	**LOT**	**$ 43,800,000.00**	**$ 27,400,000.00**	**$ 71,200,000.00**
PROJECT TOTAL	**COST / MILE**	**$ 25,984,719.10**	**$ 16,255,280.90**	**$ 42,240,000.00**

Note: The individual unit rates provide a preliminary estimate of the associated costs prior to design. The unit rates may vary in construction bids and during construction due to placement of the contractors profit and contingency. The unit rates have been increased in an effort to anticipate unforeseen conditions and unknown market fluctuations. Although the unit rates may vary, the overall cost per mile is within the industry standard level of accuracy.

PROJECTED ESTMIATE OF PROJECT COST

CLIENT NAME:	ITC	VOLTAGE CLASS:	345 kV			
PROJECT NAME:	Stoneman Route	CABLE SIZE/TYPE:	3000 kcmil XLPE			
ROUTE LENGTH (ft):	8,900	NUMBER OF CIRCUITS:	1	PREPARED BY	N. Rochel	10/10/2014
ROUTE LENGTH (mile):	1.69	NUMBER OF CABLES PER PHASE:	2	CHECKED BY	N. Scott	10/10/2014

POWER CABLE DUCT SIZE:	8	NUMBER OF OTHER DUCTS:	4
NUMBER OF POWER CABLE DUCTS:	12	TYPICAL DUCT BANK DIMENSIONS:	105 in Wide X 33 in High

MAJOR ASSUMPTIONS

1) Unit Costs Based Upon 3% Escalation, Per Year from 2015 to 2020 for a Total of 16% Escalation
2) Contaminated Material Disposal based upon 0% of Total Civil Cost
3) Utility Relocations based upon 0% of Total Civil Cost
4) Traffic Control based upon assumed 0% of Route Length
5) Unit Costs based upon CCI (Combined) = 0.944
6) Unit Costs based upon Tax = 0%
7) Civil Costs based upon an average trenching excavation of 100 feet per day
8) Civil Costs based upon an average duct bank depth of cover of 3.9 feet
9) Civil Costs based upon an assumed Horizontal Directional Drill Length of 4200 feet
10) Civil Costs based upon an assumed Jack and Bore Length of 0 feet
11) Rock Removal based upon 0% of Civil Excavation Length

APPENDIX E - MVP TRIENNIAL REVIEW

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MTEP14 MVP Triennial Review

A 2014 review of the public policy, economic, and qualitative benefits of the Multi-Value Project Portfolio

September 2014

Contents

Executive Summary

The MTEP14 Triennial Multi-Value Project (MVP) Review provides an updated view into the projected economic, public policy, and qualitative benefits of the MVP Portfolio. The MTEP14 MVP Triennial Review's business case is on par with, if not stronger than MTEP11, providing evidence that the MVP criteria and methodology works as expected. Analysis shows that projected MISO North and Central Region benefits provided by the MVP Portfolio have increased since MTEP11, the analysis from which the Portfolio's business case was approved.

Analysis shows that projected benefits provided by the MVP Portfolio have increased since MTEP11

The MTEP14 results demonstrate the MVP Portfolio:

- Provides benefits in excess of its costs, with its benefit-to-cost ratio ranging from 2.6 to 3.9; an increase from the 1.8 to 3.0 range calculated in MTEP11
- Creates $13.1 to $49.6 billion in net benefits over the next 20 to 40 years, an increase of approximately 50 percent from MTEP11
- Enables 43 million MWh of wind energy to meet renewable energy mandates and goals through year 2028, an additional 2 million MWh from the MTEP11 year 2026 forecast
- Provides additional benefits to each local resource zone relative to MTEP11

Benefit increases are primarily congestion and fuel savings largely driven by natural gas price assumptions.

The fundamental goal of the MISO's planning process is to develop a comprehensive expansion plan that meets the reliability, policy, and economic needs of the system. Implementation of a value-based planning process creates a consolidated transmission plan that delivers regional value while meeting near-term system needs. Regional transmission solutions, or Multi Value Projects (MVPs), meet one or more of three goals:

- Reliably and economically enable regional public policy needs
- Provide multiple types of regional economic value
- Provide a combination of regional reliability and economic value

MISO conducted its first triennial MVP Portfolio review, per tariff requirement, for MTEP14. The MVP Review has no impact on the existing MVP Portfolio cost allocation. MTEP14 Review analysis is performed solely for informational purposes. The intent of the MVP Review is to use the review process and results to identify potential modifications to the MVP methodology and its implementation for projects to be approved at a future date.

The Triennial MVP Review has no impact on the existing MVP Portfolio cost allocation. The intent of the MVP Review is to identify potential modifications to the MVP methodology for projects to be approved at a future date.

The MVP Review uses stakeholder-vetted MTEP14 models and makes every effort to follow procedures and assumptions consistent with the MTEP11 analysis. Metrics that required any changes to the benefit valuation due to changing tariffs, procedures or conditions are highlighted. Consistent with MTEP11, the MTEP14 MVP Review assesses the benefits of the entire MVP Portfolio and does not differentiate between facilities currently in-service and those still being planned. Because the MVP Portfolio's costs are allocated solely to the MISO North and Central Regions, only MISO North and Central Region benefits are included in the MTEP14 MVP Triennial Review.

Public Policy Benefits

The MTEP14 MVP Review reconfirms the MVP Portfolio's ability to deliver wind generation, in a cost-effective manner, in support of MISO States' renewable energy mandates. Renewable Portfolio Standards assumptions[1] have not changed since the MTEP11 analysis.

Updated analyses find that 10.5 GW of year 2023 dispatched wind would be curtailed in lieu of the MVP Portfolio, which extrapolates to 56 percent of the 2028 full RPS energy. MTEP11 analysis showed that 63 percent of the year 2026 full RPS energy would be curtailed without the installation of the MVP Portfolio. The MTEP14 calculated reduction in curtailment as a percentage of RPS has decreased since MTEP11, primarily because post-MTEP11 transmission upgrades are represented and the actual physical location of installed wind turbines has changed slightly since the 2011 forecast.

In addition to allowing energy to not be curtailed, analyses determined that 4.3 GW of wind generation in excess of the 2028 requirements is enabled by the MVP Portfolio. MTEP11 analysis determined that 2.2 GW of additional year 2026 generation could be sourced from the incremental energy zones. The results are the essentially the same for both analyses as the increase in wind enabled from MTEP 2011 is primarily attributed to additional load growth. The MTEP 2011 analysis was performed on a year 2026 model and MTEP 2014 on year 2028.

When the results from the curtailment analyses and the wind enabled analyses are combined, MTEP 2014 results show the MVP Portfolio enables a total of 43 million MWh of renewable energy to meet the renewable energy mandates through 2028. MTEP 2011 showed the MVP Portfolio enabled a similar level renewable energy mandates – 41 million MWh through 2026.

[1] Assumptions include Renewable Portflio Standard levels and fulfillment methods

Economic Benefits

MTEP14 analysis shows the Multi-Value Portfolio creates $21.5 to $66.8 billion in total benefits to MISO North and Central Region members (Figure E-1). Total portfolio costs have increased from $5.56 billion in MTEP11 to $5.86 billion in MTEP14. Even with the increased portfolio cost estimates, the increased MTEP14 congestion and fuel savings and transmission line losses benefit forecasts result in portfolio benefit-to-cost ratios that have increased since MTEP11.

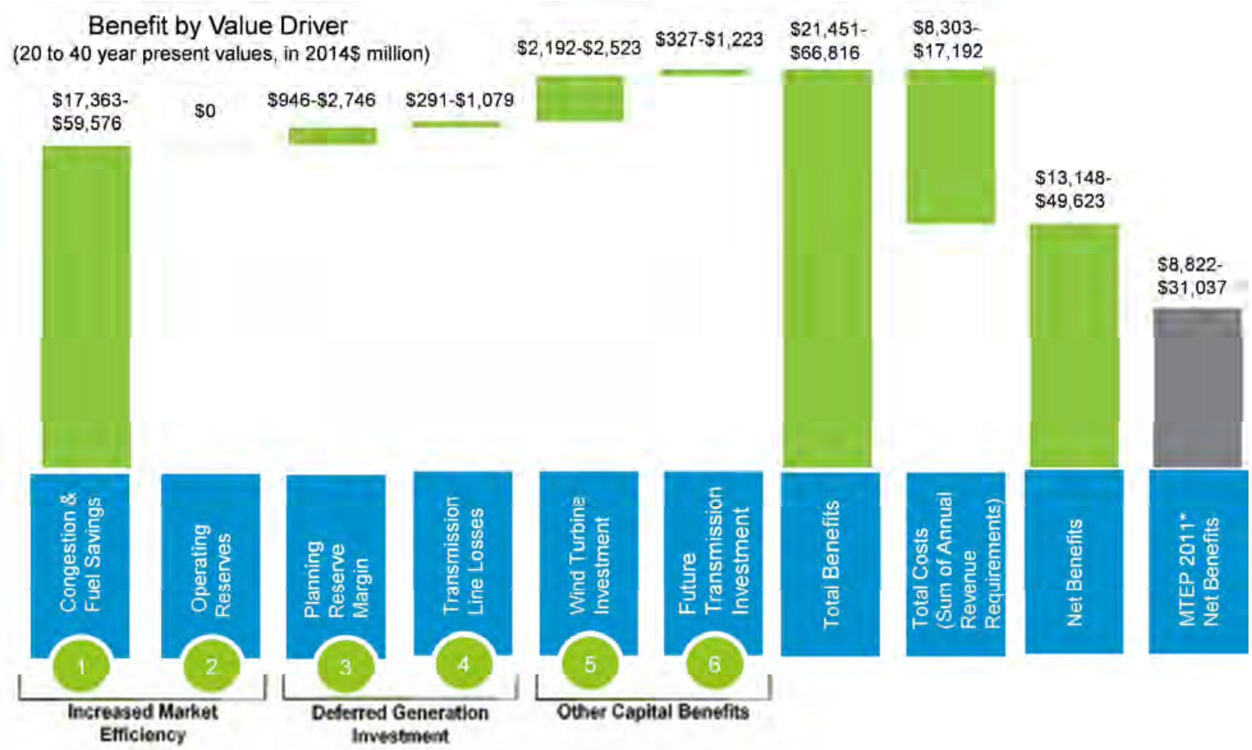

Figure E-1: MVP Portfolio Economic Benefits from MTEP14 MVP Triennial Review

The bulk of the increase in benefits is due to an increase in the assumed natural gas price forecast in MTEP14 compared to MTEP11. In addition, the MTEP15 natural gas assumptions, which will be used in the MTEP15 MVP Portfolio Limited Review, are lower than the MTEP14 forecast. Under each of the natural gas price assumption sensitivities, the MVP Portfolio is projected to provide economic benefits in excess of costs (Table E-1).

Natural Gas Forecast Assumption	Total NPV Portfolio Benefits ($M-2014)	Total Portfolio Benefit to Cost Ratio
MTEP14 – MVP Triennial Review	21,451 – 66,816	2.6 – 3.9
MTEP11	17,875 – 54,186	2.2 – 3.2
MTEP15	18,472 – 56,670	2.2 – 3.3

Table E-1: MVP Portfolio Economic Benefits - Natural Gas Price Sensitivities[2]

Increased Market Efficiency

The MVP Portfolio allows for a more efficient dispatch of generation resources, opening markets to competition and spreading the benefits of low-cost generation throughout the MISO footprint. The MVP Review estimates that the MVP Portfolio will yield $17 to $60 billion in 20- to 40-year present value adjusted production cost benefits to MISO's North and Central Regions – an increase of up to 40 percent from the MTEP11 net present value.

An increase in the natural gas price escalation rate, increases congestion and fuel savings benefits by approximately 30 percent in MTEP14 compared to MTEP11

The increase in congestion and fuel savings benefits relative to MTEP11 is primarily due to an increase in the out-year natural gas price forecast assumptions (Figures E-2). The increased escalation rate causes the assumed natural gas price to be higher in MTEP14 compared to MTEP11 in years 2023 and 2028 - the two years from which the congestion and fuel savings results are based (Figure E-2).

The MVP Portfolio allows access to wind units with a nearly $0/MWh production cost and primarily replaces natural gas units in the dispatch, which makes the MVP Portfolio's fuel savings benefit projection directly related to the natural gas price assumption. A sensitivity applying the MTEP11 Low BAU gas prices assumption to the MTEP14 MVP Triennial Review model showed a 29.3 percent reduction in the annual year 2028 MTEP14 congestion and fuel savings benefits (Figure E-2).

Post MTEP14 natural gas price forecast assumptions are more closely aligned with those of MTEP11 (Figure E-2). A sensitivity applying the MTEP15 BAU natural gas prices to the MTEP14 analysis showed a 21.7 percent reduction in year 2028 MTEP14 adjusted production cost savings.

[2] Sensitivity performed applying MTEP11/MTEP15 natural gas price to the MTEP14 congestion and fuel savings model. All other benefit valuations unchanged from the MTEP14 MVP Triennial Review.

MISO membership changes have little net effect on benefit-to-cost ratios. The exclusion of Duke Ohio/Kentucky and First Energy from the MISO pool decreases benefits by 7.4 percent relative to the MTEP14 total benefits; however, per Schedule 39, 6.3 percent of the total portfolio costs are allocated to Duke Ohio/Kentucky and First Energy, thus there is a minimal net effect to the benefit-to-cost ratio.

The MVP Portfolio is solely located in the MISO North and Central Regions and therefore, the inclusion of the MISO South Region to the MISO dispatch pool has little effect on MVP-related production cost savings (Figure E-2).

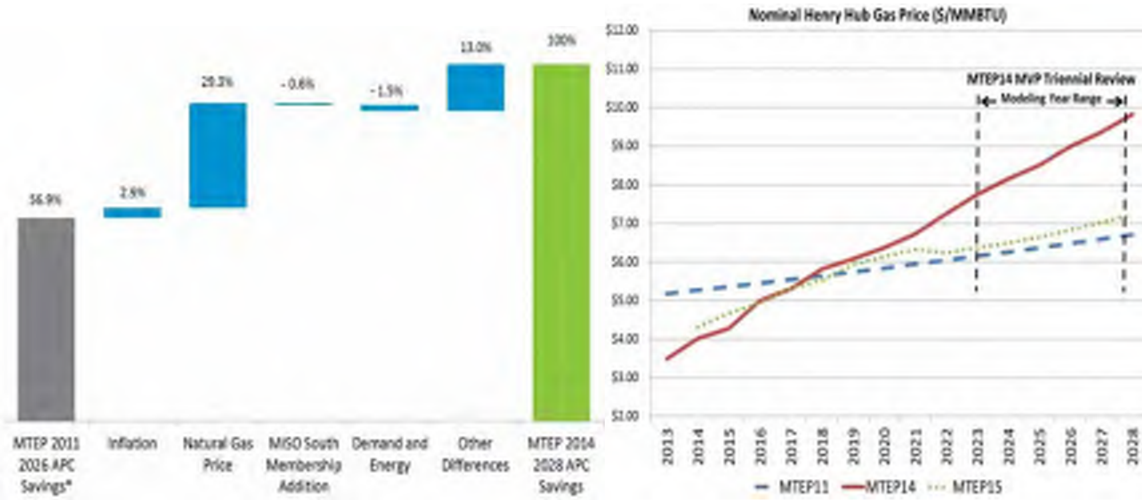

Figure E-2: Breakdown of Congestion and Fuel Savings Increase from MTEP11 to MTEP14

In addition to the energy benefits quantified in the production cost analyses, the 2011 business case showed the MVP Portfolio also reduces operating reserve costs. The MVP Review does not estimate a reduced operating reserve benefit in 2014, as a conservative measure, because of the decreased number of days a reserve requirement was calculated since the MTEP11 analysis.

Deferred Generation Investment

The addition of the MVP Portfolio to the transmission network reduces overall system losses, which also reduces the generation needed to serve the combined load and transmission line losses. Using current capital costs, the deferment from loss reduction equates to a MISO North and Central Regions' savings of $291 to $1,079 million - nearly double the MTEP11 values. Tightening reserve margins, from an additional approximate 12 GW of expected coal generation retirements, have increased the value of deferred capacity from transmission losses in MTEP14. In addition to the tighter reserve margins, a one year shift forward in MVP Portfolio in-service dates since MTEP11 has increased benefits by an additional 30 percent.

The MTEP14 MVP Review estimates the MVPs annually defer more than $900 million in future capacity expansion by increasing capacity import limits, thus reducing the local clearing requirements of the system planning reserve margin requirement. In the 2013 planning year, MISO and the Loss of Load Expectation Working Group improved the methodology that establishes the MISO Planning Reserve Margin Requirement (PRMR). Previously, and in the MTEP11 analysis, MISO developed a MISO-wide

PRMR with an embedded congestion component. The post 2013 planning year methodology no longer uses a congestion component, but rather calculates a more granular zonal PRMR and a local clearing requirement based on the zonal capacity import limit. While terminology and methods have changed between MTEP11 and MTEP14, both calculations capture the same benefit of increased capacity sharing across the MISO region provided by the MVPs; as such, MTEP14 and MTEP11 provide benefit estimates of similar magnitudes.

Other Capital Benefits

Benefits from the optimization of wind generation siting and the elimination of need for some future baseline reliability upgrades remain at similar levels to those estimated in MTEP11. A slight increase in MTEP14 wind turbine investment benefits relative to MTEP11 benefits is from an update to the wind requirement forecast and wind enabled calculations.

Consistent with MTEP11, the MTEP14 MVP Triennial Review shows that the MVP Portfolio eliminates the need for $300 million in future baseline reliability upgrades. The magnitude of estimated benefits is in close proximity to the estimate from MTEP11; however, the actual identified upgrades have some differences because of load growth, generation dispatch, wind levels and transmission upgrades.

Distribution of Economic Benefits

The MVP Portfolio provides benefits across the MISO footprint in a manner that is roughly equivalent to costs allocated to each local resource zone (Figure E-3). The MVP Portfolio's benefits are at least 2.3 to 2.8 times the cost allocated to each zone. As a result of changing tariffs/business practices (planning reserve margin requirement and baseline reliability project cost allocation), load growth, and wind siting, zonal benefit distributions have changed slightly since MTEP11.

> Benefit-to-cost ratios have increased in all zones since MTEP11

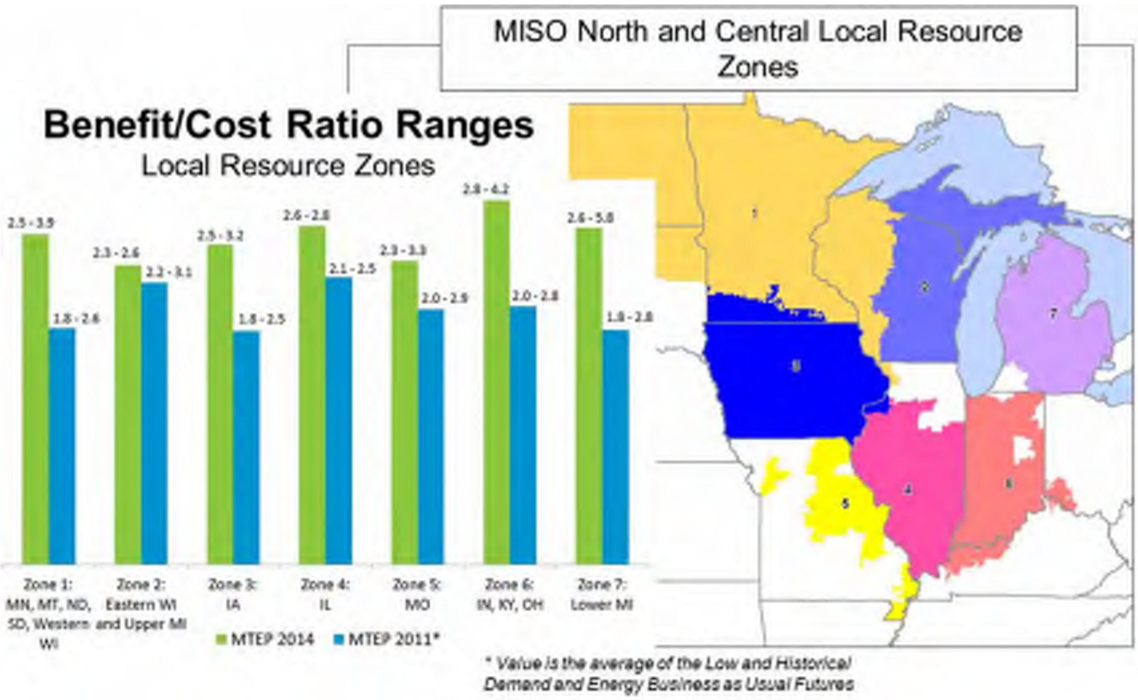

Figure E-3: MVP Portfolio Total Benefit Distribution

Qualitative and Social Benefits

Aside from widespread economic and public policy benefits, the MVP Portfolio also provides benefits based on qualitative or social values. The MVP Portfolio:

- Enhances generation flexibility
- Creates a more robust regional transmission system that decreases the likelihood of future blackouts
- Increases the geographic diversity of wind resources that can be delivered, increasing the average wind output available at any given time
- Supports the creation of thousands of local jobs and billions in local investment
- Reduces carbon emissions by 9 to 15 million tons annually

These benefits suggest quantified values from the economic analysis may be conservative because they do not account for the full potential benefits of the MVP Portfolio.

Going Forward

MTEP15 and MTEP16 will feature a Limited Review of the MVP Portfolio benefits. Each Limited Review will provide an updated assessment of the congestion and fuel savings using the latest portfolio costs and in-service dates. Beginning in MTEP17, in addition to the Full Triennial Review, MISO will perform an assessment of the congestion costs, energy prices, fuel costs, planning reserve margin requirements, resource interconnections and energy supply consumption based on historical data.

1. Study Purpose and Drivers

Beginning in MISO Transmission Expansion Plan (MTEP) 2014, MISO has a triennial tariff requirement to conduct a full review of the Multi-Value Project (MVP) Portfolio benefits. The MTEP14 Triennial MVP Review provides an updated view into the projected economic, public policy and qualitative benefits of the MTEP11 approved MVP Portfolio.

The MVP Triennial Review has no impact on the existing Multi-Value Project Portfolio cost allocation. The study is performed solely for information purposes.

The MVP Review has no impact on the existing MVP Portfolio cost allocation. Analysis is performed solely for information purposes. The intent of the MVP Reviews is to use the review process and results to identify potential modifications to the MVP methodology and its implementation for projects to be approved at a future date. The MVP Reviews are intended to verify if the MVP criteria and methodology is working as expected.

The MVP Review uses stakeholder vetted models and makes every effort to follow consistent procedures and assumptions as the Candidate MVP, also known as the MTEP11 analysis. Any metrics that required changes to the benefit valuation due to revised tariffs, procedures or conditions are highlighted throughout the report. Wherever practical, any differences between MTEP14 and MTEP11 assumptions are highlighted and the resulting differences quantified.

Consistent with MTEP11, the MTEP14 MVP Review assesses the benefits of the entire MVP Portfolio and does not differentiate between facilities currently in-service and those still being planned. The latest MVP cost estimates and in-service dates are used for all analyses.

2. Study Background

The MVP Portfolio (Figure 2-1 and Table 2-1) represents the culmination of more than eight years of planning efforts to find a cost-effective regional transmission solution that meets local energy and reliability needs.

In MTEP11, the MVP Portfolio was justified based its ability to:

- Provide benefits in excess of its costs under all scenarios studied, with its benefit-to-cost ratio ranging from 1.8 to 3.0.
- Maintain system reliability by resolving reliability violations on approximately 650 elements for more than 6,700 system conditions and mitigating 31 system instability conditions.
- Enable 41 million MWh of wind energy per year to meet renewable energy mandates and goals.
- Provide an average annual value of $1,279 million over the first 40 years of service, at an average annual revenue requirement of $624 million.
- Support a variety of generation policies by using a set of energy zones which support wind, natural gas and other fuel sources.

Figure 2-1: MVP Portfolio[3]

3 Figure for illustrative purposes only. Final line routing may differ.

ID	Project	State	Voltage (kV)
1	Big Stone–Brookings	SD	345
2	Brookings, SD–SE Twin Cities	MN/SD	345
3	Lakefield Jct.–Winnebago–Winco–Burt Area & Sheldon–Burt Area–Webster	MN/IA	345
4	Winco–Lime Creek–Emery–Black Hawk–Hazleton	IA	345
5	LaCrosse–N. Madison–Cardinal & Dubuque Co–Spring Green–Cardinal	WI	345
6	Ellendale–Big Stone	ND/SD	345
7	Adair–Ottumwa	IA/MO	345
8	Adair–Palmyra Tap	MO/IL	345
9	Palmyra Tap–Quincy–Merdosia–Ipava & Meredosia–Pawnee	IL	345
10	Pawnee–Pana	IL	345
11	Pana–Mt. Zion–Kansas–Sugar Creek	IL/IN	345
12	Reynolds–Burr Oak–Hiple	IN	345
13	Michigan Thumb Loop Expansion	MI	345
14	Reynolds–Greentown	IN	765
15	Pleasant Prairie–Zion Energy Center	WI/IL	345
16	Fargo-Galesburg–Oak Grove	IL	345
17	Sidney–Rising	IL	345

Table 2-1: MVP Portfolio

In 2008, the adoption of Renewable Portfolio Standards (RPS) (Figure 2-2) across the MISO footprint drove the need for a more regional and robust transmission system to deliver renewable resources from often remote renewable energy generators to load centers.

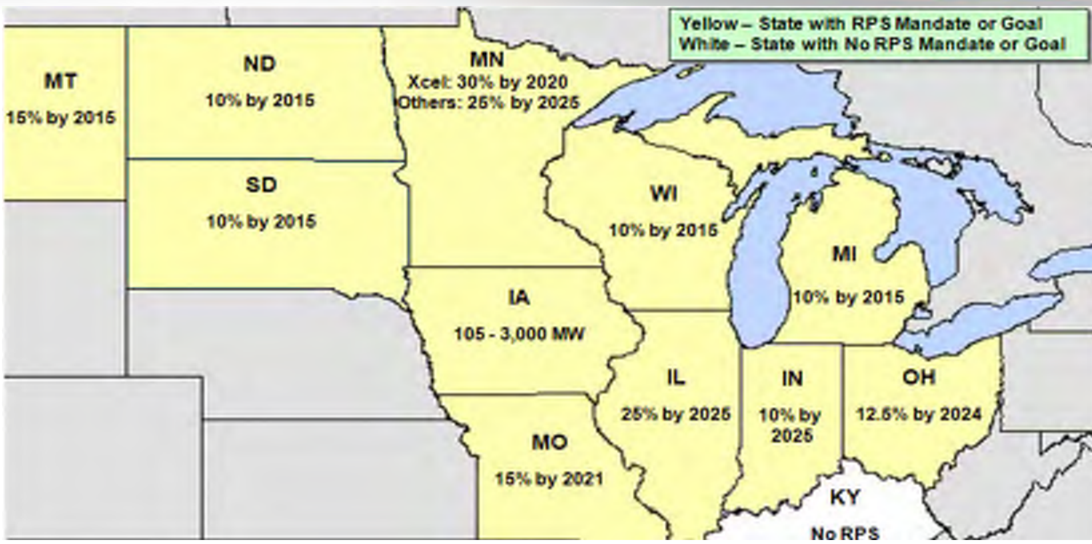

Figure 2-2: Renewable Portfolio Standards - 2011

Beginning with the MTEP 2003 Exploratory Studies, MISO and stakeholders began to explore how to best provide a value-added regional planning process to complement the local planning of MISO members. These explorations continued in later MTEP cycles and in specific targeted studies. In 2008, MISO, with the assistance of state regulators and industry stakeholders such as the Midwest Governor's Association (MGA), the Upper Midwest Transmission Development Initiative (UMTDI) and the Organization of MISO States (OMS), began the Regional Generation Outlet Study (RGOS) to identify a set of value-based transmission projects necessary to enable Load Serving Entities (LSEs) to meet their RPS mandates.

While much consideration was given to wind capacity factors when developing the energy zones utilized in the RGOS and MVP Portfolio analyses, the zones were chosen with consideration of more factors than wind capacity. Existing infrastructure, such as transmission and natural gas pipelines, also influenced the selection of the zones. As such, although the energy zones were created to serve the renewable generation mandates, they could be used for a variety of different generation types to serve various future generation policies.

Common elements between the RGOS results and previous reliability, economic and generation interconnection analyses were identified to create the 2011 candidate MVP portfolio. This portfolio represented a set of "no regrets" projects that were believed to provide multiple kinds of reliability and economic benefits under all alternate futures studied. Over the course of the MVP Portfolio analysis, the Candidate MVP Portfolio was refined into the portfolio that was approved by the MISO Board of Directors in MTEP11.

The MVP Portfolio enables the delivery of the renewable energy required by public policy mandates in a manner more reliable and economical than without the associated transmission upgrades. Specifically, the portfolio mitigates approximately 650 reliability constraints under 6,700 different transmission outage conditions for steady state and transient conditions under both peak and shoulder load scenarios. Some of these conditions could be severe enough to cause cascading outages on the system. By mitigating these constraints, approximately 41 million MWh per year of renewable generation can be delivered to serve the MISO state renewable portfolio mandates.

Under all future policy scenarios studied, the MVP Portfolio delivered widespread regional benefits to the transmission system. To use conservative projections relating only to the state renewable portfolio mandates, only the Business as Usual future was used in developing the candidate MVP business case.

The projected benefits are spread across the system, in a manner commensurate with costs (Figure 2-3).

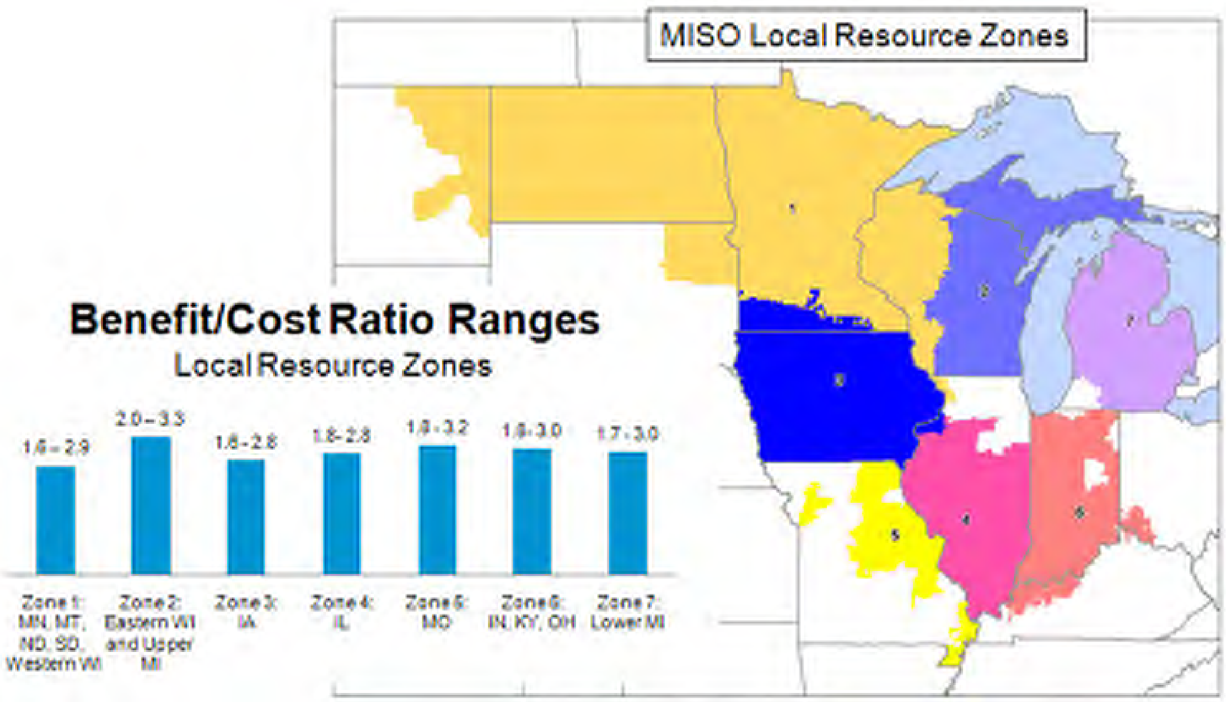

Figure 2-3: MTEP11 MVP Portfolio Benefit Spread

Taking into account the significant economic value created by the portfolio, the distribution of these value, and the ability of the portfolio to meet MVP criteria through its reliability and public policy benefits, the MVP Portfolio was approved by the MISO Board of Directors in MTEP11.

3. MTEP14 Review Model Development

The MTEP14 MVP Triennial Review uses MTEP14 economic models as the basis for the analysis. The MTEP14 economic models were developed in 2012 and 2013 with topology based on the MTEP13 series MISO powerflow models. To maintain consistency between economic and reliability models, MVP Triennial Review reliability analysis was performed with MTEP13 vintage powerflows.

MTEP14 economic models, developed in 2013, are the basis for the MTEP14 MVP Triennial Review.

The MTEP models were developed through an open stakeholder process and vetted through the MISO Planning Advisory Committee. The details of the economic and reliability models used in the MTEP14 MVP Triennial Review are described in the following sections. The MTEP models are publically available via the MISO FTP site with proper licenses and confidentiality agreements.

3.1 Economic Models

The MVP Benefit Review uses PROMOD IV as the primary tool to evaluate the economic benefits of the MVP Portfolio. The MTEP14 MISO North/Central economic models, stakeholder vetted in 2013, are used as the basis for the MTEP14 Review. The same economic models are used in the MTEP14 North/Central Market Congestion Planning Study, formerly known as the Market Efficiency Planning Study.

Consistent with the MTEP11 MVP business case[4], the MTEP14 Review relies solely on the Business as Usual (BAU) future.

The MTEP14 BAU future is most representative of the average of the MTEP11 Low and High BAU futures

The MTEP14 BAU future is defined as: A *status quo environment that assumes a slow recovery from the economic downturn and its impact on demand and energy projections. This scenario assumes existing standards for renewable mandates and little or no change in environmental legislation.*

MTEP11 had two definitions of the BAU future – a typical MTEP Planning Advisory Committee defined future and a slightly modified version from the Cost Allocation and Regional Planning (CARP) process. For the purposes of this report the two MTEP11 BAU futures are identified by their load growth rates – one with a slightly higher baseline growth rate and one with a slightly lower growth rate (Table 3-1). Based on current definitions, the MTEP14 BAU future's demand and energy growth rate is closest to the MTEP11 BAU-Low Demand and Energy, but the natural gas price is closest to the MTEP11 BAU-High Demand and Energy (Table 3-1). The MTEP14 BAU future is most representative of the average of the MTEP11 Low and High BAU futures; as such, all MTEP14 Triennial MVP Review results in this report will be compared to the arithmetic mean of the MTEP11 Low BAU and High BAU results.

[4] The Candidate MVP Analysis provided results for information purposes under all MTEP11 future scenarios; however, the business case only used the Business as Usual futures.

		MTEP14 BAU	MTEP11 Low BAU	MTEP11 High BAU
Demand and Energy	**Demand Growth Rate**	1.06 percent	1.26 percent	1.86 percent
	Energy Growth Rate	1.06 percent	1.26 percent	1.86 percent
Natural Gas Forecast[5]	**Starting Point**	3.48 $/MMBTU	5 $/MMBTU	5 $/MMBTU
	2018 Price	5.81 $/MMBTU	5.64 $/MMBTU	6.11 $/MMBTU
	2023 Price	7.76 $/MMBTU	6.15 $/MMBTU	7.05 $/MMBTU
	2028 Price	9.83 $/MMBTU	6.70 $/MMBTU	8.14 $/MMBTU
Fuel Cost (Starting Price)	**Oil**	Powerbase Default	Powerbase Default	Powerbase Default
	Coal	Powerbase Default	Powerbase Default	Powerbase Default
	Uranium	1.14 $/MMBTU	1.12 $/MMBTU	1.12 $/MMBTU
Fuel Escalations	**Oil**	2.50 percent	1.74 percent	2.91 percent
	Coal	2.50 percent	1.74 percent	2.91 percent
	Uranium	2.50 percent	1.74 percent	2.91 percent
Emission Costs	**SO2**	0	0	0
	NOx	0	0	0
	CO2	0	0	0
Other Variables	**Inflation**	2.50 percent	1.74 percent	2.91 percent
	Retirements	Known + EPA Driven Forecast MISO ~12,600 MW	Known Retirements MISO ~400 MW	Known Retirements MISO ~400 MW
	Renewable Levels	State Mandates	State Mandates	State Mandates
MISO Footprint		Duke and FE in PJM; includes MISO South	MTEP11	MTEP11

Table 3-1: MTEP14 and MTEP11 Key PROMOD Model Assumptions

Models include all publically announced retirements as well as 12,600 MW of baseline generation retirements driven by environmental regulations. Unit-specific retirements are based on a MISO Planning Advisory Committee vetted generic process as the results of the MISO Asset Owner EPA Survey are confidential.

MISO footprint changes since the MTEP11 analysis are modeled verbatim to current[6] configurations, i.e. Duke Ohio/Kentucky and First Energy are modeled as part of PJM and the MISO pool includes the MISO South Region. While the MISO pool includes the South Region, only the MISO North and Central Region benefits are being included in the MTEP14 MVP Triennial Review's business case.

[5] MTEP11 and MTEP13 use different natural gas escalation methodologies

[6] As of July 2014

MTEP13 powerflow models for the year 2023 are used as the base transmission topology for the MVP Triennial Review. Because there are no significant transmission topology changes known between years 2023 and 2028, the 2028 production cost models use the same transmission topology as 2023.

PROMOD uses an “event file” to provide pre- and post-contingent ratings for monitored transmission lines. The latest MISO Book of Flowgates and the NERC Book of Flowgates are used to create the event file of transmission constraints in the hourly security constrained model. Ratings and configurations are updated for out-year models by taking into account all approved MTEP Appendix A projects.

3.2 Capacity Expansion Models

The MTEP14 Triennial Review decreased transmission line losses benefit (Section 6.4) is monetized using the Electricity Generation Expansion Analysis System (EGEAS) model. EGEAS is designed by the Electric Power Research Institute to find the least-cost integrated resource supply plan given a demand level. EGEAS expansions include traditional supply-side resources, demand response, and storage resources. The EGEAS model is used annually in MISO’s MTEP process to identify future capacity needs beyond the typical five-year project-planning horizon.

The EGEAS optimization process is based on a dynamic programming method where all possible resource addition combinations that meet user-specified constraints are enumerated and evaluated. The EGEAS objective function minimizes the present value of revenue requirements. The revenue requirements include both carrying charges for capital investment and system operating costs.

MTEP14 Triennial MVP Review analysis was performed using the MTEP14 BAU future, developed in 2012 and 2013. The capacity model shares the same input database and assumptions as the economic models (Section 3.1).

3.3 Reliability Models

To maintain consistency between economic and reliability models, MTEP13 vintage MISO powerflow models are used as the basis for the MTEP14 MVP Triennial Review reliability analysis. The MTEP14 economic models are developed with topology based on the MTEP13 MISO powerflow models. Siemens PTI Power System Simulator for Engineering (PSS E) and Power System Simulator for Managing and Utilizing System Transmission (PSS MUST) is utilized for the MTEP14 MVP Triennial Review.

Powerflow models are built using MISO's Model on Demand (MOD) model data repository. Models include approved MTEP Appendix A projects and the Eastern Interconnection Reliability Assessment Group (ERAG) Multiregional Modeling Working Group (MMWG) modeling for the external system. Load and generation profiles are seasonal dependent (Table 3-2). MTEP powerflow models have wind dispatched at 90 percent connected capacity in Shoulder models and 20 percent in the Summer Peak.

Additional wind units were added to the MTEP14 MVP Triennial Review cases to meet renewable portfolio standards.

Demand is grown in the Future Transmission Investment case using the extrapolated growth rate between the year 2018 MTEP13 Summer Peak case and the 2023 MTEP13 Summer Peak Case.

Analysis	Model(s)
Wind Curtailment	2023 MTEP13 Shoulder
Wind Enabled	2023 MTEP13 Shoulder with Wind at 2028 Levels
Transmission Line Losses	2023 MTEP13 Summer Peak
Future Transmission Investment	2023 MTEP13 Summer Peak with Demand and Wind at 2033 Levels

Table 3-2: Reliability Models by Analysis

3.4 Capacity Import Limit Models

The MTEP13 series of MISO powerflow models updated for the 2014 Loss of Load Expectations (LOLE) study are used as the basis for the MTEP14 MVP Triennial Review capacity import limit analysis. Siemens Power Technology International Power System Simulator for Engineering (PSS E) and Power System Simulator for Managing and Utilizing System Transmission (PSS MUST) were utilized for the LOLE analyses, which produced results used in the MTEP14 MVP Triennial Review analysis.

Wind modeling and dispatch assumptions for LOLE studies were updated since completion of the 2014 LOLE analysis. These changes were applied to the MVP Triennial Review models so the Triennial analysis is using the up-to-date LOLE study methodology. Consistent with the current LOLE methodology, MISO wind dispatch was set at the wind capacity credit level. Applicable updates to generation retirements or suspensions were applied to the MTEP14 Triennial Review Models.

Zonal Local Clearing Requirements are calculated using the capacity import limits that are identified using PSS MUST transfer analysis. The MTEP14 MVP Triennial Review incorporates capacity import limits calculated using a year 2023 model both with and without the MVP Portfolio.

PSS MUST contingency files from Coordinated Seasonal Assessment (CSA) and MTEP[7] reliability assessment studies were used in the MTEP14 MVP Review (Table 3-3). Single-element contingencies in MISO and seam areas were evaluated in addition to submitted files.

Model	Contingency files used
2014-15 Planning Year	2013 Summer CSA
5-year-out peak	MTEP13 study

Table 3-3: Contingency files per model

PSS MUST subsystem files include source and sink definitions. The PSS MUST monitored file includes all facilities under MISO functional control and seam facilities 100 kV and above.

Additional details on the models used in the Planning Reserve Margin benefit estimation can be found in the 2014 Loss of Load Expectation Report.

3.5 Loss of Load Expectation Models

MISO utilizes the General Electric-developed Multi-Area Reliability Simulation (MARS) program to calculate the loss of load expectation for the applicable planning year. GE MARS uses a sequential Monte Carlo simulation to model a generation system and assess the system's reliability based on any number of interconnected areas. GE MARS calculates the annual LOLE for the MISO system and each Local Resource Zone (LRZ) by stepping through the year chronologically and taking into account generation, load, load modifying and energy efficiency resources, equipment forced outages, planned and maintenance outages, load forecast uncertainty and external support.

The 2014 planning year LOLE models, updated to include generation retirements, were the basis for the MTEP14 MVP Triennial Review models. Additional model details can be found in the 2014 Loss of Load Expectation Report.

[7] Refer to sections 4.3.4 and 4.3.6 of the Transmission Planning BPM for more information regarding MTEP PSS MUST input files. https://www.misoenergy.org/_layouts/MISO/ECM/Redirect.aspx?ID=19215

4. Project Costs and In-Service Dates

The MTEP14 MVP Triennial Review cost and in-service data is referenced from the MTEP Quarter One 2014 Report – dated April 11, 2014 (Figure 4-1).

MVP No.	Project Name	State	Estimated In Service Date[1]		Status		Cost[1]	
			MTEP Approved	Q1 2014	State Regulatory Status	Construction	MTEP Approved	Q1 2014
1	Big Stone-Brookings	SD	2017	2017	●	Pending	226.7	226.7
2	Brookings, SD-SE Twin Cities	MN/SD	2011-2015	2013-2015	●	Underway	738.4	640.9
3	Lakefield Jct. - Winnebago-Winco-Burt area & Sheldon-Burt Area-Webster	MN/IA	2015-2016	2016-2018	◑	Pending	550.4	541.1
4	Winco-Lime Creek-Emery-Black Hawk-Hazelton	IA	2015	2015-2018	◑	Pending	468.6	464.3
5	N. LaCrosse-N. Madison-Cardinal (a/k/a Badger-Coulee Project) & Dubuque Co.-Spring Green-Cardinal	WI/IA	2018-2020	2013-2018	◑	Pending	797.5	879.0
6	Big Stone South - Ellendale	ND/SD	2019	2019	◑	Pending	330.7	395.7
7	Adair-Ottumwa	IA/MO	2017-2020	2017-2018	○	Pending	152.3	178.2
8	Adair-Palmyra Tap	MO	2016-2018	2016-2018	○	Pending	112.8	108.1
9	Palmyra Tap-Quincy-Merdosia-Ipava & Meredosia-Pawnee	MO/IL	2016-2017	2016-2017	●	Pending	432.2	524.2
10	Pawnee-Pana	IL	2018	2016-2018	●	Pending	99.4	108.6
11	Pana-Mt. Zion-Kansas-Sugar Creek	IL/IN	2018-2019	2016-2019	●	Pending	318.4	356.2
12	Reynolds-Burr Oak-Hiple	IN	2019	2019	●	Pending	271.0	271.0
13	Michigan Thumb Loop Expansion	MI	2013-2015	2013-2015	●	Underway	510.0	510.0
14	Reynolds-Greentown	IN	2018	2018	●	Pending	245.0	328.7
15	Pleasant Prairie-Zion Energy Center	WI	2014	2013	●	Complete	28.8	33.0
16	Fargo-Galesburg-Oak Grove	IL	2014-2019	2016-2018	○	Pending	199.0	225.5
17	Sidney-Rising	IL	2016	2016	●	Pending	83.2	66.3
						Totals:	*5,564*	*5,858*

Figure 4-1: MVP Cost and In-Service Dates – MTEP11 version MTEP14[8]

For MTEP14, all benefit calculations start in year 2020, the first year when all projects are in service. For MTEP11, year 2021 was the first year when the MVP Portfolio was expected in-service.

The costs contained within the MTEP database are in nominal, as spent, dollars. Nominal dollars are converted to real dollars for net present value benefit cost calculations using the facility level in-service dates. To obtain a real value in 2020 dollars from the nominal values in the MTEP database each facility's cost escalates using a 2.5 percent inflation rate from in-service year to 2020.

A load ratio share was developed to allocate the benefit-to-cost ratios in each of the seven MISO North/Central local resource zones (LRZ). Load ratios are based off the actual 2010 energy withdrawals with an applied Business as Usual (BAU) MTEP growth rate applied.

[8] All costs in nominal dollars.

MTEP14 MVP Triennial Review benefit-to-cost calculations only include direct benefits to MISO North and Central members. Therefore it is necessary to exclude costs paid by parties outside of MISO via exports and costs paid by Duke Ohio/Kentucky and First Energy pursuant to Schedule 39. Consistent with MTEP11, export revenue is estimated as 1.94 percent of the total MVP Portfolio costs. Schedule 39 is estimated as 6.24 percent of the total portfolio costs. MISO South Region benefits are excluded from all estimations.

Total costs are annualized using the MISO North/Central-wide average Transmission Owner annual charge rate/revenue requirement. Consistent with the MTEP11 analysis and other Market Efficiency Projects, the MTEP14 MVP Triennial Review assumes that costs start in 2020, such as year one of the annual charge rate is 2020 and construction work in progress (CWIP) is excluded from the total costs.

5. Portfolio Public Policy Assessment

The MTEP14 MVP Triennial Review redemonstrates the MVP Portfolio's ability to enable the renewable energy mandates of the footprint. Renewable Portfolio Standards assumptions[9] have not changed since the MTEP11 analysis and any changes in capacity requirements are solely attributed to load forecast changes and the actual installation of wind turbines.

> The MVP portfolio enables a total of 43 million MWh of renewable energy to meet the renewable energy mandates and goals through 2028.

This analysis took place in two parts. The first part demonstrated the wind needed to meet renewable energy mandates would be curtailed but for the approved MVP Portfolio. The second demonstrated the additional renewable energy, above the mandate, that will be enabled by the portfolio. This energy could be used to serve mandated renewable energy needs beyond 2028, as most of the mandates are indexed to grow with load.

5.1 Wind Curtailment

A wind curtailment analysis was performed to find the percentage of mandated renewable energy that could not be enabled but for the MVP Portfolio.
The shift factors for all wind machines were calculated on the worst NERC Category B and C contingency constraints of each monitored element identified in 2011 as mitigated by the MVP Portfolio. The 488 monitored element/contingent element pairs (flowgates) consisted of 233 Category B and 255 Category C contingency events. These constraints were taken from a blend of projected 2023 and 2028 wind levels with the final calculations based on the projected 2028 wind levels.

Since the majority of the MISO West Region MVP justification was based on 2023 wind levels, it was assumed that any incremental increase to reach the 2028 renewable energy mandated levels would be curtailed. A transfer of the 279 wind units, sourced from both committed wind units and the Regional Generation Outlet Study (RGOS) energy zones to the system sink, Browns Ferry in the Tennessee Valley Authority, was used to develop the shift factors on the flowgates.

Linear optimization logic was used to minimize the amount of wind curtailed while reducing loadings to within line capacities. Similar to the MTEP11 justifications, a target loading of less than or equal to 95 percent was used. Fifty-four of the 488 flowgates could not achieve the target loading reduction, and their targets were relaxed in order to find a solution.

[9] Assumptions include Renewable Portflio Standard levels and fulfillment methods

The algorithm found that 9,315 MW of year 2023 dispatched wind would be curtailed. It was also assumed that any additional wind in the West to meet Renewable Portfolio Standard (RPS) levels would be curtailed. This equated to 1,212 MW of dispatched wind. As a connected capacity, 11,697 MW would be curtailed, as the wind is modeled at 90 percent of its nameplate. The MTEP14 results are similar in magnitude to MTEP11, which found that 12,201 MW of connected wind would be curtailed through 2026.

The curtailed energy was calculated to be 32,176,153 MWh from the connected capacity multiplied by the capacity factor times 8,760 hours of the year. A MISO-wide per-unit capacity factor was averaged from the 2028 incremental wind zone capacities to 31.4 percent. Comparatively, the full 2028 RPS energy is 57,019,978 MWh. As a percentage of the 2028 full RPS energy, 56.4 percent would be curtailed in lieu of the MVP Portfolio. MTEP11 analysis showed that 63 percent of the year 2026 full RPS energy would be curtailed without the installation of the MVP Portfolio. The MTEP14 calculated reduction in curtailment as a percentage of RPS has decreased since MTEP11, primarily because post-MTEP11 transmission upgrades are represented and the actual physical location of installed wind turbines has changed slightly since the 2011 forecast.

5.2 Wind Enabled

Additional analyses were performed to determine the incremental wind energy in excess of the 2028 requirements enabled by the approved MVP Portfolio. This energy could be used to meet renewable energy mandates beyond 2028, as most of the state mandates are indexed to grow with load. A set of three First Contingency Incremental Transfer Capability (FCITC) analyses were run on the 2028 model to determine how much the wind in each zone could be ramped up prior to additional reliability constraints occurring.

Transfers were sourced from the wind zones in proportion to their 2028 maximum output. All Bulk Electric System (BES) elements in the MISO system were monitored, with constraints being flagged at 100 percent of the applicable ratings. All single contingencies in the MISO footprint were evaluated during the transfer analysis. This transfer was sunk against MISO, PJM, and SPP units (Table 5-1). More specifically, the power was sunk to the smallest units in each region, with the assumption that these small units would be the most expensive system generation.

Region	Sink
MISO	33 percent
PJM	44 percent
SPP	23 percent

Table 5-1: Transfer Sink Distribution

MTEP14 analysis determined that 4,335 MW of additional year 2028 generation could be sourced from the incremental energy zones to serve future renewable energy mandates (Table 5-2). MTEP11 analysis determined that 2,230 MW of additional year 2026 generation could be sourced from the incremental energy zones. The results are the essentially the same for both analyses as the increase in wind enabled from MTEP11 is primarily attributed to additional load growth. MTEP11 analysis was performed on a year 2026 model and MTEP14 on year 2028.

Wind Zone	Incremental Wind Enabled	Wind Zone	Incremental Wind Enabled
MI-B	250	IL-K	465
MI-C	238	IN-K	70
MI-D	318	WI-B	491
MI-E	264	WI-D	452
MI-F	320	WI-F	144
MI-I	210	MO-C	347
IL-F	167	MO-A	599

Table 5-2: Incremental Wind Enabled Above 2028 Mandated Level, by Zone

Consistent with the MTEP11 analysis, incremental wind enabled was calculated using a multiple pass technique – a first pass where wind is sourced from all wind zones, and a second where wind is sourced from just wind zones east of the Mississippi River. System-wide transfers from west to east across this boundary have historically been limited, and the first transfer limitations are seen along this corridor.

In the MTEP14 Review, no additional wind was enabled in much of the West. The MTEP14 Review power flow model had significantly stronger base dispatch flows from the Western portion of the system compared to the MTEP11 analysis. A first transfer including all zones east of the Mississippi as well as those from Missouri enabled the addition of 2,334 MW nameplate wind, at which point the wind zones in Michigan began meeting system limits. That wind was added to the model, and the analysis repeated for a second pass. The second transfer sourced wind from the Eastern wind zones minus those in Michigan, allowing an addition of 584 MW of nameplate wind, at which point a wind zone in Missouri met a local limit. The last transfer was performed leaving out the Missouri zone, and 1,416 MW of additional nameplate wind was enabled, before meeting a transfer limit in West-Central Illinois.

When the results from the curtailment analyses and the wind enabled analyses are combined, MTEP14 results show the MVP Portfolio enables a total of 43 million MWh of renewable energy to meet the renewable energy mandates through 2028. MTEP11 showed the MVP Portfolio enabled a similar level renewable energy mandates – 41 million MWh through 2026.

6. Portfolio Economic Analysis

MTEP14 estimates show the Multi-Value Portfolio creates $13.1 to $49.6 billion in net benefits to MISO North and Central Region members, an increase of approximately 50 percent from MTEP11 (Figure 6-1). Increases are primarily congestion and fuel savings driven by natural gas prices. Total portfolio costs have increased from $5.56 billion in MTEP11 to $5.86 billion in MTEP14. Even with the increased portfolio cost estimates, the increased MTEP14 benefit estimation results in portfolio benefit-to-cost ratios that have increased from 1.8 to 3.0 in MTEP11 to 2.6 to 3.9 in MTEP14.

The MTEP14 Triennial MVP Review estimates the MVP benefit-to-cost ratio has increased from 1.8 – 3.0 in MTEP11 to 2.6 – 3.9.

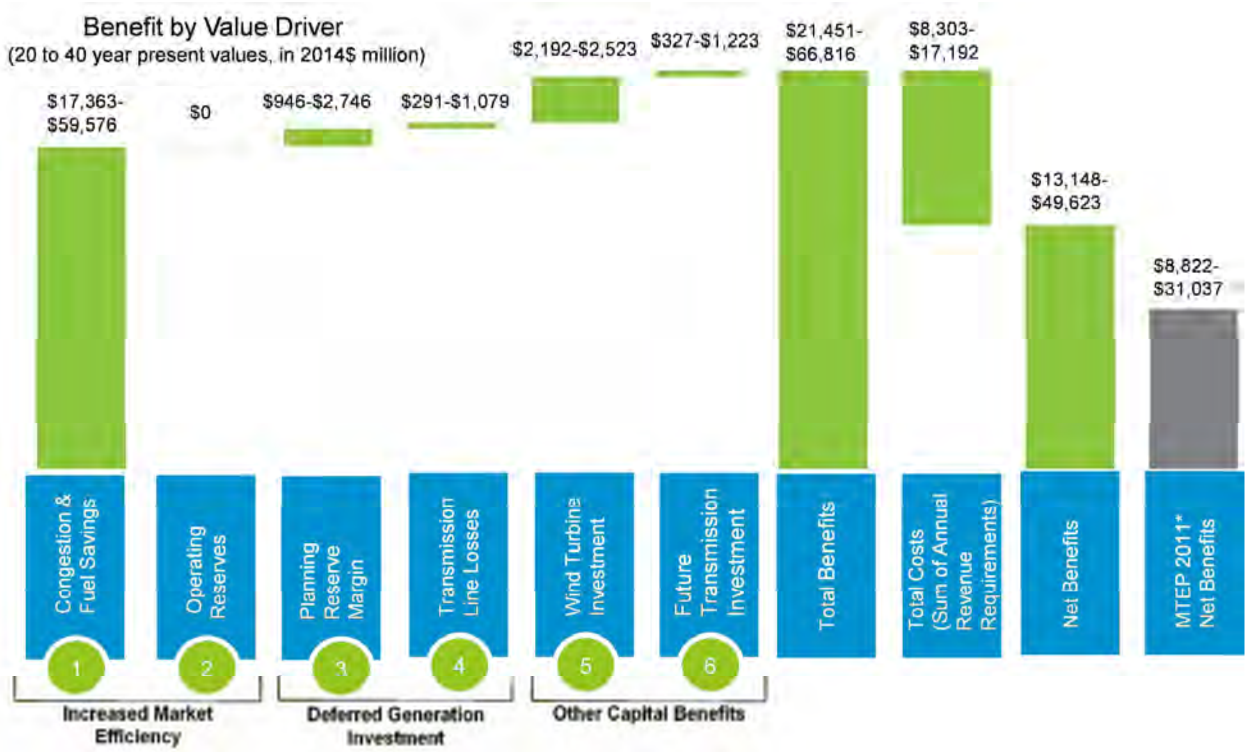

Figure 6-1: MVP Portfolio Economic Benefits from MTEP14 MVP Triennial Review

The bulk of the increase in benefits is due to an increase in the assumed natural gas price forecast in MTEP14 compared to MTEP11. In addition, the MTEP15 natural gas assumptions, which will be used in the MTEP15 MVP Portfolio Limited Review, are lower than the MTEP14 forecast. Under each of the natural gas price assumption sensitivities, the MVP Portfolio is projected to provide economic benefits in excess of costs (Table 6-1).

Natural Gas Forecast Assumption	Total NPV Portfolio Benefits ($M-2014)	Total Portfolio Benefit to Cost Ratio
MTEP14 – MVP Triennial Review	21,451 – 66,816	2.6 – 3.9
MTEP11	17,875 – 54,186	2.2 – 3.2
MTEP15	18,472 – 56,670	2.2 – 3.3

Table 6-1: MVP Portfolio Economic Benefits - Natural Gas Price Sensitivities[10]

The MVP Portfolio provides benefits across the MISO footprint in a manner that is roughly equivalent to cost allocated to each North and Central Region local resource zones (Figure 6-2). MTEP14 MVP Triennial Review results indicate that benefit-to-cost ratios have increased in all zones since MTEP11. Portfolio's benefits are at least 2.3 to 2.8 times the cost allocated to each zone. Zonal benefit distributions have changed slightly since the MTEP11 business case as a result of changing tariffs/business practices (planning reserve margin requirement and baseline reliability project cost allocation), load growth, and wind siting. As state demand and energy forecasts change and additional clarity is gained in to the location of actual wind turbine installation so does the siting of forecast wind.

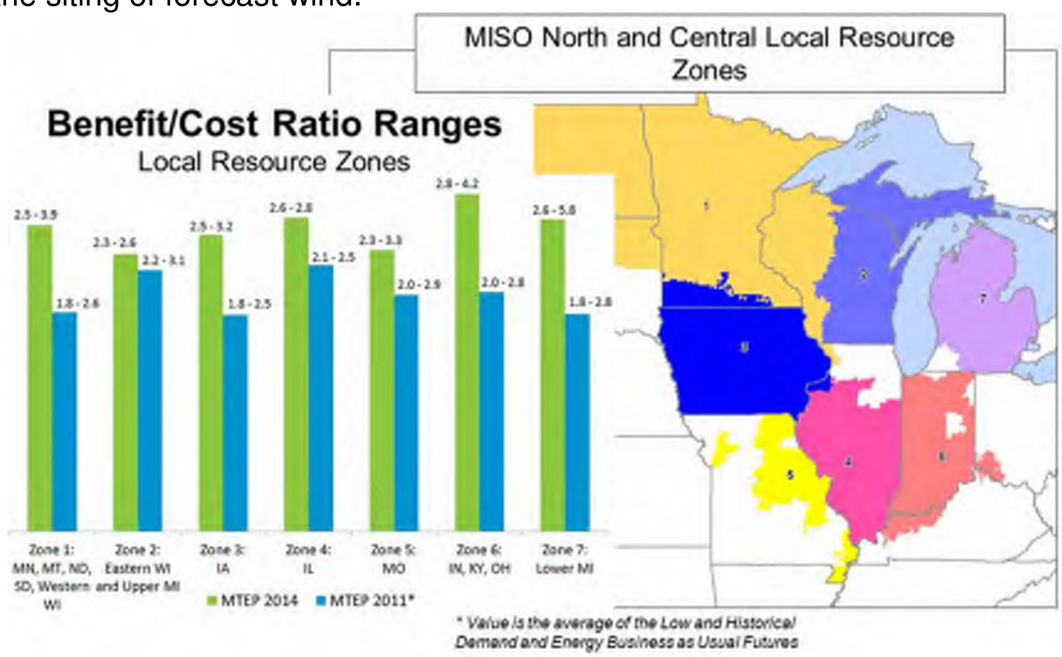

Figure 6-2: MVP Portfolio Production Cost Benefit Spread

10 Sensitivity performed applying MTEP11/MTEP15 natural gas price to the MTEP14 congestion and fuel savings model. All other benefit valuations unchanged from the MTEP14 MVP Triennial Review.

MVP Portfolio benefits under lower natural gas price sensitivities are at least 1.9 to 2.5 times the cost allocated to each zone (Figure 6-3). Under each natural gas price sensitivity benefits are zonally distributed in a manner roughly equivalent to the zonal cost allocation.

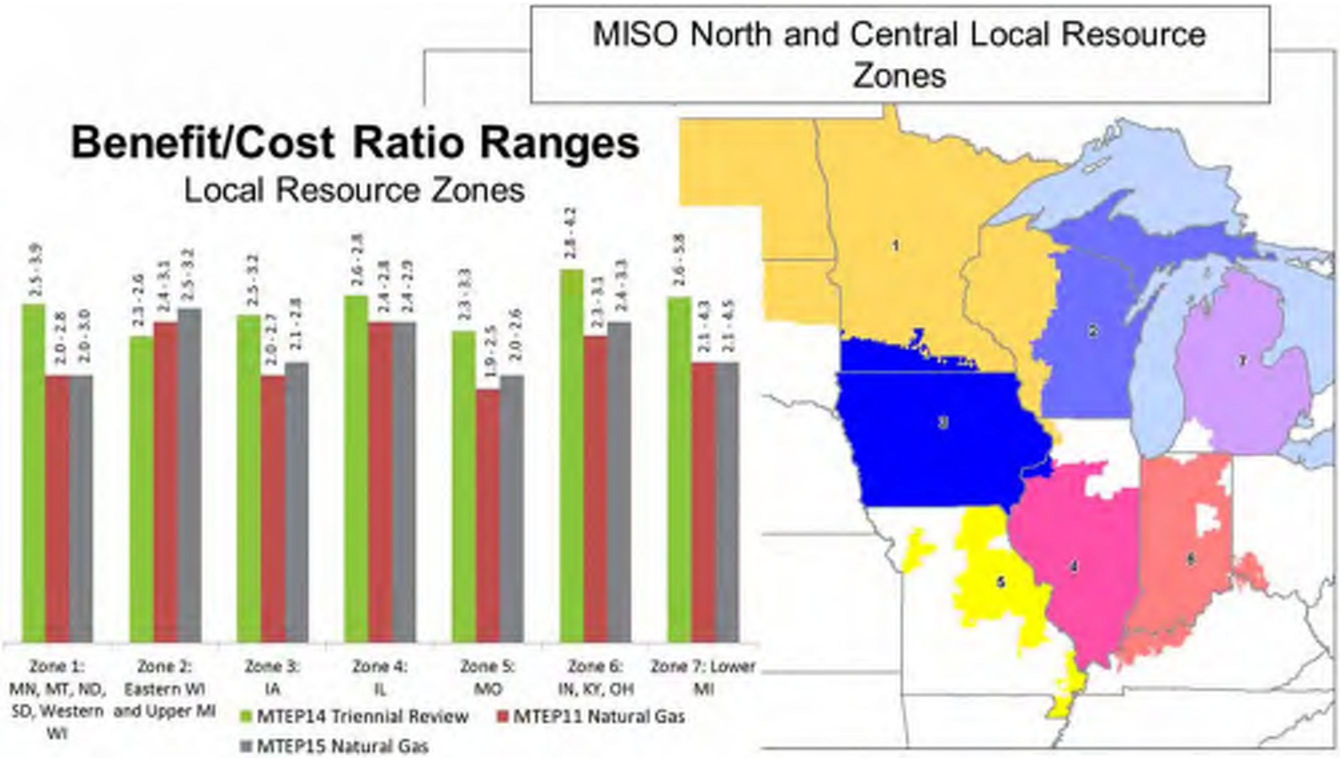

Figure 6-3: MVP Portfolio Production Cost Benefit Spread – Natural Gas Price Sensitivities[11]

[11] Sensitivity performed applying MTEP11/MTEP15 natural gas price to the MTEP14 congestion and fuel savings model. All other benefit valuations unchanged from the MTEP14 MVP Triennial Review.

6.1 Congestion and Fuel Savings

The MVP Portfolio allows for a more efficient dispatch of generation resources, opening markets to competition and spreading the benefits of low-cost generation throughout the MISO footprint. These benefits were outlined through a series of production cost analyses, which capture the economic benefits of the MVP transmission and the wind it enables. These benefits reflect the savings achieved through the reduction of transmission congestion costs and through more efficient use of generation resources.

> Primarily because of an increase in natural gas price forecast assumptions, congestion and fuel savings have increased by approximately 40 percent since MTEP11

Congestion and fuel savings is the most significant portion of the MVP benefits (Figure 6-1). The MTEP14 Triennial MVP Review estimates that the MVP Portfolio will yield $17 to $60 billion in 20- to 40-year present value adjusted production cost benefits, depending on the timeframe and discount rate assumptions. This value is up 22 percent to 44 percent from the original MTEP11 valuation (Table 6-2).

	MTEP14	MTEP11[12]
3 percent Discount Rate; 20 Year Net Present Value	28,057	21,918
8 percent Discount Rate; 20 Year Net Present Value	17,363	14,203
3 percent Discount Rate; 40 Year Net Present Value	59,576	41,330
8 percent Discount Rate; 40 Year Net Present Value	25,088	19,016

Table 6-2: Congestion and Fuel Savings Benefit ($M-2014)

The increase in congestion and fuel savings benefits relative to MTEP11 is primarily from an increase in the out-year natural gas price forecast assumptions (Figures 6-4, 6-5, and 6-6). In 2013, as part of the futures development, the MISO Planning Advisory Committee adopted a natural gas price escalation rate assumption sourced from a combination of the New York Mercantile Exchange (NYMEX) and Energy Information Administration (EIA) forecasts. The MTEP14 assumed natural gas price escalation rate is approximately 7.2% per year[13], compared to 1.74% per year in MTEP11. The increased escalation rate causes the assumed natural gas price to be $1.61/MMBTU higher in MTEP14 than MTEP11 in year 2023 and $3.13/MMBTU higher in year 2028 - the two years from which congestion and fuel savings results are based.

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[12] Average of the High and Low MTEP11 BAU Futures

[13] 2.5% of the assumed MTEP14 natural gas price escalation rate represents inflation . Inflation rate added to the NYMEX and EIA sourced growth rate.

The MVP Portfolio allows access to wind units with a nearly $0/MWh production cost and primarily replaces natural gas units in the dispatch[14], which makes the MVP Portfolio's fuel savings benefit projection directly related to the natural gas price assumption. A sensitivity applying the MTEP11 Low BAU gas prices assumption to the MTEP14 MVP Triennial Review model showed a 29.3 percent reduction in the annual year 2028 MTEP14 congestion and fuel savings benefits (Figure 6-5). Approximately 68% of the difference between the MTEP11 and MTEP14 congestion and fuel savings benefit is attributable to the natural gas price escalation rate assumed in MTEP14 (Figure 6-6).

Post MTEP14 natural gas price forecast assumptions are more closely aligned with those of MTEP11 (Figure 6-4). A sensitivity applying the MTEP15 BAU natural gas prices to the MTEP14 analysis showed a 21.7 percent reduction in year 2028 MTEP14 adjusted production cost savings.

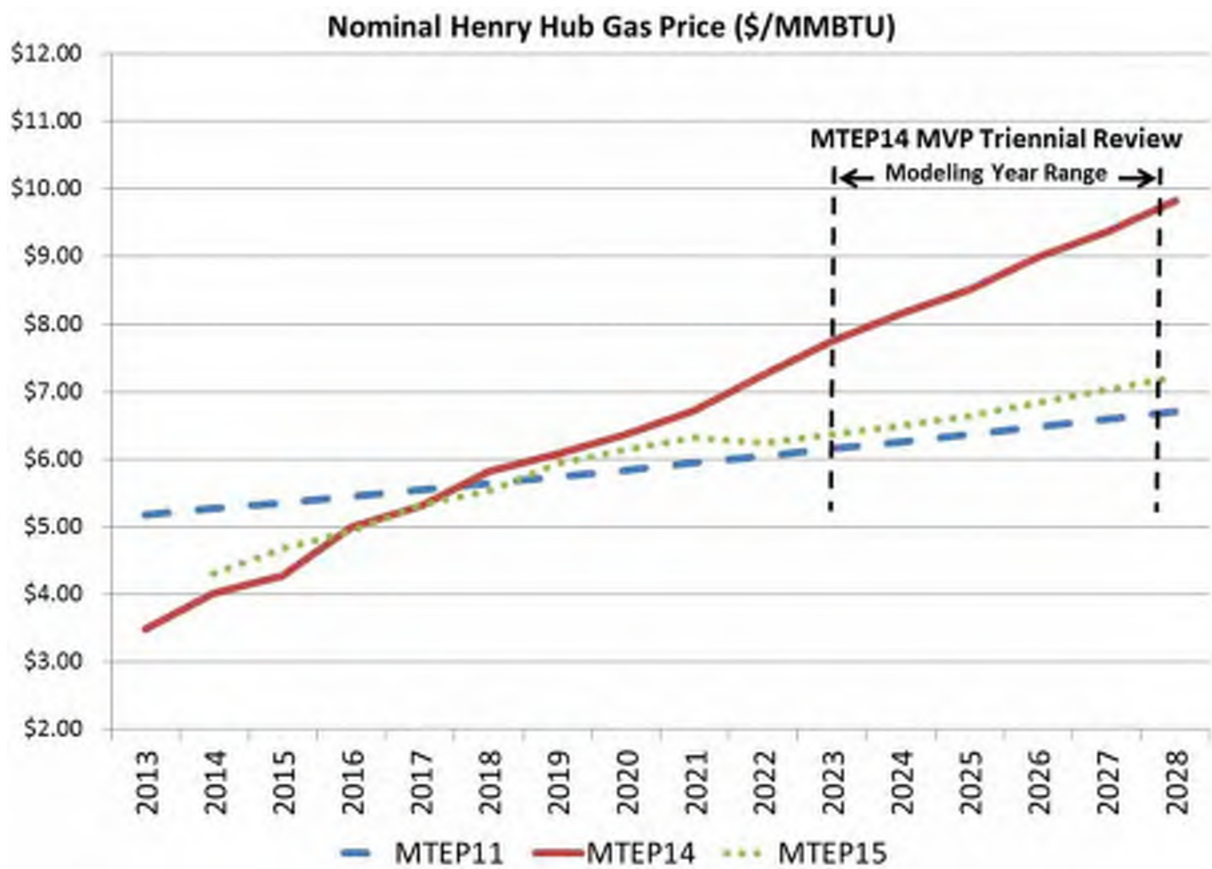


Figure 6-4: Natural Gas Price Forecast Comparison

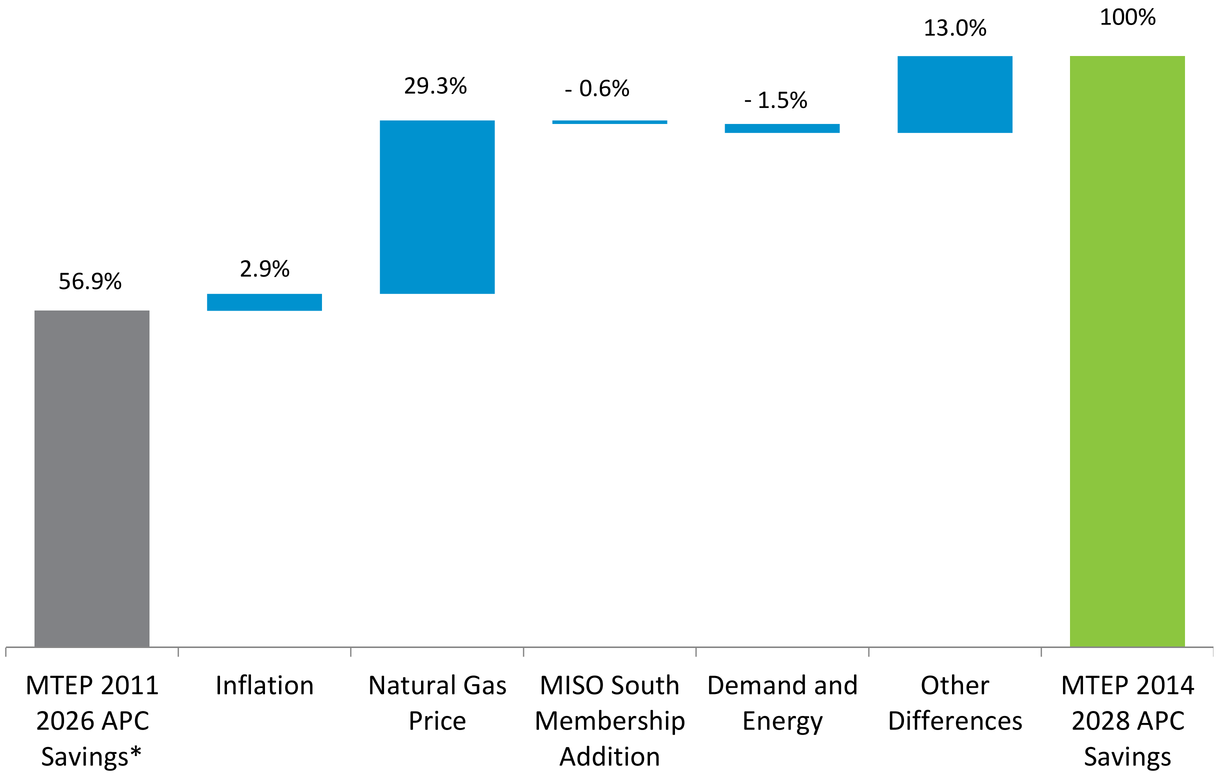
MISO membership changes have little net effect on benefit-to-cost ratios. For example if Duke Ohio/Kentucky and First Energy's benefits and costs are either both included or excluded the benefit-to-cost ratio calculation yields similar results. The exclusion of Duke Ohio/Kentucky and First Energy from the MISO pool decreases benefits by 7.4

[14] In the year 2028 simulation, the MVP enabled wind replaced 66% natural gas, 33% coal, and 1% other fueled units in the dispatch

percent relative to the MTEP14 total benefits; however, per Schedule 39, 6.3 percent of the total portfolio costs are allocated to Duke Ohio/Kentucky and First Energy, thus there is a minimal net effect to the benefit-to-cost ratio.

The MVP Portfolio is solely located in the MISO North and Central Regions and therefore, the inclusion of the South Region to the MISO dispatch pool has little effect on MVP related production cost savings (Figure 6-5).

Because demand and energy levels are similar between the MTEP11 Low BAU and MTEP14 cases, the updated demand and energy assumptions have little relative effect. Other Differences is calculated as the remaining difference between the MTEP14 saving and the sum of MTEP11 2026 APC Savings, Inflation, Natural Gas Prices, Footprint Changes, and Demand and Energy values. The largest modeling assumption differences in the Other Differences category is Environmental Protection Agency driven generation retirements, forecast generation siting, and topology upgrades. Other Differences also includes the compounding/synergic effects of all categories together.



**Excludes Duke Ohio/Kentucky - MTEP 2011 Business Case included Duke Ohio/Kentucky but excluded First Energy*

Figure 6-5: Breakdown of Annual Congestion and Fuel Savings Benefit Increase from MTEP11 to MTEP14 – Values a percentage of MTEP14 year 2028 Adjusted Production Cost (APC) Savings

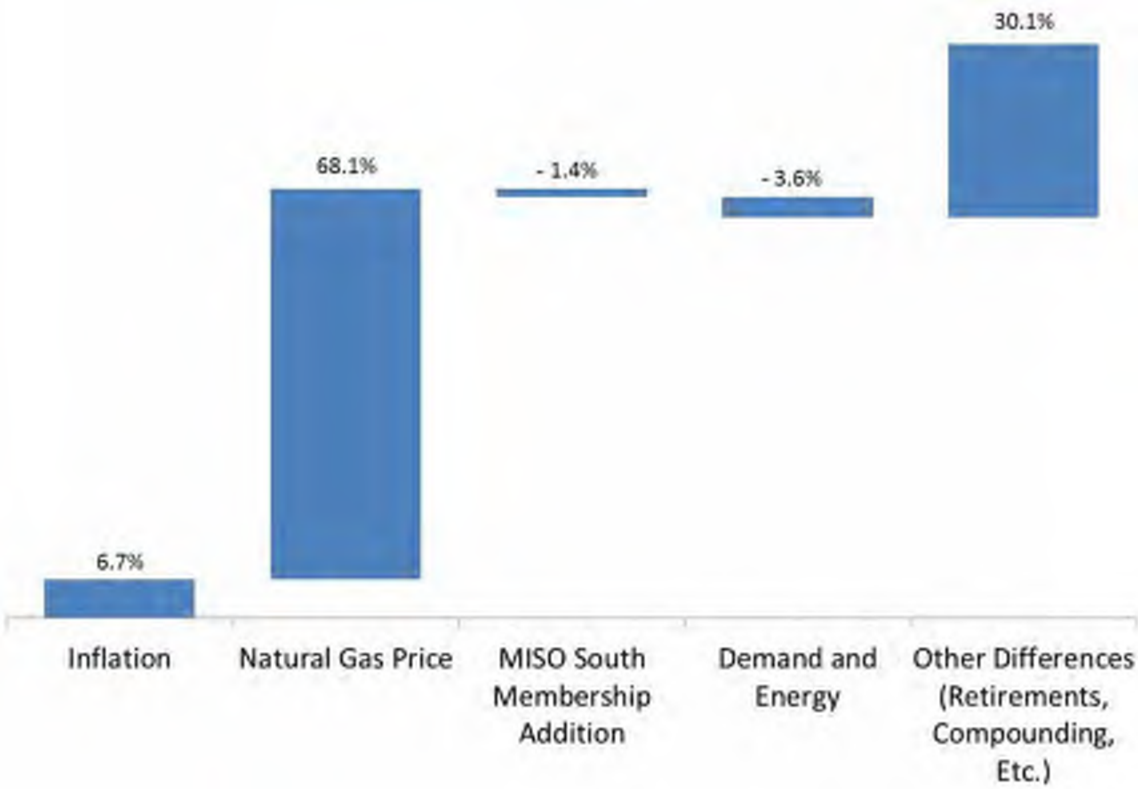


Figure 6-6: Breakdown of Annual Congestion and Fuel Savings Benefit Increase from MTEP11 to MTEP14 – Values a percentage of difference between MTEP14 year 2028 and MTEP11 year 2026 Adjusted Production Cost (APC) Savings

The MTEP14 MVP Triennial Review economic analysis was performed with 2023 and 2028 BAU future production cost models, with incremental wind mandates considered for 2023, 2028 and 2033. The 2033 case was used as a proxy case to determine the additional benefits from wind enabled above and beyond that mandated by the year 2028 (Section 5.2).

6.2 Operating Reserves

In addition to the energy benefits quantified in the production cost analyses, the 2011 business case showed the MVP Portfolio also reduce operating reserve costs. The 2011 business case showed that the MVP Portfolio decreases congestion on the system, increasing the transfer capability into several areas that would otherwise have to hold additional operating reserves under certain system conditions. While MTEP14 analysis shows the MVP Portfolio improves flows on the flowgates for which the reserves are calculated (Table 6-3), as a conservative measure, the MTEP14 Triennial MVP Review is not estimating a reduced operating reserve benefit. Since MTEP11, a reserve requirement has been calculated only a limited number of days (Table 6-4).

As a conservative measure, the MVP Triennial Review does not estimate a reduced operating reserve benefit in MTEP14.

Zone	Limiter	Contingency	Change in Flows
Indiana	Bunsonville - Eugene 345	Casey - Breed 345	-15.0 percent
Indiana	Crete - St. Johns Tap 345	Dumont-Wilton Center 765	3.0 percent
Michigan	Benton Harbor - Palisades 345	Cook - Palisades 345	-9.4 percent
Wisconsin	MWEX	N/A	-11.6 percent
Minnesota	Arnold-Hazleton 345	N/A	23.9 percent

Table 6-3: Change in Transfers; Pre-MVP minus Post-MVP

Zone	MTEP11 (June 2010 – May 2011)			MTEP14 (January 2013 – December 2013)		
	Total Requirement (MW)	Days with Requirement (#)	Average daily requirement (MW)	Total Requirement (MW)	Days with Requirement (#)	Average daily requirement (MW)
Missouri/Illinois[15]	95	1	95.1	0	0	0
Indiana	14966	53	282.4	0	0	0
Northern Ohio	9147	15	609.8	N/A	N/A	N/A
Michigan	4915	17	289.1	0	0	0
Wisconsin	227	2	113.4	0	0	0
Minnesota	376	1	376.3	32	2	16

Table 6-4: Historic Operating Requirements

MTEP11 MVP analysis concluded that the addition of the MVP Portfolio eliminated the need for the Indiana operating reserve zone and the reduction by half of additional system reserves held in other zones across the footprint. This created the opportunity to locate an average of 690,000 MWh of operating reserves annually where it would be most economical to do so, as opposed to holding these reserves in prescribed zones. MTEP11 estimated benefits from reduced operating reserves of $33 to $82 million in 20 to 40 year present value terms (Table 6-5).

	MTEP14	MTEP11[16]
3 percent Discount Rate; 20 Year Net Present Value	-	50
8 percent Discount Rate; 20 Year Net Present Value	-	34
3 percent Discount Rate; 40 Year Net Present Value	-	84
8 percent Discount Rate; 40 Year Net Present Value	-	42

Table 6-5: Reduction in Operating Reserves Benefit ($M-2014)

As operating reserve zones are determined on an ongoing basis, by monitoring the energy flowing through flowgates across the system, the benefit valuation in future MVP Triennial Reviews may provide a different result.

[15] The Missouri Reserve Zone was changed to Illinois in 2012. The Illinois Reserve Zone was eliminated in September 2013
[16] Average of the High and Low MTEP11 BAU Futures

6.3 Planning Reserve Margin Requirements

The MVPs increase capacity sharing between local resource zones which defers more than $900 million in future capacity expansion

MTEP14 MVP Triennial Review analysis estimates the MVPs annually defer more than 800 MW in capacity expansion by increasing capacity import limits thus reducing the local clearing requirements of the planning reserve margin requirement. Local clearing requirements are the amount of capacity that must be physically located within a resource zone to meet resource adequacy standards. The MTEP14 Review estimates that the MVPs increase capacity sharing between local resource zones (LRZ), which defers $946 to $2,746 million in future capacity expansion (Table 6-7).

In the 2013 planning year, MISO and the Loss of Load Expectation Working Group improved the methodology that establishes the MISO Planning Reserve Margin Requirement (PRMR). Previously, and in the MTEP11 analysis, MISO developed a MISO-wide PRMR with an embedded congestion component. The Candidate MVP Analysis showed the MVP Portfolio reduces total system congestion and thus reduces the congestion component of the PRMR. The MVP Portfolio allows MISO to carry a decreased PRMR while maintaining the same system reliability. The post-2013 planning year methodology no longer uses a single congestion component, but instead calculates a more granular zonal PRMR and a local clearing requirement based on the zonal capacity import limit. While terminology and methods have changed between MTEP11 and MTEP14, both calculations are capturing the same benefit of increased capacity sharing across the MISO region provided by the MVPs; as such, MTEP14 and MTEP11 provide benefit estimates of similar magnitudes (Table 6-6).

	MTEP14	MTEP11[17]
3 percent Discount Rate; 20 Year Net Present Value	1,440	2,846
8 percent Discount Rate; 20 Year Net Present Value	946	1,237
3 percent Discount Rate; 40 Year Net Present Value	2,746	3,760
8 percent Discount Rate; 40 Year Net Present Value	1,266	1,421

Table 6-6: Local Clearing Requirement Benefit ($M-2014)

[17] Average of the High and Low MTEP11 BAU Futures

Loss of load expectation (LOLE) analysis was performed to show the decrease in the local clearing requirement of the planning reserve margin requirement due to MVP Portfolio. This analysis used the 2014-2015 Planning Reserve Margin (PRM) 10-year out (2023) case. Capacity import limit increases from the MVPs were captured by comparing the zonal capacity import limits of a case with the MVP Portfolio to a case without inclusion of the MVP Portfolio. The 2023 Local Reliability Requirement (LRR) for each LRZ was determined by running GE MARS. Local clearing requirements were calculated for both the "with" and "without" MVP cases by subtracting the CIL values from the LRR values (Table 6-7).

Local Resource Zone	1	2	3	4	5	6	7	Formula Key
2023 Unforced Capacity (MW)	17,583	14,592	9,646	10,664	8,135	19,735	24,833	[A]
2023 Local Reliability Requirement Unforced Capacity (MW)	21,515	15,737	11,696	12,754	10,998	21,222	25,793	[B]
No MVP Capacity Import Limit (CIL) (MW)	5,326	2,958	1,198	4,632	5,398	5,328	3,589	[C]
MVP Capacity Import Limit (MW)	5,576	3,387	2,925	9,534	4,328	5,761	3,648	[D]
No MVP CIL Local Clearing Requirement (MW)	16,189	12,779	10,498	8,122	5,600	15,894	22,204	[E]=[B]-[C]
With MVP CIL Local Clearing Requirement (MW)	15,939	12,351	8,771	3,220	6,670	15,461	22,145	[F]=[B]-[D]
Excess capacity after LCR with No MVP CIL (MW)	1,394	1,813	-852	2,542	2,535	3,841	2,629	[G]=[A]-[E]
Excess capacity after LCR with MVP CIL (MW)	1,644	2,242	875	7,444	1,465	4,274	2,688	[H]=[A]-[F]
Deferred Capacity Value ($M-2014)			$75.8					[I]=[G]*CONE

Table 6-7: Deferred Capacity Value Calculation

The MTEP14 MVP Triennial Review analysis shows the MVP Portfolio allows 852 MW of capacity expansion deferral in LRZ 3. The deferred capacity benefit is valued using the Cost of New Entry (CONE) (Table 6-8). It's important to note that the capacity expansion deferral benefit may or may not be realized due to future market design changes around external resource capacity qualification.

The MTEP14 MVP Triennial Review methodology does not capture the MVP benefit to the capacity import of LRZ 5. This limitation is driven by the selection of generation used to perform import studies. MISO's LOLE methodology defines the selection of generation used as the source for a transfer study based on a zone's Local Balancing Area (LBA) ties. Based on its LBA ties, import studies indicate LRZ 5 primarily uses generation from the MISO South Region since its LBA ties in the North and Central Regions have very limited available capacity. The MVP facilities are not used to transfer power from the South Region so a benefit for LRZ 5 is not quantified.

Local Resource Zone	Cost of New Entry ($/MW-year)
1	89,500
2	90,320
3	88,450
4	89,890
5	91,610
6	89,670
7	90,100

Table 6-8: Cost of New Entry for Planning Year 2014/15[18]

18 From MISO Business Practice Manual 011 Resource Adequacy – January 2014

6.4 Transmission Line Losses

The addition of the MVP Portfolio to the transmission network reduces overall system losses, which also reduces the generation needed to serve the combined load and transmission line losses. The energy value of these loss reductions is considered in the congestion and fuel savings benefits, but the loss reduction also helps to reduce future generation capacity needs.

> Reflective of MISO's tighter reserve margins, the value of MTEP14 capacity deferment benefits from reduced losses has increased

The MTEP14 Review found that system losses decrease by 122 MW with the inclusion of the MVP Portfolio. MTEP11 estimates that the MVPs reduced losses by 150 MW. The difference between MTEP11 and MTEP14 results is attributed to decreased system demand, the MISO North and Central Regions membership changes, and transmission topology upgrades in the base model.

Tightening reserve margins, from an additional approximate 12 GW of expected generation retirements due mostly to emissions compliance restrictions, have increased the value of deferred capacity from transmission losses in MTEP14. In MTEP11, baseload additions were not required in the 20-year capacity expansion forecast to maintain planning reserve requirements. In MTEP11, the decreased transmission losses from the MVP Portfolio allowed the deferment of a single combustion turbine. In MTEP14, the decreased losses cause a large shift in the proportion of baseload combined cycle units and peaking combustion turbines in the capacity expansion forecast.

In addition to the tighter reserve margins, a one-year shift forward in the MVP Portfolio expected in-service date relative to MTEP11, has increased benefits by approximately 30 percent. In MTEP11, the MVP Portfolio's expected in-service date was year 2021. In MTEP14, the MVP's Portfolio's expected in-service date has shifted to year 2020. Given current reserve margins, additional capacity is needed as soon as year 2016 to maintain out-year reserve requirements. The in-service date shift forward allows earlier access to the 122 MW of reduced losses which allows earlier and less discounted deferment of capacity expansions.

The combined result of the tighter reserve margins and in-service date shift has caused the estimated benefits from reduced transmission line losses to more than double compared to the MTEP11 values (Table 6-9). Using current capital costs, the deferment equates to a savings of $291 to $1,079 million ($-2014), excluding the impacts of any potential future policies.

	MTEP14	MTEP11[19]
3 percent Discount Rate; 20 Year Net Present Value	734	227
8 percent Discount Rate; 20 Year Net Present Value	291	287
3 percent Discount Rate; 40 Year Net Present Value	1,079	315
8 percent Discount Rate; 40 Year Net Present Value	401	327

Table 6-9: Transmission Line Losses Benefit ($M-2014)

The benefit valuation methodology used in the MTEP14 Review is identical to that used in MTEP11. The transmission loss reduction was calculated by comparing the transmission line losses in the 2023 summer peak powerflow model both with and without the MVP Portfolio. This value was then used to extrapolate the transmission line losses for 2018 through 2023, assuming escalation at the business as usual demand growth rate. The change in required system capacity expansion due to the impact of the MVP Portfolio was calculated through a series of EGEAS simulations. In these simulations, the total system generation requirement was set to the system PRMR multiplied by the system load plus the system losses (Generation Requirements = (1+PRMR)*(Load + Losses)). To isolate the impact of the transmission line loss benefit, all variables in these simulations were held constant, except system losses.

MVP benefits from the optimization of wind generation siting remain similar in magnitude since MTEP11

The difference in capital fixed charges and fixed operation and maintenance costs in the no-MVP case and the post-MVP case is equal to the capacity benefit from transmission loss reduction, due to the addition of the MVP portfolio to the transmission system.

6.5 Wind Turbine Investment

During the Regional Generator Outlet Study (RGOS), the pre-cursor to the Candidate MVP Study, MISO developed a wind siting approach that results in a low-cost solution when transmission and generation capital costs are considered. This approach sources generation in a combination of local and regional locations, placing wind local to load, where less transmission is required; and regionally, where the wind is the strongest (Figure 6-7). However, this strategy depends on a strong regional transmission system to deliver the wind energy. Without this regional transmission backbone, the wind generation has to be sited close to load, requiring the construction of significantly larger amounts of wind capacity to produce the renewable energy mandated by public policy.

[19] Average of the High and Low MTEP11 BAU Futures

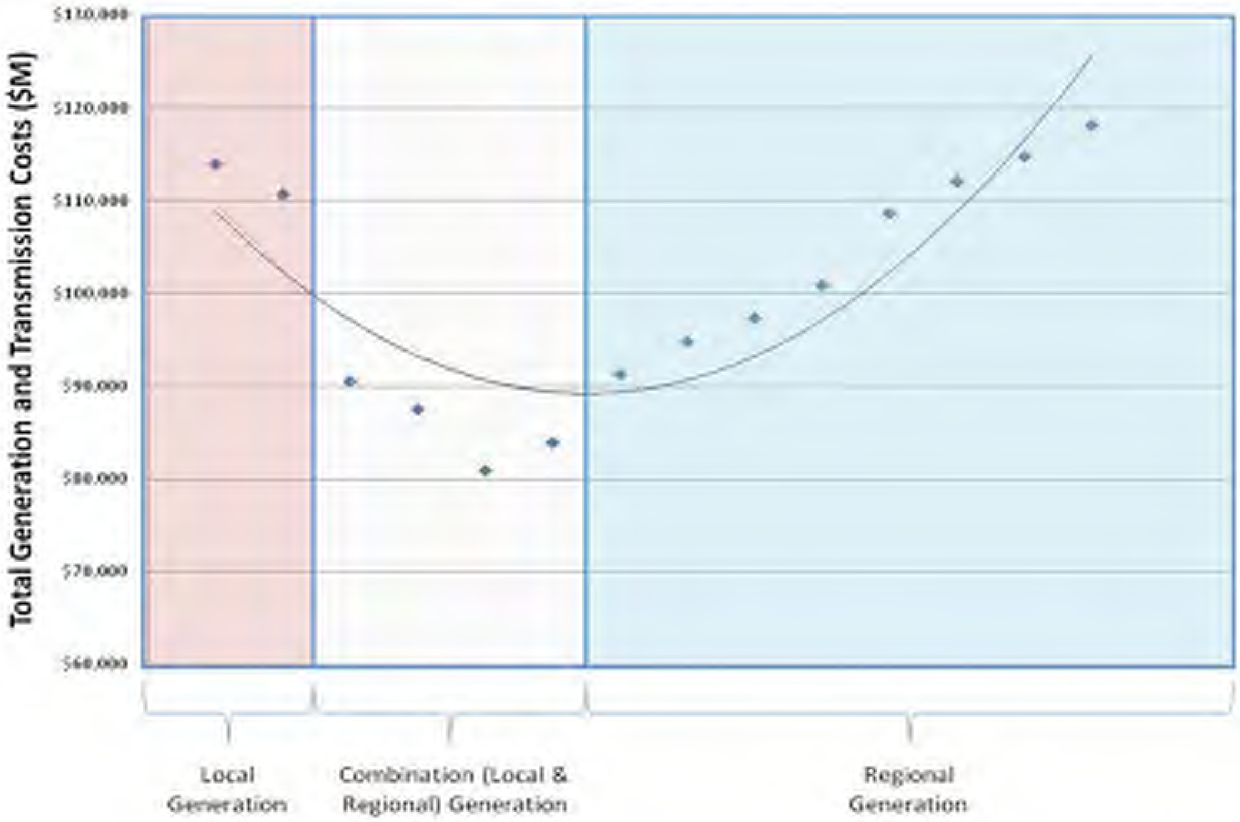


Figure 6-7: Local versus Combination Wind Siting

The MTEP14 Triennial MVP Review found that the benefits from the optimization of wind generation siting remain similar in magnitude since MTEP11 (Table 6-10). The slight increase in MTEP14 benefits relative to MTEP11 is from an update to the wind requirement forecast and wind enabled calculations. The MTEP14 Review found that the MVPs reduce turbine capital investments by 3,262 MW through 2028, compared to 2,884 MW through 2026 in MTEP11.

	MTEP14	MTEP11[20]
3 percent Discount Rate; 20 Year Net Present Value	2,192	1,850
8 percent Discount Rate; 20 Year Net Present Value	2,523	2,222
3 percent Discount Rate; 40 Year Net Present Value	2,192	1,850
8 percent Discount Rate; 40 Year Net Present Value	2,523	2,222

Table 6-10: Wind Turbine Investment Benefit ($M-2014)

[20] Average of the High and Low MTEP11 BAU Futures

In the RGOS study, it was determined that 11 percent less wind would need to be built to meet renewable energy mandates in a combination local/regional methodology relative to a local only approach. This change in generation was applied to energy required by the renewable energy mandates, as well as the total wind energy enabled by the MVP Portfolio (Section 5). This resulted in a total of 3.2 GW of avoided wind generation (Table 6-11).

Year	MVP Portfolio Enabled Wind (MW)	Equivalent Local Wind Generation (MW)	Incremental Cumulative Wind Benefit (MW)
Pre-2018	16,403	18,246	1,843
2018	20,289	22,568	2,279
2023	22,946	25,524	2,578
2028	24,702	27,477	2,775
Full Wind Enabled	29,037	32,299	3,262

Table 6-11: Renewable Energy Requirements, Combination versus Local Approach

The incremental wind benefits were monetized by applying a value of $2 to $2.8 million/MW, based on the U.S. Energy Information Administration's estimates of the capital costs to build onshore wind[21]. The total wind enabled benefits were then spread over the expected life of a wind turbine. Consistent with the MTEP11 business case that avoids overstating the benefits of the combination wind siting, a transmission cost differential of approximately $1.5 billion was subtracted from the overall wind turbine capital savings to represent the expected lower transmission costs required by a local-only siting strategy.

[21] Value as of November 2013

6.6 Future Transmission Investment

Consistent with MTEP11, the MTEP14 MVP Triennial Review shows that the MVP Portfolio eliminates the need for $300 million in future baseline reliability upgrades (Table 6-12). The magnitude of estimated benefits is in close proximity to the estimate from MTEP11; however, the actual identified upgrades have some differences because of bus-level load growth, generation dispatch, wind levels and transmission upgrades.

MTEP14 analysis shows the MVP Portfolio eliminates the need for $300 million in future baseline reliability upgrades.

	MTEP14	MTEP11[22]
3 percent Discount Rate; 20 Year Net Present Value	674	521
8 percent Discount Rate; 20 Year Net Present Value	327	286
3 percent Discount Rate; 40 Year Net Present Value	1,223	931
8 percent Discount Rate; 40 Year Net Present Value	452	394

Table 6-12: Future Transmission Investment Benefits ($M-2014)

Reflective of the post-Order 1000 Baseline Reliability Project cost allocation methodology, capital cost deferment benefits were fully distributed to the LRZ in which the avoided investment is physically located; a change from the MTEP11 business case that distributed 20 percent of the costs regionally and 80 percent locally.

A model simulating 2033 summer peak load conditions was created by growing the load in the 2023 summer peak model by approximately 8 GW. The 2033 model was run both with and without the MVP Portfolio to determine which out-year reliability violations are eliminated with the inclusion of the MVP Portfolio (Table 6-13).

[22] Average of the High and Low MTEP11 BAU Futures

Avoided Investment	Upgrade Required	Miles
New Carlisle - Olive 138 kV	Transmission line, < 345 kV	2.0
Reynolds 345/138 kV Transformer	Transformer	N/A
Lee - Lake Huron Pumping Tap 120 kV	Transmission line, < 345 kV	8.5
Waterman - Detroit Water 120 kV	Transmission line, < 345 kV	2.9
Dresden - Electric Junction 345 kV	Transmission line, 345 kV	31.1
Dresden - Goose Lake 138 kV	Transmission line, < 345 kV	5.8
Golf Mill - Niles Tap 138 kV	Transmission line, < 345 kV	2.5
Boy Branch - Saint Francois 138 kV	Transmission line, < 345 kV	7.1
Newton - Robinson Marathon 138 kV	Transmission line, < 345 kV	34.3
Weedman - North Leroy 138 kV	Transmission line, < 345 kV	3.6
Wilmarth - Eastwood 115 kV	Transmission line, < 345 kV	4.6
Swan Lake - Fort Ridgely 115 kV	Transmission line, < 345 kV	13.2
Black Dog - Pilot Knob 115 kV	Transmission line, < 345 kV	10.3
Lake Marion - Kenrick 115 kV	Transmission line, < 345 kV	3.5
Johnson Junction - Ortonville 115 kV	Transmission line, < 345 kV	24.7
Maquoketa - Hillsie 161 kV	Transmission line, < 345 kV	12.0
New Iowa Wind - Lime Creek 161 kV	Transmission line, < 345 kV	10
Lore - Turkey River 161 kV	Transmission line, < 345 kV	19.6
Lore - Kerper 161 kV	Transmission line, < 345 kV	7.0
Salem 161 kV Bus Tie	Bus Tie	N/A
8th Street - Kerper 161 kV	Transmission line, < 345 kV	2.6
Rock Creek 161 kV Bus Tie	Bus Tie	N/A
Beaver Channel 161 kV Bus Tie	Bus Tie	N/A
East Calamus - Grand Mound 161 kV	Transmission line, < 345 kV	2.6
Dundee - Coggon 161 kV	Transmission line, < 345 kV	18.1
Sub 56 (Davenport) - Sub 85 161 kV	Transmission line, < 345 kV	3.8
Vienna - North Madison 138 kV	Transmission line, < 345 kV	0.2
Townline Road - Bass Creek 138 kV	Transmission line, < 345 kV	11.8
Portage - Columbia 138 kV Ckt 2	Transmission line, < 345 kV	5.7
Portage - Columbia 138 kV Ckt 1	Transmission line, < 345 kV	5.7

Table 6-13: Avoided Transmission Investment

The cost of this avoided investment was valued using generic transmission costs, as estimated from projects in the MTEP database and recent transmission planning studies (Table 6-14). Generic estimates, in nominal dollars, are unchanged since the MTEP11 analysis. Transmission investment costs were assumed to be spread between 2029 and 2033. To represent potential production cost benefits that may be missed by avoiding this transmission investment, the 345 kV transmission line savings was reduced by half.

Avoided Transmission Investment	Estimated Upgrade Cost
Bus Tie	$1,000,000
Transformer	$5,000,000
Transmission lines (per mile, for voltages under 345 kV)	$1,500,000
Transmission lines (per mile, for 345 kV)	$2,500,000

Table 6-14: Generic Transmission Costs

7. Qualitative and Social Benefits

Aside from widespread economic and public policy benefits, the MVP Portfolio also provides benefits based on qualitative or social values. Consistent with the MTEP11 analysis, these benefits are excluded from the business case. The quantified values from the economic analysis may be conservative because they do not account for the full potential benefits of the MVP Portfolio.

The MVP Portfolio also provides benefits based on qualitative or social values, which suggests that the quantified values from the economic analysis may be conservative because they do not account for the full benefit potential.

7.1 Enhanced Generation Flexibility

The MVP Portfolio is primarily evaluated on its ability to reliably deliver energy required by renewable energy mandates. However, the MVP Portfolio also provides value under a variety of different generation policies. The energy zones, which were a key input into the MVP Portfolio analysis, were created to support multiple generation fuel types. For example, the correlation of the energy zones to the existing transmission lines and natural gas pipelines were a major factor considered in the design of the zones (Figure 7-1).

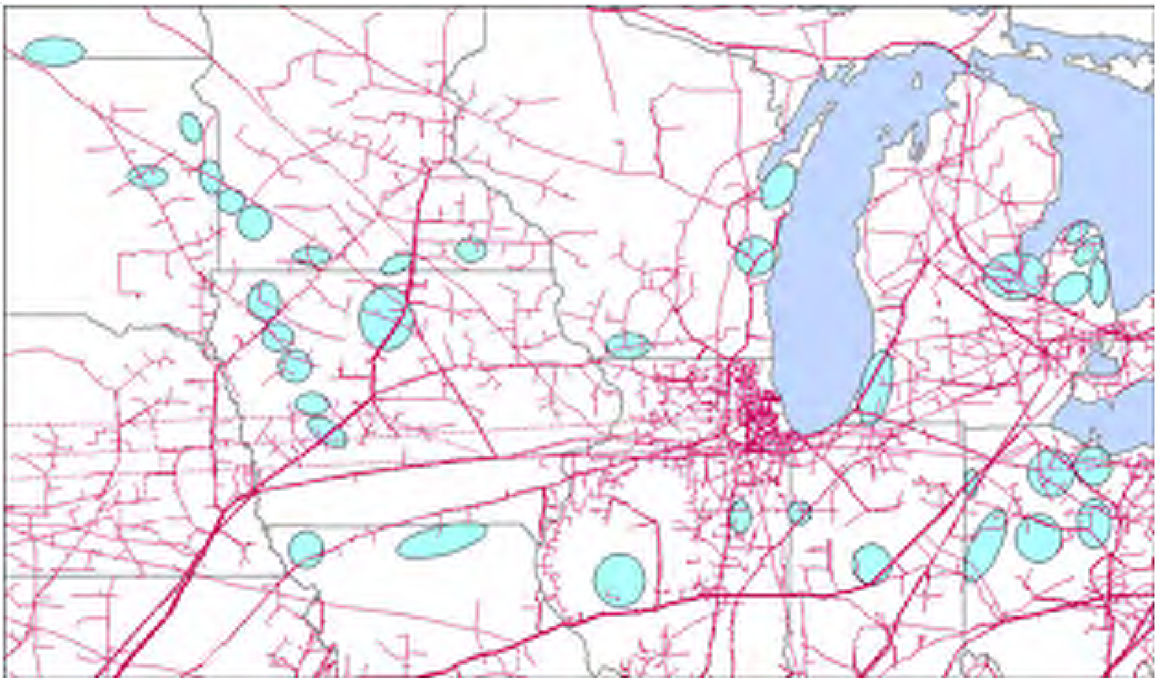


Figure 7-1: Energy Zone Correlation with Natural Gas Pipelines

7.2 Increased System Robustness

A transmission system blackout, or similar event, can have wide spread repercussions and result in billions of dollars of damage. The blackout of the Eastern and Midwestern United States in August 2003 affected more than 50 million people and had an estimated economic impact of between $4 and $10 billion.

The MVP Portfolio creates a more robust regional transmission system that decreases the likelihood of future blackouts by:

- Strengthening the overall transmission system by decreasing the impacts of transmission outages
- Increasing access to additional generation under contingent events
- Enabling additional transfers of energy across the system during severe conditions

7.3 Decreased Natural Gas Risk

Natural gas prices vary widely (Figure 7-2) causing corresponding fluctuations in the cost of energy from natural gas. In addition, recent and pending U.S. Environmental Protection Agency regulations limiting the emissions permissible from power plants will likely lead to more natural gas generation. This may cause the cost of natural gas to increase along with demand. The MVP Portfolio can partially offset the natural gas price risk by providing additional access to generation that uses fuels other than natural gas (such as nuclear, wind, solar and coal) during periods with high natural gas prices. Assuming a natural gas price increase of 25 percent to 50 percent, 2014 analysis shows the MVP Portfolio provides approximately a 24 to 45 percent higher adjusted production cost benefits.

Figure 7-2: Historic Henry Hub Natural Gas Prices

A set of sensitivity analyses were performed to quantify the impact of changes in natural gas prices. The sensitivity cases maintained the same modeling assumptions from the base business case analyses, except for the gas prices. The gas prices were increased from $3.50 to $4.35 and $5.22/MMBTU and then escalated to year 2028 using MTEP14 rates.

The system production cost is driven by many variables, including fuel prices, carbon emission regulations, variable operations, management costs and renewable energy mandates. The increase in natural gas prices imposed additional fuel costs on the system, which in turn produced greater production cost benefits due to the inclusion of the MVP Portfolio. These increased benefits were driven by the efficient usage of renewable and low cost generation resources (Figure 7-3).

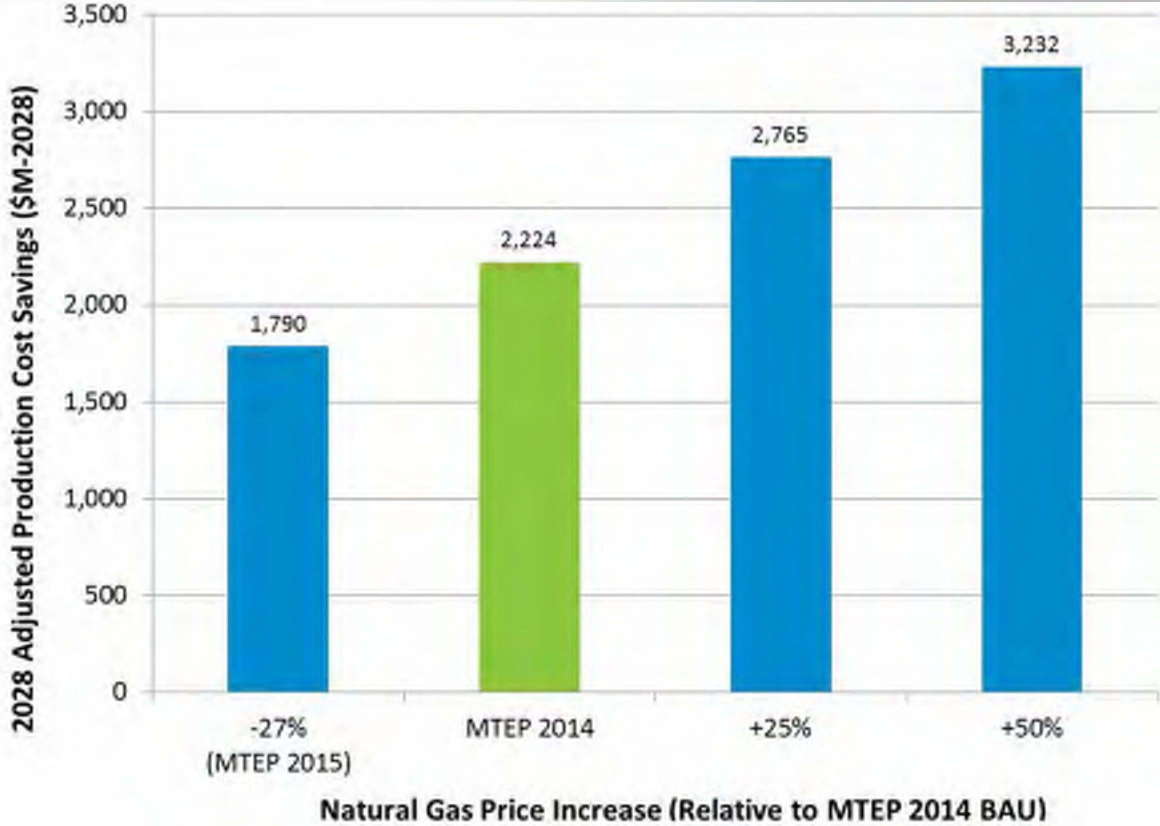


Figure 7-3: MVP Portfolio Adjusted Production Cost Savings by Natural Gas Price

7.4 Decreased Wind Generation Volatility

As the geographical distance between wind generators increases, the correlation in the wind output decreases (Figure 7-4). This relationship leads to a higher average output from wind for a geographically diverse set of wind plants, relative to a closely clustered group of wind plants. The MVP Portfolio will increase the geographic diversity of wind resources that can be delivered, increasing the average wind output available at any given time.

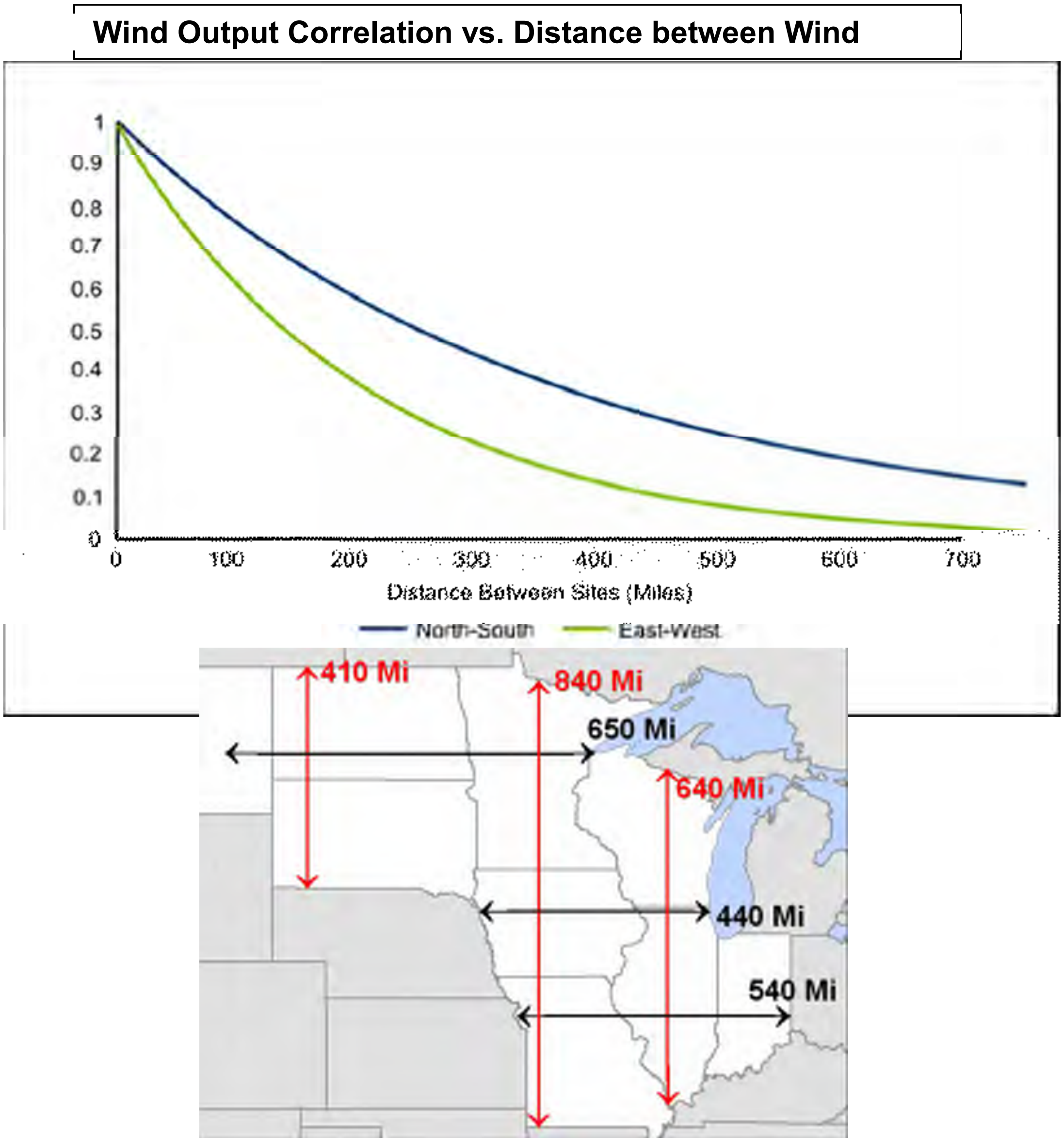


Figure 7-4: Wind Output Correlation to Distance between Wind Sites

7.5 Local Investment and Jobs Creation

In addition to the direct benefits of the MVP Portfolio, studies performed by the State Commissions have shown the indirect economic benefits of the MVP transmission investment. The MVP Portfolio supports thousands of local jobs and creates billions in local investment. In MTEP11, it was estimated that the MVP Portfolio supports between 17,000 and 39,800 local jobs, as well as $1.1 to $9.2 billion in local investment. Going forward, MISO is exploring the use of the IMPLAN model to quantify the direct, indirect, and induced effects on jobs and income related to transmission construction.

7.6 Carbon Reduction

The MVP Portfolio reduces carbon emissions by 9 to 15 million tons annually (Figure 7-5).

The MVP Portfolio enables the delivery of significant amounts of wind energy across MISO and neighboring regions, which reduces carbon emissions.

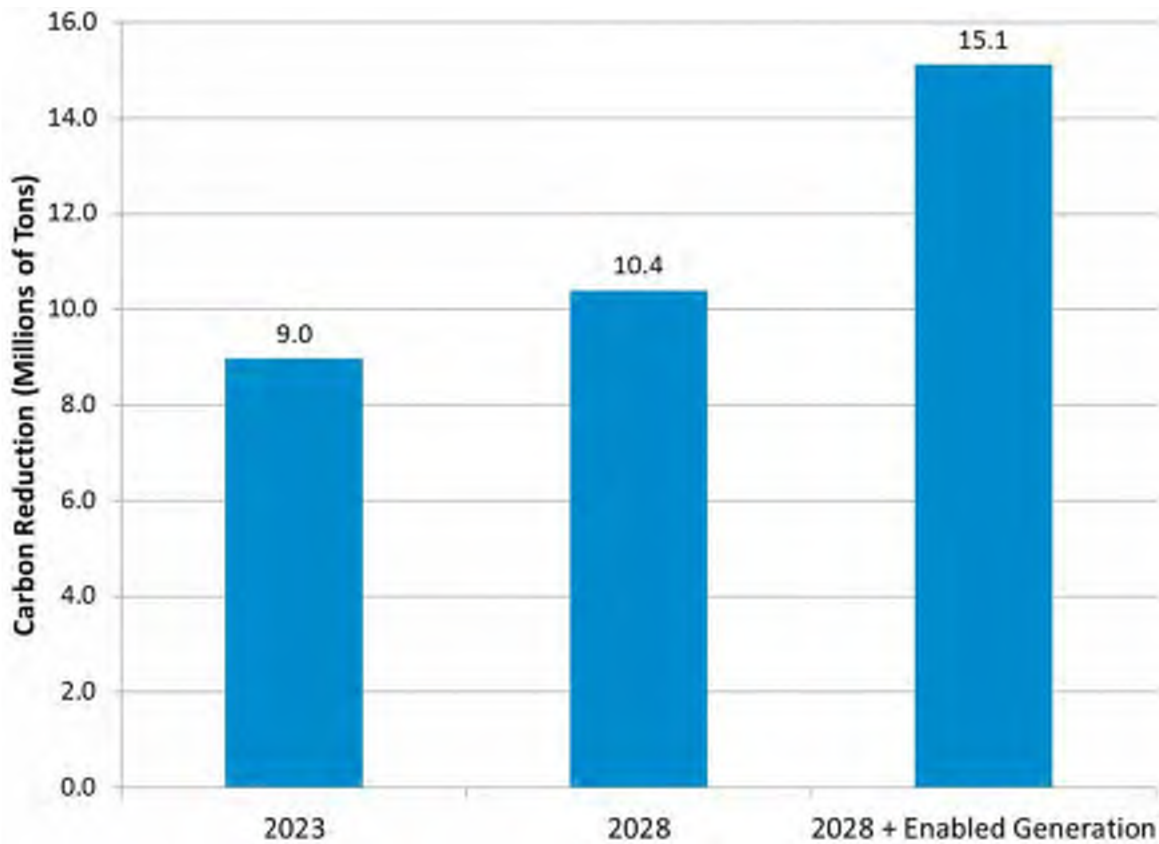


Figure 7-5: Forecasted Carbon Reduction from the MVP Portfolio by Year

8. Conclusions and Going Forward

The MTEP14 Triennial MVP Review provides an updated view into the projected economic, public policy and qualitative benefits of the MTEP11 MVP Portfolio. Analysis shows Multi-Value Project benefit-to-cost ratios have increased from 1.8 to 3.0 to a range of 2.6 to 3.9 since the MTEP11 analysis. Benefit increases are primarily congestion and fuel savings largely driven by natural gas prices.

The MTEP14 MVP Triennial Review's business case is on par with, if not stronger than, MTEP11 providing proof that the MVP criteria and methodology is working as expected. While the economic cost savings provide further benefit, the updated MTEP14 assessment corroborates the MVP Portfolio's ability to enable the delivery of wind generation in support of the renewable energy mandates of the MISO states in a cost effective manner.

Results prepared through the MTEP14 Triennial Review are for information purposes only and have no effect on the existing MVP Portfolio status or cost allocation.

MTEP15 and MTEP16 will feature a Limited Review of the MVP Portfolio benefits. Each Limited Review will provide an updated assessment of the congestion and fuel savings (Section 6.1) using the latest portfolio costs and in-service dates. Beginning in MTEP17, in addition to the Full Triennial Review, MISO will perform an assessment of the congestion costs, energy prices, fuel costs, planning reserve margin requirements, resource interconnections and energy supply consumption based on historical operations data.

Appendix

Detailed Transfer Analysis Results

LRZ	FCITC	Import Limit (CIL in MW)	Monitored Element	Contingency
1	-209	5,576	631115 OTTUMWA5 161 631116 BRDGPRT5 161 1	C:631115 OTTUMWA5 161 631134 TRICNTY5 161 1
2	-146	3,387	270810 LOCKPORT; B 345 274702 KENDALL; BU 345 1	C:270811 LOCKPORT; R 345 274703 KENDALL; RU 345 1
3	810	2,925	630388 WINCOR 8 69.0 630395 WNTRSET8 69.0 1	C:635631 BOONVIL5 161 635632 EARLHAM5 161 1
4	9,913	9,534	Limited by generation in tiers 1 and 2 - resulting limit considering Tier 1 and 2 available capacity and base interchange	
5	3,027	4,328	337651 8WHT BLUFF percent 500 337957 8KEO percent 500 1	C:P1_2-1312
6	2,002	5,761	243212 05BENTON 345 243250 05BENTON 138 1	C:P1_2_EXT_31
7	987	3,648	256290 18TITBAW 138 256542 18REDSTONE 138 1	C:b|18BULOCK-18SUMRTN 138-1

Table A-1: With MVP Capacity Import Limits

LRZ	FCITC	Import Limit (CIL in MW)	Monitored Element	Contingency
1	-204	5,326	699211 PT BCH3 345 699630 KEWAUNEE 345 1	C:ATC_B2_NAPL121
2	-237	2,958	270810 LOCKPORT; B 345 274702 KENDALL; BU 345 1	C:345-L10806_R-S
3	-564	1,198	300049 7THOMHL 345 300120 5THMHIL 161 1	C:345088 7MCCREDIE 345 345408 7OVERTON 345 1
4	4,429	4,632	256026 18THETFD 345 264580 19JEWEL 345 1	C:b|19BAUER-19PONTC 345-1
5	3,917	5,398	337651 8WHT BLUFF percent 500 337957 8KEO percent 500 1	C:P1_2-1312
6	1,277	5,328	256026 18THETFD 345 264580 19JEWEL 345 1	C:b|19BAUER-19PONTC 345-1
7	470	3,589	264522 19MENLO1 120 264947 19BUNCE2 120 1	C:x|19GRNEC 345-120-1

Table A-2: Without MVP Capacity Import Limits

APPENDIX F - STATE PROTECTED SPECIES

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State Protected Species - Project Study Area

Common Name	Scientific Name	Type of Organism	State Listing Status			
			Clayton County, IA*	Dubuque County, IA**	Jo Daviess County, IL***	Grant County, WI****
Blanchard's Cricket Frog	*Acris blanchardi*	Amphibian				E
Four-toed Salamander	*Hemidactylium scutatum*	Amphibian			T	
Mudpuppy	*Necturus maculosus*	Amphibian	T			
Pickerel Frog	*Lithobates palustris*	Amphibian				S/H
Acadian Flycatcher	*Empidonax virescens*	Bird				T
Bald Eagle	*Haliaeetus leucocephalus*	Bird	S	S		
Barn Owl	*Tyto alba*	Bird	E			S/M
Bell's Vireo	*Vireo bellii*	Bird				T
Cerulean Warbler	*Dendroica cerulea*	Bird			T	T
Great Egret	*Ardea alba*	Bird				T
Henslow's Sparrow	*Ammodramus henslowii*	Bird	T			T
Hooded Warbler	*Setophaga citrina*	Bird				T
Kentucky Warbler	*Geothlypis formosa*	Bird				T
King Rail	*Rallus elegans*	Bird		E		
Lark Sparrow	*Chondestes grammacus*	Bird				S/M
Least Bittern	*Ixobrychus exilis*	Bird				S/M
Loggerhead Shrike	*Lanius ludovicianus*	Bird			E	
Louisiana Waterthrush	*Parkesia motacilla*	Bird				S/M
Peregrine Falcon	*Falco peregrinus*	Bird				E
Prothonotary Warbler	*Protonotaria citrea*	Bird				S/M
Red-shouldered Hawk	*Buteo lineatus*	Bird	E			T
Trumpeter Swan	*Cygnus buccinator*	Bird				S/M
Upland Sandpiper	*Bartramia longicauda*	Bird			E	
Worm-eating Warbler	*Helmitheros vermivorum*	Bird				E
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	Bird			E	
Yellow-throated Warbler	*Setophaga dominica*	Bird				E
American Brook Lamprey	*Lampetra appendix*	Fish	T			
American Eel	*Anguilla rostrata*	Fish				S/N
Black Buffalo	*Ictiobus niger*	Fish				T
Black Redhorse	*Moxostoma duquesnei*	Fish	T			
Blue Sucker	*Cycleptus elongatus*	Fish				T
Bluntnose Darter	*Etheostoma chlorosoma*	Fish	E			E
Burbot	*Lota lota*	Fish	T			
Crystal Darter	*Crystallaria asprella*	Fish				E
Goldeye	*Hiodon alosoides*	Fish				E
Grass Pickerel	*Esox americanus*	Fish	T			
Lake Chubsucker	*Erimyzon sucetta*	Fish				S/N
Lake Sturgeon	*Acipenser fulvescens*	Fish	E		E	S/H
Least Darter	*Etheostoma microperca*	Fish	E			
Mud Darter	*Etheostoma asprigene*	Fish				S/N
Ozark Minnow	*Notropis nubilus*	Fish				S/N
Paddlefish	*Polyodon spathula*	Fish				T
Pallid Shiner	*Hybopsis amnis*	Fish			E	E
Pirate Perch	*Aphredoderus sayanus*	Fish				S/N

State Protected Species - Project Study Area

Common Name	Scientific Name	Type of Organism	State Listing Status			
			Clayton County, IA*	Dubuque County, IA**	Jo Daviess County, IL***	Grant County, WI****
Pugnose Minnow	*Opsopoeodus emiliae*	Fish	S	S		S/N
River Chub	*Nocomis micropogon*	Fish			E	
River Redhorse	*Moxostoma carinatum*	Fish				T
Shoal Chub	*Macrhybopsis hyostoma*	Fish				T
Silver Chub	*Macrhybopsis storeriana*	Fish				S/N
Starhead Topminnow	*Fundulus dispar*	Fish				E
Weed Shiner	*Notropis texanus*	Fish	E		E	S/N
Western Sand Darter	*Ammocrypta clara*	Fish	T		T	S/N
Black Sandshell	*Ligumia recta*	Freshwater Mussel			T	
Buckhorn/Pistolgrip	*Tritogonia verrucosa*	Freshwater Mussel	E	E		T
Bullhead/Sheepnose	*Plethobasus cyphyus*	Freshwater Mussel	E			E
Creek Heelsplitter	*Lasmigona compressa*	Freshwater Mussel		T		
Creeper	*Strophitus undulatus*	Freshwater Mussel	T	T		
Cylindrical Papershell	*Anodontoides ferussacianus*	Freshwater Mussel		T		
Ebony Shell	*Fusconaia ebena*	Freshwater Mussel				E
Elephant Ear	*Elliptio crassidens*	Freshwater Mussel				E
Elktoe	*Alasmidonta marginata*	Freshwater Mussel				S/P
Ellipse	*Venustaconcha ellipsiformis*	Freshwater Mussel		T		T
Fawnsfoot	*Truncilla donaciformis*	Freshwater Mussel				T
Flat Floater	*Anodonta suborbiculata*	Freshwater Mussel				S/P
Higgin's-eye Pearly Mussel	*Lampsilis higginsii*	Freshwater Mussel	E	E	E	E
Mapleleaf	*Quadrula quadrula*	Freshwater Mussel				S/P
Monkeyface	*Quadrula metanevra*	Freshwater Mussel				T
Purple Wartyback	*Cyclonaias tuberculata*	Freshwater Mussel	T	T		E
Rock Pocketbook	*Arcidens confragosus*	Freshwater Mussel				T
Round Pigtoe	*Pleurobema sintoxia*	Freshwater Mussel	E	E		
Salamander Mussel	*Simpsonaias ambigua*	Freshwater Mussel				x
Slippershell	*Alasmidonta viridis*	Freshwater Mussel		T	T	
Spectacle Case	*Cumberlandia monodonta*	Freshwater Mussel				E
Wartyback	*Quadrula nodulata*	Freshwater Mussel				T
Washboard	*Megalonaias nervosa*	Freshwater Mussel				S/P
Yellow Sandshell	*Lampsilis teres*	Freshwater Mussel	E			E
A Flat-headed Mayfly	*Macdunnoa persimplex*	Invertebrate				S/N
A Leafhopper	*Attenuipyga vanduzeei*	Invertebrate				E
A Melyrid Beetle	*Collops vicarius*	Invertebrate				S/N
A Predaceous Diving Beetle	*Neoporus hybridus*	Invertebrate				S/N
A Riffle Beetle	*Stenelmis musgravei*	Invertebrate				S/N
A Small Minnow Mayfly	*Paracloeodes minutus*	Invertebrate				S/N
A Small Square-gilled Mayfly	*Caenis hilaris*	Invertebrate				S/N
A Small Square-gilled Mayfly	*Sparbarus lacustris*	Invertebrate				S/N
A Small Square-gilled Mayfly	*Sparbarus nasutus*	Invertebrate				S/N
A Water Savenger Beetle	*Cymbiodyta toddi*	Invertebrate				S/N
Abbreviated Underwing Moth	*Catocala abbreviatella*	Invertebrate				S/N
An Issid Planthopper	*Fitchiella robertsonii*	Invertebrate				T

State Protected Species - Project Study Area

Common Name	Scientific Name	Type of Organism	State Listing Status			
			Clayton County, IA*	Dubuque County, IA**	Jo Daviess County, IL***	Grant County, WI****
Bluff Vertigo	*Vertigo meramecensis*	Invertebrate	E	E		
Briarton Pleistoscene Vertigo	*Vertigo brierensis*	Invertebrate	E			
Brilliant Granule	*Guppya sterkii*	Invertebrate				S/N
Butterfly	*Ellipsaria lineolata*	Invertebrate	T	T	T	E
Byssus Skipper	*Problema byssus*	Invertebrate				S/N
Cherrystone Drop	*Hendersonia occulta*	Invertebrate				T
Club-horned Grasshopper	*Aeropedellus clavatus*	Invertebrate				S/N
Columbine Dusky Wing	*Erynnis lucilius*	Invertebrate	S			S/N
Douglas Stenelmis Riffle Beetle	*Stenelmis douglasensis*	Invertebrate				S/N
Dusted Skipper	*Atrytonopsis hianna*	Invertebrate				S/N
Fox Small Square-gilled Mayfly	*Cercobrachys fox*	Invertebrate				S/N
Frigid Ambersnail	*Catinella gelida*	Invertebrate	E	E		
Gorgone Checker Spot	*Chlosyne gorgone*	Invertebrate				S/N
Gray Copper	*Lycaena dione*	Invertebrate				S/N
Great Spreadwing	*Archilestes grandis*	Invertebrate				S/N
Highland Dancer	*Argia plana*	Invertebrate				S/N
Hine's Emerald	*Somatochlora hineana*	Invertebrate				E
Honey Vertigo	*Vertigo tridentata*	Invertebrate				S/N
Iowa Amphipod	*Stygobromus iowae*	Invertebrate			E	
Iowa Pleistocene Snail	*Discus macclintocki*	Invertebrate	E	E	E	
Iowa Pleistocene Vertigo	*Vertigo iowaensis*	Invertebrate	E			
Juniper Hairstreak	*Callophrys gryneus*	Invertebrate				S/N
Knobel's Riffle Beetle	*Stenelmis knobeli*	Invertebrate				E
Leadplant Flower Moth	*Shinia lucens*	Invertebrate				S/N
Midwest Pleistocene Vertigo	*Vertigo hubrichti*	Invertebrate	T	T		E
Ojibwe Small Square-gilled Mayfly	*Brachycercus ojibwe*	Invertebrate				S/N
Ottoe Skipper	*Hesperia ottoe*	Invertebrate				E
Pecatonica River Mayfly	*Acanthametropus pecatonica*	Invertebrate				E
Phyllira Tiger Moth	*Grammia phyllira*	Invertebrate				S/N
Prairie Leafhopper	*Polyamia dilata*	Invertebrate				T
Regal Fritillary	*Speyeria idalia*	Invertebrate			T	
Royal River Cruiser	*Macromia taeniolata*	Invertebrate				S/N
Smooth Coil	*Helicodiscus singleyanus*	Invertebrate				S/N
Swamp Darner	*EpiaeShna heros*	Invertebrate				S/N
Trumpet Vallonia	*Vallonia parvula*	Invertebrate				S/N
Velvet-striped Grasshopper	*Eritettix simplex*	Invertebrate				S/N
Wallace's Deepwater Mayfly	*Spinadis simplex*	Invertebrate				E
Whitney's Underwing Moth	*Catocala whitneyi*	Invertebrate				S/N
Wing Snaggletooth	*Gastrocopta procera*	Invertebrate				T
Wisconsin Small Square-gilled Mayfly	*Cercobrachys lilliei*	Invertebrate				S/N
Yellowbanded Bumble Bee	*Bombus terricola*	Invertebrate				S/N
Big Brown Bat	*Eptesicus fuscus*	Mammal				T
Eastern Pipistrelle	*Perimyotis subflavus*	Mammal				T
Franklin's Ground Squirrel	*Spermophilus franklinii*	Mammal				S/N

State Protected Species - Project Study Area

Common Name	Scientific Name	Type of Organism	State Listing Status			
			Clayton County, IA*	Dubuque County, IA**	Jo Daviess County, IL***	Grant County, WI****
Gray/Timber Wolf	*Canis lupus*	Mammal			T	
Indiana Bat	*Myotis sodalis*	Mammal		E	E	
Little Brown Bat	*Myotis lucifugus*	Mammal				T
Northern Long-eared Bat	*Myotis septentrionalis*	Mammal				T
Prairie Vole	*Microtus ochrogaster*	Mammal				S/N
Southern Flying Squirrel	*Glaucomys volans*	Mammal	S	S		
Spotted Skunk	*Spilogale putorius*	Mammal	E	E		
Western Harvest Mouse	*Reithrodontomys megalotis*	Mammal				S/N
Woodland Vole	*Microtus pinetorum*	Mammal				S/N
Alderleaf Buckthorn	*Rhamnus alnifolia*	Plant	S	S		
American Speedwell	*Veronica americana*	Plant		S		
Balsam Fir	*Abies balsamea*	Plant	S			
Beaked Hazelnut	*Corylus cornuta*	Plant			E	
Bearded Wheat Grass	*Elymus trachycaulus*	Plant			T	
Bigroot Prickly-pear	*Opuntia macrorhiza*	Plant		E		
Bird's-eye Primrose	*Primula mistassinica*	Plant			E	
Blue Giant Hyssop	*Agastache foeniculum*	Plant	E			
Blue Grama	*Bouteloua gracilis*	Plant			E	
Blue Sage	*Salvia azurea* ssp. *pitcheri*	Plant			T	
Bog Bedstraw	*Galium labradoricum*	Plant	E			
Bog Birch	*Betula pumila*	Plant	T			
Bog Bluegrass	*Poa paludigena*	Plant	S	S		
Bog Willow	*Salix pedicellaris*	Plant	T			
Broad Beech Fern	*Phegopteris hexagonoptera*	Plant				S
Bunchberry	*Cornus canadensis*	Plant	T			
Buttonweed	*Diodia teres* var. *teres*	Plant				S
Canada Plum	*Prunus nigra*	Plant	E			
Canada Violet	*Viola canadensis*	Plant			E	
Carey Sedge	*Carex careyana*	Plant	S	S		
Chinquapin Oak	*Quercus muehlenbergii*	Plant				S
Cinnamon Fern	*Osmunda cinnamomea*	Plant	E			S
Cleft Phlox	*Phlox bifida*	Plant				S
Cliff Goldenrod	*Solidago sciaphila*	Plant			T	
Clustered Poppy-mallow	*Callirhoe triangulata*	Plant				S
Crowfoot Clubmoss	*Lycopodium digitatum*	Plant	S	S		
Cutleaf Water-milfoil	*Myriophyllum pinnatum*	Plant		S		
Dragon Wormwood	*Artemisia dracunculus*	Plant				S
Drooping Bluegrass	*Poa languida*	Plant	S			
Drooping Sedge	*Carex prasina*	Plant			T	
Dwarf Scouring-rush	*Equisetum scirpoides*	Plant	S	S		
Earleaf Foxglove	*Tomanthera auriculata*	Plant	S			
False Heather	*Hudsonia tomentosa*	Plant			E	
False Melic Grass	*Schizachne purpurascens*	Plant			E	
False Mermaid-weed	*Floerkea proserpinacoides*	Plant	E	E		

State Protected Species - Project Study Area

Common Name	Scientific Name	Type of Organism	State Listing Status			
			Clayton County, IA*	Dubuque County, IA**	Jo Daviess County, IL***	Grant County, WI****
Field Sedge	*Carex conoidea*	Plant		S		
Fineberry Hawthorn	*Crataegus chrysocarpa*	Plant		S		
Flat Top White Aster	*Aster pubentior*	Plant	S			
Flat-stemmed Spike-rush	*Eleocharis compressa*	Plant				S
Fragile Prickly Pear	*Opuntia fragilis*	Plant			E	
Frost Grape	*Vitis vulpina*	Plant	S			
Glade Fern	*Diplazium pycnocarpon*	Plant				S
Glandular Wood Fern	*Dryopteris intermedia*	Plant	T	T		
Glomerate Sedge	*Carex aggregata*	Plant		S		
Golden Saxifrage	*Chrysosplenium iowense*	Plant	T	T		
Grape-stemmed Clematis	*Clematis occidentalis*	Plant	S	S	E	
Grass Pink	*Calopogon tuberosus*	Plant	S			
Great Plains Ladies'-tresses	*Spiranthes magnicamporum*	Plant		S		
Great Water-leaf	*Hydrophyllum appendiculatum*	Plant				S
Green Violet	*Hybanthus concolor*	Plant	T	T		
Ground Juniper	*Juniperus communis*	Plant			T	
Hairy Umbrella-wort	*Mirabilis hirsuta*	Plant			E	
Hairy White Violet	*Viola blanda*	Plant			E	
Hairy Wild-petunia	*Ruellia humilis*	Plant				E
Hairy Woodrush	*Luzula acuminata*	Plant			E	
Hazel Dodder	*Cuscuta coryli*	Plant				S
Heart-leaved Skullcap	*Sutellaria ovata* ssp. *ovata*	Plant				S
Hedge Nettle	*Stachys aspera*	Plant	S			
Hemlock Parsley	*Conioselinum chinense*	Plant			E	
Hill's Thistle	*Cirsium hillii*	Plant		S		T
Hoary Tick-trefoil	*Desmodium canescens*	Plant				S
Hooker's Orchid	*Platanthera hookeri*	Plant	T	T		S
Intermediate Sedge	*Carex media*	Plant				E
James' Clammyweed	*Polanisia jamesii*	Plant			E	
Jeweled Shooting Star	*Dodecatheon amethystinum*	Plant	T	T		S
Kentucky Coffee-tree	*Gymnocladus dioicus*	Plant				S
Kidney-leaf White Violet	*Viola renifolia*	Plant	T	T		
Kittentails	*Besseya bullii*	Plant			T	
Lanced-leaved Buckthorn	*Rhamnus lanceolata* ssp. *glabrata*	Plant				S
Leathery Grape Fern	*Botrychium multifidum*	Plant	T	T		
Ledge Spikemoss	*Selaginella rupestris*	Plant	S	S		
Limestone Oak Fern	*Gymnocarpium robertianum*	Plant	S	S		S
Limestone Rockcress	*Arabis divaricarpa*	Plant		S		
Low Bindweed	*Calystegia spithamaea*	Plant	S	S		
Low Sweet Blueberry	*Vaccinium angustifolium*	Plant	T			
Marginal Shield Fern	*Dryopteris marginalis*	Plant		T		
Maryland Senna	*Senna marilandica*	Plant				S
Meadow Bluegrass	*Poa wolfii*	Plant	S			
Meadow Horsetail	*Equisetum pratense*	Plant			T	

State Protected Species - Project Study Area

Common Name	Scientific Name	Type of Organism	State Listing Status			
			Clayton County, IA*	Dubuque County, IA**	Jo Daviess County, IL***	Grant County, WI****
Moschatel	*Adoxa moschatellina*	Plant			E	
Mountain Maple	*Acer spicatum*	Plant	S	S		
Mountain Ricegrass	*Oryzopsis asperifolia*	Plant	S	S		
Mullein Foxglove	*Dasistoma macrophylla*	Plant				S
Muskroot	*Adoxa moschatellina*	Plant	S	S		T
Narrowleaf Pinweed	*Lechea intermedia*	Plant		T		
Narrow-leaved Dayflower	*Commelina erecta* var. *deamiana*	Plant				S
Nodding Onion	*Allium cernuum*	Plant	T	T		
Nodding Pogonia	*Triphora trianthophora*	Plant				S
Nodding Rattlesnake-root	*Prenanthes crepidinea*	Plant				E
Northern Adder's-tongue	*Ophioglossum pusillum*	Plant	S			
Northern Black Currant	*Ribes hudsonianum*	Plant	T	T		
Northern Lungwort	*Mertensia paniculata*	Plant	E			
Northern Monkshood	*Aconitum noveboracense*	Plant	T	T		T
Northern Panic-grass	*Dichanthelium boreale*	Plant	E			
Oak Fern	*Gymnocarpium dryopteris*	Plant	T	T	T	
October Lady's-tresses	*Spiranthes ovalis* var. *erostellata*	Plant				S
One-flowered Broomrape	*Orobanche uniflora*	Plant				S
Oval Ladies'-tresses	*Spiranthes ovalis*	Plant		T		
Ovate Spikerush	*Eleocharis ovata*	Plant	S			
Pale False Foxglove	*Agalinis skinneriana*	Plant		E		E
Pale Purple Coneflower	*Echinacea pallida*	Plant				T
Pale Vetchling	*Lathyrus ochroleucus*	Plant			T	
Partridge Berry	*Mitchella repens*	Plant		T		
Pearly Everlasting	*Anaphalis margaritacea*	Plant	S	S		
Pin Oak	*Quercus palustris*	Plant				S
Pinesap	*Monotropa hypopithys*	Plant	T	T		
Pink Milkwort	*Polygala incarnata*	Plant				E
Prairie Bush-clover	*Lespedeza leptostachya*	Plant				E
Prairie Dandelion	*Nothocalais cuspidata*	Plant			E	S
Prairie Dock	*Silphium terebinthinaceum*	Plant		S		
Prairie Fame-flower	*Phemeranthus rugospermus*	Plant				S
Prairie Indian-plantain	*Arnoglossum plantagineum*	Plant				S
Prairie Ragwort	*Packera plattensis*	Plant				S
Prairie Turnip	*Pediomelum esculentum*	Plant				S
Prairie White-fringed Orchid	*Platanthera leucophaea*	Plant				E
Pretty Sedge	*Carex woodii*	Plant			T	
Prickly Rose	*Rosa acicularis*	Plant	E	E	E	
Purple Angelica	*Angelica atropurpurea*	Plant		S		
Purple Cliff-brake Fern	*Pellaea atropurpurea*	Plant	E	E		S
Purple Milkweed	*Asclepias purpurascens*	Plant				E
Purple Rocket	*Iodanthus pinnatifidus*	Plant				S
Putty Root	*Aplectrum hyemale*	Plant				S
Redroot	*Ceanothus herbaceus*	Plant			E	

State Protected Species - Project Study Area

Common Name	Scientific Name	Type of Organism	State Listing Status			
			Clayton County, IA*	Dubuque County, IA**	Jo Daviess County, IL***	Grant County, WI****
Rock Clubmoss	*Lycopodium porophilum*	Plant	T			S
Rock Elm	*Ulmus thomasii*	Plant			E	
Rock Sandwort	*Minuartia michauxii*	Plant		S		
Rosy Twisted Stalk	*Streptopus roseus*	Plant	T	T		
Rough Bedstraw	*Galium asprellum*	Plant	S	S		
Rough Buttonweed	*Diodia teres*	Plant		S		
Rough Rattlesnake-root	*Prenanthes aspera*	Plant				E
Round-fruited St. John's-wort	*Hypericum sphaerocarpum*	Plant				T
Roundstem Foxglove	*Agalinis gattingeri*	Plant				T
Sage Willow	*Salix candida*	Plant	S			
Saskatoon Service-berry	*Amelanchier alnifolia*	Plant	S			
Scarlet Hawthorn	*Crataegus coccinea*	Plant		S		
Sedge	*Carex cephalantha*	Plant	S			
Sedge	*Carex inops* ssp. *heliophila*	Plant			E	
Shadbush	*Amelanchier interior*	Plant			T	
Shadbush	*Amelanchier sanguinea*	Plant	S	S		
Shinners' Tee-awned Grass	*Aristida dichotoma*	Plant				S
Short's Rock-cress	*Arabis shortii*	Plant				S
Showy Lady's Slipper	*Cypripedium reginae*	Plant	T			
Silvery Scurf Pea	*Pediomelum argophyllum*	Plant				S
Slender Mountain-ricegrass	*Oryzopsis pungens*	Plant	E			
Slender Sedge	*Carex tenera*	Plant		S		
Slim-leaved Panic Grass	*Dichanthelium linearifolium*	Plant		T		
Small Enchanter's Nightshade	*Circaea alpina*	Plant			E	
Small Forget-me-not	*Myosotis laxa*	Plant				S
Small White Lady's-slipper	*Cypripedium candidum*	Plant				T
Snow Trillium	*Trillium nivale*	Plant				T
Snowberry	*Symphoricarpos albus*	Plant	S			
Snowberry	*Symphoricarpos albus* var. *albus*	Plant			E	
Snowy Campion	*Silene nivea*	Plant				S
Solomon's Seal	*Polygonatum pubescens*	Plant	S			
Spotted Coralroot	*Corallorhiza maculata*	Plant	T	T		
Spreading Chervil	*Chaerophyllum procumbens*	Plant				S
Spreading Hawthorn	*Crataegus disperma*	Plant		S		
Spurge	*Euphorbia commutata*	Plant	S			
Stickseed	*Hackelia deflexa* var. *americana*	Plant			E	
Sullivantia	*Sullivantia sullivantii*	Plant			T	
Summer Grape	*Vitis aestivalis*	Plant	S	S		
Sycamore	*Platanus occidentalis*	Plant				S
Tall Cotton Grass	*Eriophorum angustifolium*	Plant	S			
Tee-flowered Melic Grass	*Melica nitens*	Plant				S
Tree Clubmoss	*Lycopodium dendroideum*	Plant	T	T		
Twinflower	*Linnaea borealis*	Plant	T			
Twinleaf	*Jeffersonia diphylla*	Plant	T	T		S

State Protected Species - Project Study Area

Common Name	Scientific Name	Type of Organism	State Listing Status			
			Clayton County, IA*	Dubuque County, IA**	Jo Daviess County, IL***	Grant County, WI****
Umbrella Sedge	*Cyperus grayoides*	Plant			T	
Upland Boneset	*Eupatorium sessilifolium*	Plant	S			
Valerian	*Valeriana edulis*	Plant	S			
Velvet Leaf Blueberry	*Vaccinium myrtilloides*	Plant	T			
Violet Bush-clover	*Lespedeza violacea*	Plant				S
Wafer-ash	*Ptelea trifoliata*	Plant				S
Western Prairie Fringed Orchid	*Platanthera praeclara*	Plant	T			
Whip Nutrush	*Sleria triglomerata*	Plant				S
White Camass	*Zigadenus elegans*	Plant			E	S
Wild Licorice	*Glycyrrhiza lepidota*	Plant				S
Wooly Milkweed	*Asclepias lanuginosa*	Plant			E	T
Yellow Giant Hyssop	*Agastache nepetoides*	Plant				S
Yellow Monkey Flower	*Mimulus glabratus*	Plant		T		
Yellow Trout-lily	*Erythronium americanum*	Plant	T	T		
Yerba-de-tajo	*Eclipta prostrata*	Plant				S
Blanding's Turtle	*Emydoidea blandingii*	Reptile	T		T	S/H
Bullsnake/Gophersnake	*Pituophis catenifer*	Reptile	S			S/P
Common Musk Turtle	*Sternotherus odoratus*	Reptile	T			
Gray Ratsnake	*Pantherophis spiloides*	Reptile				S/P
Lined Snake	*Tropidoclonion lineatum*	Reptile			T	
North American Racer	*Coluber constrictor*	Reptile				S/P
Ornate Box Turtle	*Terrapene ornata*	Reptile	T	T	T	E
Plains Hog-nosed Snake	*Heterodon nasicus*	Reptile			T	
Prairie Ring-necked Snake	*Diadophis punctatus arnyi*	Reptile				S/H
Six-lined Racerunner	*Aspidoscelis sexlineata*	Reptile				S/H
Smooth Softshell	*Apalone mutica*	Reptile				S/H
Timber Rattlesnake	*Crotalus horridus*	Reptile			T	S/P
Western Wormsnake	*Carphophis vermis*	Reptile				S/H
Wood Turtle	*Glyptemys insculpta*	Reptile				T

Iowa and Illinios listing statuses: T - Threatened, E - Endangered, S - Special Concern.

Wisconsin listing statuses: S - Special concern fully protected, S/N - Special concern no laws regulating use, S/H - Special concern take regulated by establishment of open closed seasons, S/FL - Special concern federal protected as endangered or threatened, but not so designated by the WI DNR, S/M - Special concern fully protected by federal and state laws under the MBTA

* Iowa Natural Areas Inventory, Clayton County, IA. https://programs.iowadnr.gov/naturalareasinventory/pages/RepDistinctSpeciesByCounty.aspx?CountyID=22. Accessed October 12, 2015.

** Iowa Natural Areas Inventory, Dubuque County, IA. https://programs.iowadnr.gov/naturalareasinventory/pages/RepDistinctSpeciesByCounty.aspx?CountyID=31. Accessed October 12, 2015.

*** Illinois Threatened and Endangered Species by County. https://www.dnr.illinois.gov/espb/documents/et_by_county.pdf. Accessed October 12, 2015.

**** Wisconsin Department of Natural Resources, Natural Heritage Inventory Data. http://dnr.wi.gov/topic/NHI/Data.asp?tool=county. Accessed October 12, 2015.

APPENDIX G - OPTIONAL TRANSMISSION DESIGN THROUGH THE REFUGE

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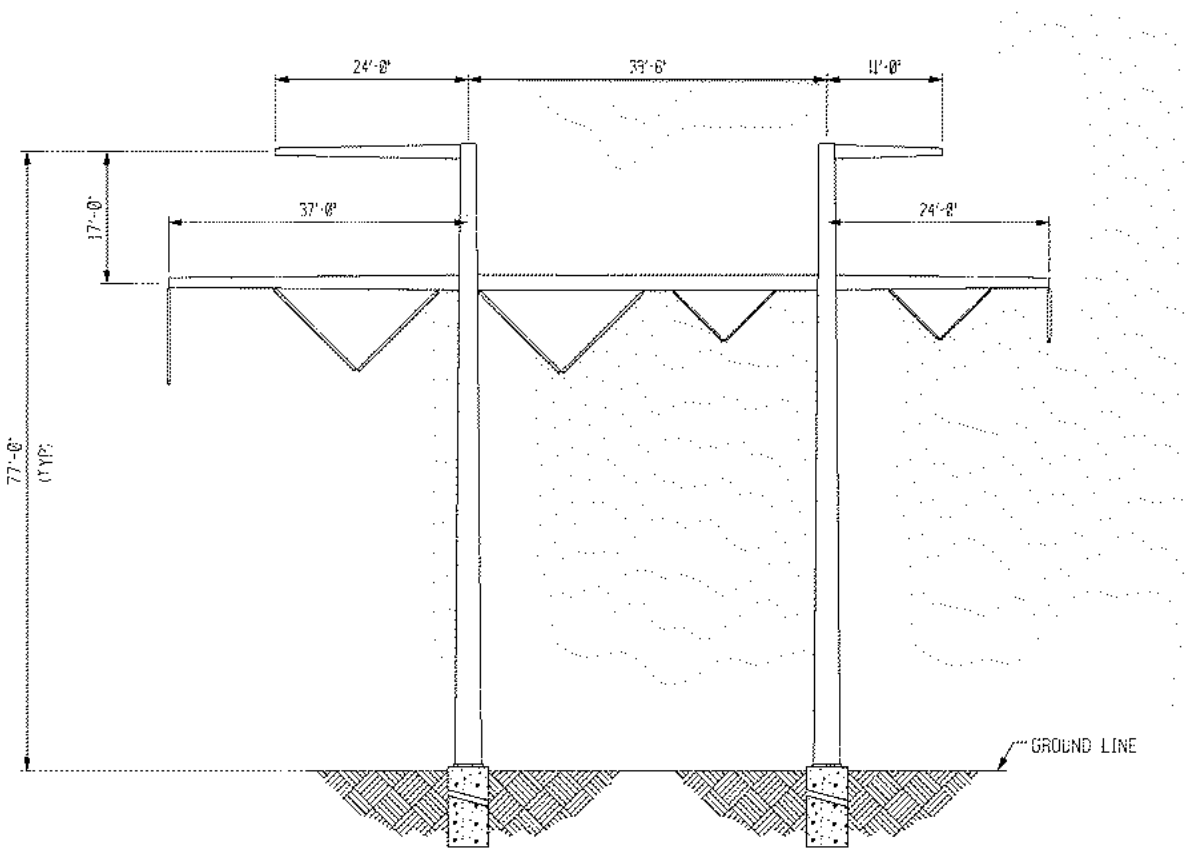
Proposed Optional Transmission Design through Refuge

345 kV/161 kV Double Circuit H-Frame



Impact Summary Table

Nelson Dewey Optional Transmission Design through Refuge

Route Name	**Nelson Dewey**
Total length (Miles)	14.6
Number of angles greater than 30˚	13
Length not Along Transmission Lines (miles	12.7
Length of river crossing (miles)	0.3
Airport, airstrip, or heliport within 1 mile (number)	0
Water towers within 1,000 feet (number)	0
Communication facilities within 1,000 feet (number)	18
Length through Corps Restricted Area (miles)	0.0
Length through floodplain (miles)	0.8
Length Through Terrain with Greater than 30% Slope (miles)	0.1
Total Wetland acres in ROW (acres)	8.7
Woody wetland in ROW (acres)	6.9
Emergent wetland in ROW (acres)	1.8
Total Woodland acres in ROW (acres)	61.5
Number of streams/ waterways crossed	15
Length through state or local public lands (miles)	0.0
Length through private conservation easements (miles)	0.5
Length through USFWS Refuge (feet)	3698.0
USFWS Refuge Land within ROW (acres)	20.4
Parks within 1,000 feet (number)	0
Residences within 0-25 feet (number)	0
Residences within 26-50 feet (number)	1
Residences within 51-100 feet (number)	1
Residences within 101-300 feet (number)	6
Schools within 300 feet (number)	0
Daycares within 300 feet (number)	0
Hospitals within 300 feet (number)	0
Places of Worship within 300 feet (number)	0
Business/ Commercial structure within 300 feet (number)	0
Public Facilities within 300 feet (number)	0
Cemeteries within 300 feet (number)	0
Archaeological sites in ROW (number)	1
Historical resources within 1,000 feet (number)	1
Length not along actual fence row or property line (miles)	2.7
Length through developed space (miles)	3.3
Length through cultivated crops (miles)	5.1
Length through pasture/hayland (miles)	0.5
Length through prime farmland (miles)	2.1

APPENDIX H - NATIONAL WILDLIFE REFUGE SYSTEM IMPROVEMENT ACT OF 1997

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PUBLIC LAW 105–57—OCT. 9, 1997

NATIONAL WILDLIFE REFUGE SYSTEM IMPROVEMENT ACT OF 1997

Public Law 105–57
105th Congress

An Act

Oct. 9, 1997
[H.R. 1420]

To amend the National Wildlife Refuge System Administration Act of 1966 to improve the management of the National Wildlife Refuge System, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

National Wildlife Refuge System Improvement Act of 1997.
16 USC 668dd note.

SECTION 1. SHORT TITLE; REFERENCES.

(a) SHORT TITLE.—This Act may be cited as the "National Wildlife Refuge System Improvement Act of 1997".

(b) REFERENCES.—Whenever in this Act an amendment or repeal is expressed in terms of an amendment to, or repeal of, a section or other provision, the reference shall be considered to be made to a section or provision of the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd et seq.).

16 USC 668dd note.

SEC. 2. FINDINGS.

The Congress finds the following:

(1) The National Wildlife Refuge System is comprised of over 92,000,000 acres of Federal lands that have been incorporated within 509 individual units located in all 50 States and the territories of the United States.

(2) The System was created to conserve fish, wildlife, and plants and their habitats and this conservation mission has been facilitated by providing Americans opportunities to participate in compatible wildlife-dependent recreation, including fishing and hunting, on System lands and to better appreciate the value of and need for fish and wildlife conservation.

(3) The System serves a pivotal role in the conservation of migratory birds, anadromous and interjurisdictional fish, marine mammals, endangered and threatened species, and the habitats on which these species depend.

(4) The System assists in the fulfillment of important international treaty obligations of the United States with regard to fish, wildlife, and plants and their habitats.

(5) The System includes lands purchased not only through the use of tax dollars but also through the proceeds from sales of Duck Stamps and national wildlife refuge entrance fees. It is a System that is financially supported by those benefiting from and utilizing it.

(6) When managed in accordance with principles of sound fish and wildlife management and administration, fishing, hunting, wildlife observation, and environmental education in national wildlife refuges have been and are expected to continue to be generally compatible uses.

(7) On March 25, 1996, the President issued Executive Order 12996, which recognized "compatible wildlife-dependent recreational uses involving hunting, fishing, wildlife observation and photography, and environmental education and interpretation as priority public uses of the Refuge System".

(8) Executive Order 12996 is a positive step and serves as the foundation for the permanent statutory changes made by this Act.

SEC. 3. DEFINITIONS.

(a) IN GENERAL.—Section 5 (16 U.S.C. 668ee) is amended to read as follows:

"SEC. 5. DEFINITIONS.

"For purposes of this Act:

"(1) The term 'compatible use' means a wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Director, will not materially interfere with or detract from the fulfillment of the mission of the System or the purposes of the refuge.

"(2) The terms 'wildlife-dependent recreation' and 'wildlife-dependent recreational use' mean a use of a refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation.

"(3) The term 'sound professional judgment' means a finding, determination, or decision that is consistent with principles of sound fish and wildlife management and administration, available science and resources, and adherence to the requirements of this Act and other applicable laws.

"(4) The terms 'conserving', 'conservation', 'manage', 'managing', and 'management', mean to sustain and, where appropriate, restore and enhance, healthy populations of fish, wildlife, and plants utilizing, in accordance with applicable Federal and State laws, methods and procedures associated with modern scientific resource programs. Such methods and procedures include, consistent with the provisions of this Act, protection, research, census, law enforcement, habitat management, propagation, live trapping and transplantation, and regulated taking.

"(5) The term 'Coordination Area' means a wildlife management area that is made available to a State—

"(A) by cooperative agreement between the United States Fish and Wildlife Service and a State agency having control over wildlife resources pursuant to section 4 of the Fish and Wildlife Coordination Act (16 U.S.C. 664); or

"(B) by long-term leases or agreements pursuant to title III of the Bankhead-Jones Farm Tenant Act (50 Stat. 525; 7 U.S.C. 1010 et seq.).

"(6) The term 'Director' means the Director of the United States Fish and Wildlife Service or a designee of that Director.

"(7) The terms 'fish', 'wildlife', and 'fish and wildlife' mean any wild member of the animal kingdom whether alive or dead, and regardless of whether the member was bred, hatched, or born in captivity, including a part, product, egg, or offspring of the member.

"(8) The term 'person' means any individual, partnership, corporation, or association.

"(9) The term 'plant' means any member of the plant kingdom in a wild, unconfined state, including any plant community, seed, root, or other part of a plant.

"(10) The terms 'purposes of the refuge' and 'purposes of each refuge' mean the purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit.

"(11) The term 'refuge' means a designated area of land, water, or an interest in land or water within the System, but does not include Coordination Areas.

"(12) The term 'Secretary' means the Secretary of the Interior.

"(13) The terms 'State' and 'United States' mean the several States of the United States, Puerto Rico, American Samoa, the Virgin Islands, Guam, and the territories and possessions of the United States.

"(14) The term 'System' means the National Wildlife Refuge System designated under section 4(a)(1).

"(15) The terms 'take', 'taking', and 'taken' mean to pursue, hunt, shoot, capture, collect, or kill, or to attempt to pursue, hunt, shoot, capture, collect, or kill.".

(b) CONFORMING AMENDMENT.—Section 4 (16 U.S.C. 668dd) is amended by striking "Secretary of the Interior" each place it appears and inserting "Secretary".

SEC. 4. MISSION OF THE SYSTEM.

Section 4(a) (16 U.S.C. 668dd(a)) is amended—

(1) by redesignating paragraphs (2) and (3) as paragraphs (5) and (6), respectively;

(2) in clause (i) of paragraph (6) (as so redesignated), by striking "paragraph (2)" and inserting "paragraph (5)"; and

(3) by inserting after paragraph (1) the following new paragraph:

"(2) The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.".

SEC. 5. ADMINISTRATION OF THE SYSTEM.

(a) ADMINISTRATION GENERALLY.—Section 4(a) (16 U.S.C. 668dd(a)), as amended by section 4 of this Act, is further amended by inserting after new paragraph (2) the following new paragraphs:

"(3) With respect to the System, it is the policy of the United States that—

"(A) each refuge shall be managed to fulfill the mission of the System, as well as the specific purposes for which that refuge was established;

"(B) compatible wildlife-dependent recreation is a legitimate and appropriate general public use of the System, directly related to the mission of the System and the purposes of many refuges, and which generally fosters refuge management and through which the American public can develop an appreciation for fish and wildlife;

"(C) compatible wildlife-dependent recreational uses are the priority general public uses of the System and shall receive priority consideration in refuge planning and management; and

"(D) when the Secretary determines that a proposed wildlife-dependent recreational use is a compatible use within a refuge, that activity should be facilitated, subject to such restrictions or regulations as may be necessary, reasonable, and appropriate.

"(4) In administering the System, the Secretary shall—

"(A) provide for the conservation of fish, wildlife, and plants, and their habitats within the System;

"(B) ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans;

"(C) plan and direct the continued growth of the System in a manner that is best designed to accomplish the mission of the System, to contribute to the conservation of the ecosystems of the United States, to complement efforts of States and other Federal agencies to conserve fish and wildlife and their habitats, and to increase support for the System and participation from conservation partners and the public;

"(D) ensure that the mission of the System described in paragraph (2) and the purposes of each refuge are carried out, except that if a conflict exists between the purposes of a refuge and the mission of the System, the conflict shall be resolved in a manner that first protects the purposes of the refuge, and, to the extent practicable, that also achieves the mission of the System;

"(E) ensure effective coordination, interaction, and cooperation with owners of land adjoining refuges and the fish and wildlife agency of the States in which the units of the System are located;

"(F) assist in the maintenance of adequate water quantity and water quality to fulfill the mission of the System and the purposes of each refuge;

"(G) acquire, under State law, water rights that are needed for refuge purposes;

"(H) recognize compatible wildlife-dependent recreational uses as the priority general public uses of the System through which the American public can develop an appreciation for fish and wildlife;

"(I) ensure that opportunities are provided within the System for compatible wildlife-dependent recreational uses;

"(J) ensure that priority general public uses of the System receive enhanced consideration over other general public uses in planning and management within the System;

"(K) provide increased opportunities for families to experience compatible wildlife-dependent recreation, particularly opportunities for parents and their children to safely engage in traditional outdoor activities, such as fishing and hunting;

"(L) continue, consistent with existing laws and interagency agreements, authorized or permitted uses of units of the System by other Federal agencies, including those necessary to facilitate military preparedness;

"(M) ensure timely and effective cooperation and collaboration with Federal agencies and State fish and wildlife agencies during the course of acquiring and managing refuges; and

"(N) monitor the status and trends of fish, wildlife, and plants in each refuge.".

(b) POWERS.—Section 4(b) (16 U.S.C. 668dd(b)) is amended—

(1) in the matter preceding paragraph (1) by striking "authorized—" and inserting "authorized to take the following actions:";

(2) in paragraph (1) by striking "to enter" and inserting "Enter";

(3) in paragraph (2)—

(A) by striking "to accept" and inserting "Accept"; and

(B) by striking ", and" and inserting a period;

(4) in paragraph (3) by striking "to acquire" and inserting "Acquire"; and

(5) by adding at the end the following new paragraphs:

"(4) Subject to standards established by and the overall management oversight of the Director, and consistent with standards established by this Act, to enter into cooperative agreements with State fish and wildlife agencies for the management of programs on a refuge.

Regulations. "(5) Issue regulations to carry out this Act.".

SEC. 6. COMPATIBILITY STANDARDS AND PROCEDURES.

Section 4(d) (16 U.S.C. 668dd(d)) is amended by adding at the end the following new paragraphs:

"(3)(A)(i) Except as provided in clause (iv), the Secretary shall not initiate or permit a new use of a refuge or expand, renew, or extend an existing use of a refuge, unless the Secretary has determined that the use is a compatible use and that the use is not inconsistent with public safety. The Secretary may make the determinations referred to in this paragraph for a refuge concurrently with development of a conservation plan under subsection (e).

"(ii) On lands added to the System after March 25, 1996, the Secretary shall identify, prior to acquisition, withdrawal, transfer, reclassification, or donation of any such lands, existing compatible wildlife-dependent recreational uses that the Secretary determines shall be permitted to continue on an interim basis pending completion of the comprehensive conservation plan for the refuge.

"(iii) Wildlife-dependent recreational uses may be authorized on a refuge when they are compatible and not inconsistent with public safety. Except for consideration of consistency with State laws and regulations as provided for in subsection (m), no other determinations or findings are required to be made by the refuge official under this Act or the Refuge Recreation Act for wildlife-dependent recreation to occur.

"(iv) Compatibility determinations in existence on the date of enactment of the National Wildlife Refuge System Improvement Act of 1997 shall remain in effect until and unless modified.

Regulations. "(B) Not later than 24 months after the date of the enactment of the National Wildlife Refuge System Improvement Act of 1997, the Secretary shall issue final regulations establishing the process for determining under subparagraph (A) whether a use of a refuge is a compatible use. These regulations shall—

"(i) designate the refuge official responsible for making initial compatibility determinations;

"(ii) require an estimate of the timeframe, location, manner, and purpose of each use;

"(iii) identify the effects of each use on refuge resources and purposes of each refuge;

"(iv) require that compatibility determinations be made in writing;

"(v) provide for the expedited consideration of uses that will likely have no detrimental effect on the fulfillment of the purposes of a refuge or the mission of the System;

"(vi) provide for the elimination or modification of any use as expeditiously as practicable after a determination is made that the use is not a compatible use;

"(vii) require, after an opportunity for public comment, reevaluation of each existing use, other than those uses specified in clause (viii), if conditions under which the use is permitted change significantly or if there is significant new information regarding the effects of the use, but not less frequently than once every 10 years, to ensure that the use remains a compatible use, except that, in the case of any use authorized for a period longer than 10 years (such as an electric utility right-of-way), the reevaluation required by this clause shall examine compliance with the terms and conditions of the authorization, not examine the authorization itself;

"(viii) require, after an opportunity for public comment, reevaluation of each compatible wildlife-dependent recreational use when conditions under which the use is permitted change significantly or if there is significant new information regarding the effects of the use, but not less frequently than in conjunction with each preparation or revision of a conservation plan under subsection (e) or at least every 15 years, whichever is earlier; and

"(ix) provide an opportunity for public review and comment on each evaluation of a use, unless an opportunity for public review and comment on the evaluation of the use has already been provided during the development or revision of a conservation plan for the refuge under subsection (e) or has otherwise been provided during routine, periodic determinations of compatibility for wildlife-dependent recreational uses. Public information.

"(4) The provisions of this Act relating to determinations of the compatibility of a use shall not apply to—

"(A) overflights above a refuge; and

"(B) activities authorized, funded, or conducted by a Federal agency (other than the United States Fish and Wildlife Service) which has primary jurisdiction over a refuge or a portion of a refuge, if the management of those activities is in accordance with a memorandum of understanding between the Secretary or the Director and the head of the Federal agency with primary jurisdiction over the refuge governing the use of the refuge.".

SEC. 7. REFUGE CONSERVATION PLANNING PROGRAM.

(a) IN GENERAL.—Section 4 (16 U.S.C. 668dd) is amended—

(1) by redesignating subsections (e) through (i) as subsections (f) through (j), respectively; and

(2) by inserting after subsection (d) the following new subsection:

"(e)(1)(A) Except with respect to refuge lands in Alaska (which shall be governed by the refuge planning provisions of the Alaska National Interest Lands Conservation Act (16 U.S.C. 3101 et seq.)), the Secretary shall—

“(i) propose a comprehensive conservation plan for each refuge or related complex of refuges (referred to in this subsection as a ‘planning unit’) in the System;

Federal Register, publication.

“(ii) publish a notice of opportunity for public comment in the Federal Register on each proposed conservation plan;

“(iii) issue a final conservation plan for each planning unit consistent with the provisions of this Act and, to the extent practicable, consistent with fish and wildlife conservation plans of the State in which the refuge is located; and

“(iv) not less frequently than 15 years after the date of issuance of a conservation plan under clause (iii) and every 15 years thereafter, revise the conservation plan as may be necessary.

“(B) The Secretary shall prepare a comprehensive conservation plan under this subsection for each refuge within 15 years after the date of enactment of the National Wildlife Refuge System Improvement Act of 1997.

“(C) The Secretary shall manage each refuge or planning unit under plans in effect on the date of enactment of the National Wildlife Refuge System Improvement Act of 1997, to the extent such plans are consistent with this Act, until such plans are revised or superseded by new comprehensive conservation plans issued under this subsection.

“(D) Uses or activities consistent with this Act may occur on any refuge or planning unit before existing plans are revised or new comprehensive conservation plans are issued under this subsection.

“(E) Upon completion of a comprehensive conservation plan under this subsection for a refuge or planning unit, the Secretary shall manage the refuge or planning unit in a manner consistent with the plan and shall revise the plan at any time if the Secretary determines that conditions that affect the refuge or planning unit have changed significantly.

“(2) In developing each comprehensive conservation plan under this subsection for a planning unit, the Secretary, acting through the Director, shall identify and describe—

“(A) the purposes of each refuge comprising the planning unit;

“(B) the distribution, migration patterns, and abundance of fish, wildlife, and plant populations and related habitats within the planning unit;

“(C) the archaeological and cultural values of the planning unit;

“(D) such areas within the planning unit that are suitable for use as administrative sites or visitor facilities;

“(E) significant problems that may adversely affect the populations and habitats of fish, wildlife, and plants within the planning unit and the actions necessary to correct or mitigate such problems; and

“(F) opportunities for compatible wildlife-dependent recreational uses.

“(3) In preparing each comprehensive conservation plan under this subsection, and any revision to such a plan, the Secretary, acting through the Director, shall, to the maximum extent practicable and consistent with this Act—

“(A) consult with adjoining Federal, State, local, and private landowners and affected State conservation agencies; and

"(B) coordinate the development of the conservation plan or revision with relevant State conservation plans for fish and wildlife and their habitats.

"(4)(A) In accordance with subparagraph (B), the Secretary shall develop and implement a process to ensure an opportunity for active public involvement in the preparation and revision of comprehensive conservation plans under this subsection. At a minimum, the Secretary shall require that publication of any final plan shall include a summary of the comments made by States, owners of adjacent or potentially affected land, local governments, and any other affected persons, and a statement of the disposition of concerns expressed in those comments. Public information.

"(B) Prior to the adoption of each comprehensive conservation plan under this subsection, the Secretary shall issue public notice of the draft proposed plan, make copies of the plan available at the affected field and regional offices of the United States Fish and Wildlife Service, and provide opportunity for public comment.". Public information.

SEC. 8. EMERGENCY POWER; STATE AUTHORITY; WATER RIGHTS; COORDINATION.

(a) IN GENERAL.—Section 4 (16 U.S.C. 668dd) is further amended by adding at the end the following new subsections:

"(k) Notwithstanding any other provision of this Act, the Secretary may temporarily suspend, allow, or initiate any activity in a refuge in the System if the Secretary determines it is necessary to protect the health and safety of the public or any fish or wildlife population.

"(l) Nothing in this Act shall be construed to authorize the Secretary to control or regulate hunting or fishing of fish and resident wildlife on lands or waters that are not within the System.

"(m) Nothing in this Act shall be construed as affecting the authority, jurisdiction, or responsibility of the several States to manage, control, or regulate fish and resident wildlife under State law or regulations in any area within the System. Regulations permitting hunting or fishing of fish and resident wildlife within the System shall be, to the extent practicable, consistent with State fish and wildlife laws, regulations, and management plans.

"(n)(1) Nothing in this Act shall—

"(A) create a reserved water right, express or implied, in the United States for any purpose;

"(B) affect any water right in existence on the date of enactment of the National Wildlife Refuge System Improvement Act of 1997; or

"(C) affect any Federal or State law in existence on the date of the enactment of the National Wildlife Refuge System Improvement Act of 1997 regarding water quality or water quantity.

"(2) Nothing in this Act shall diminish or affect the ability to join the United States in the adjudication of rights to the use of water pursuant to the McCarran Act (43 U.S.C. 666).

"(o) Coordination with State fish and wildlife agency personnel or with personnel of other affected State agencies pursuant to this Act shall not be subject to the Federal Advisory Committee Act (5 U.S.C. App.).".

(b) CONFORMING AMENDMENT.—Section 4(c) (16 U.S.C. 668dd(c)) is amended by striking the last sentence.

16 USC 668dd note.

SEC. 9. STATUTORY CONSTRUCTION WITH RESPECT TO ALASKA.

(a) IN GENERAL.—Nothing in this Act is intended to affect—

(1) the provisions for subsistence uses in Alaska set forth in the Alaska National Interest Lands Conservation Act (Public Law 96–487), including those in titles III and VIII of that Act;

(2) the provisions of section 102 of the Alaska National Interest Lands Conservation Act, the jurisdiction over subsistence uses in Alaska, or any assertion of subsistence uses in Alaska in the Federal courts; and

(3) the manner in which section 810 of the Alaska National Interest Lands Conservation Act is implemented in national wildlife refuges in Alaska.

(b) CONFLICTS OF LAWS.—If any conflict arises between any provision of this Act and any provision of the Alaska National Interest Lands Conservation Act, then the provision in the Alaska National Interest Lands Conservation Act shall prevail.

Approved October 9, 1997.

LEGISLATIVE HISTORY—H.R. 1420:

HOUSE REPORTS: No. 105–106 (Comm. on Resources).
CONGRESSIONAL RECORD, Vol. 143 (1997):
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Sept. 23, House concurred in Senate amendments.
WEEKLY COMPILATION OF PRESIDENTIAL DOCUMENTS, Vol. 33 (1997):
Oct. 9, Presidential statement.

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