BURNS McDONNELL

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

Cardinal-Hickory Creek Transmission Line Project Alternative Crossings Analysis

prepared for

ITC Midwest LLC
American Transmission Company LLC
Dairyland Power Cooperative
Cardinal-Hickory Creek Transmission Line Project

April 2016

prepared by

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

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.

(This page intentionally left blank)

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]

[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,

(This page intentionally left blank)

BURNS McDONNELL

Cardinal Substation

Hickory Creek Substation

Lock & Dam No. 10

Nelson Dewey

Stoneman

Lock & Dam No. 11

Highland Bridge

Galena 161 kV

Julien Dubuque Bridge

Richland County

Sauk County

Crawford County

Iowa County

Allamakee County

Grant County

Dane County

Clayton County

Delaware County

Dubuque County

Lafayette County

Green County

Jo Daviess County

Stephenson County

Jackson County

IOWA

WISCONSIN

ILLINOIS

MINNESOTA

Lynxville, Waterville, Harpers Ferry, Steuben, Eastman, Boscobel, Gotham, Blue River, Muscoda, Avoca, Lone Rock, Spring Green, Arena, Mazomanie, Black Earth, Cross Plains, Middleton, Windsor, Waunakee, DeForest, Maple Bluff, Madison, Shorewood Hills, Monona, McFarland, Fitchburg, Verona, Oregon, Luana, Marquette, Prairie du Chien, McGregor, Wauzeka, Woodman, Highland, Blue Mounds, Barneveld, Ridgeway, Mount Horeb, Fennimore, Montfort, Cobb, Edmund, Dodgeville, Linden, Farmersburg, St. Olaf, Patch Grove, Clayton, Bagley, Bloomington, Livingston, Hollandale, Mineral Point, Belleville, Brooklyn, Garnavillo, Elkader, Glen Haven, Guttenberg, Lancaster, Rewey, Blanchardville, New Glarus, Monticello, Elkport, Osterdock, Millville, Cassville, Platteville, Belmont, Argyle, Albany, Strawberry Point, North Buena Vista, Potosi, Tennyson, Darlington, Woodford, Brodhead, Edgewood, Colesburg, Balltown, Dickeyville, Cuba City, Monroe, Juda, Luxemburg, Holy Cross, Rickardsville, Durango, Sageville, Sandy Hook, Hazel Green, Benton, Shullsburg, Gratiot, Browntown, South Wayne, Greeley, New Vienna, Asbury, Dubuque, East Dubuque, Menominee, Bankston, Graf, Centralia, Manchester, Earlville, Dyersville, Delaware, Farley, Epworth, Peosta, Delhi, Worthington, Ryan, Hopkinton, Scales Mound, Apple River, Warren, Winslow, Nora, Apple Canyon Lake, Galena, The Galena Territory, Lena, Stockton, Elizabeth, St. Donatus

0 3.5 7 Miles

NORTH

Alternative Crossing Locations

Cardinal-Hickory Creek Initial Study Area

ACA Study Area

Proposed Intermediate Substation Siting Area

County

State

Existing 345 kV

Existing 161 kV

Existing 138 kV

Municipal Area

Substation

Locator Map

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

(This page intentionally left blank)

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.

(This page intentionally left blank)

TABLE OF CONTENTS

ABSTRACT/NOTE TO REVIEWER OR READER

EXECUTIVE SUMMARY

Page No.

1.0 INTRODUCTION 1-1
1.1 Project Description 1-1
1.2 Owners 1-8
1.3 Development of Cardinal-Hickory Creek Initial Study Area and Alternative Crossing Locations 1-11
1.4 Overview of Agency Requirements and Outreach 1-15
1.5 Organization of This Report 1-16

2.0 PURPOSE AND NEED 2-1
2.1 Study Efforts Supporting the Project 2-1
2.1.1 Upper Midwest Transmission Development Initiative 2-2
2.1.2 MISO Regional Generator Outlet Study 2-3
2.2 MISO MVP Portfolio Development 2-4
2.2.1 Transmission System Reliability 2-6
2.2.2 Increased Economic Benefits 2-6
2.2.3 Increased Transfer Capability – Reliable Renewable Energy Integration 2-7
2.2.4 National Public Policy Benefits 2-7
2.3 Conclusion 2-12

3.0 DEVELOPMENT OF CARDINAL-HICKORY CREEK INITIAL STUDY AREA, ALTERNATIVE CROSSING LOCATIONS, AND ACA STUDY AREA 3-1
3.1 Development of Initial Study Area and Crossing Locations 3-1
3.2 ACA Study Area Boundary 3-3
3.3 USFWS Mitigation Policy and Refuge Lands 3-4
3.3.1 USFWS Authority to Grant Right-of-Way for Power Line Use 3-4
3.3.2 Non-Refuge Alternative Crossing Locations 3-6
3.3.3 Refuge Alternatives 3-9
3.4 Major Stakeholders 3-9
3.4.1 Federal Agencies 3-15
3.4.2 State Agencies 3-15
3.4.3 Native American Tribes and Nations 3-16

4.0 DESCRIPTION OF THE ACA STUDY AREA AND ALTERNATIVE CROSSING LOCATIONS 4-1
4.1 Existing Conditions in ACA Study Area 4-1
4.1.1 Physiographic Setting 4-1

4.1.2 Hydrology 4-1
4.1.3 Transportation 4-2
4.1.4 Population and Housing 4-7
4.1.5 Threatened and Endangered Species 4-9
4.1.6 Conservation Areas/Natural Resources 4-12
4.2 Existing Conditions in Municipalities 4-17
4.2.1 Guttenberg, Iowa 4-17
4.2.2 Cassville, Wisconsin 4-21
4.2.3 Dubuque, Iowa/East Dubuque, Illinois 4-22
4.3 Existing Conditions in Non-Refuge Crossing Locations 4-24
4.3.1 L&D 11 4-24
4.3.2 Highway 151 Bridge 4-24
4.3.3 Galena 161 kV 4-24
4.3.4 Julien Dubuque Bridge 4-25
4.4 Existing Conditions in Refuge Crossing Locations 4-25
4.4.1 L&D 10 4-25
4.4.2 Nelson Dewey 4-26
4.4.3 Stoneman 4-26

5.0 ANALYSIS OF ACA ROUTES AND ALTERNATIVE CROSSING LOCATIONS 5-1
5.1 Overview of Methodology 5-2
5.2 NEPA and the Analysis of Alternative Crossing Locations 5-4
5.3 Site Reconnaissance and GIS Analysis 5-5
5.4 Evaluation Criteria for ACA Routes 5-6
5.4.1 Engineering 5-6
5.4.2 Environmental and Land Use 5-7
5.4.3 Social Issues 5-8
5.4.4 Feasibility 5-10
5.5 Overview of the Alternative Crossing Evaluation Process 5-10
5.6 Non-Refuge ACA Routes and Alternative Crossing Locations 5-11
5.6.1 L&D 11 Alternative Crossing Location and ACA Route 5-15
5.6.2 Highway 151 Bridge Alternative Crossing Location and ACA Route 5-26
5.6.3 Julien Dubuque Bridge Alternative Crossing Location and ACA Route 5-33
5.6.4 Galena 161 kV Line Alternative Crossing Location and ACA Route 5-41
5.6.5 Summary of Non-Refuge ACA Routes and Alternative Crossing Locations 5-48
5.7 Refuge ACA Routes and Alternative Crossing Locations 5-48
5.7.1 L&D 10 ACA Route and Alternative Crossing Locations 5-48
5.7.2 Stoneman ACA Route and Alternative Crossing Location 5-59
5.7.3 Nelson Dewey ACA Route and Alternative Crossing Location 5-70
5.7.4 Summary of Refuge Options 5-77
5.8 Underground Construction Options 5-78

5.8.1 Potential Locations for Underground Construction 5-78
5.8.2 Review of Potential Costs 5-80
5.8.3 Analysis of an Underground Alternative at the Refuge 5-80
5.8.4 State Regulatory Considerations 5-85

6.0 MAJOR FEDERAL, STATE, AND LOCAL PERMITS AND APPROVALS 6-1
6.1 NEPA 6-1
6.2 Primary Federal Authorizations and Approvals for the Mississippi River Crossing 6-2
6.2.1 USFWS 6-2
6.2.2 RUS 6-3
6.2.3 USACE/EPA 6-3
6.2.4 U.S. Coast Guard 6-4
6.3 State Need, Siting, and Condemnation Approvals for the Mississippi River Crossing 6-4
6.3.1 Iowa 6-4
6.3.2 Wisconsin Certificate of Public Convenience and Necessity 6-4
6.3.3 Illinois 6-5
6.3.4 Other State-Required Permits 6-6
6.4 Local Siting and Condemnation Approvals for the Mississippi River Crossing 6-7
6.4.1 City of Dubuque 6-7
6.4.2 City of Guttenberg 6-8

7.0 AGENCY OUTREACH 7-1
7.1 Federal Agencies 7-1
7.2 State Agencies 7-3
7.3 Local Government Units 7-3
7.4 Multi-Agency and Other Agencies 7-5

8.0 PREFERRED CROSSING LOCATION FOR THE PROJECT 8-1
8.1 Elimination of Alternatives from Further Consideration 8-1
8.2 Selection of the Preferred Crossing Location 8-2
8.2.1 Design of the Utilities' Preferred Alternative Crossing Location 8-3
8.2.2 Measures to Mitigate Potential Impacts to the Refuge 8-9
8.2.3 Optional Transmission Design through Refuge 8-9

9.0 REFERENCES 9-1

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

LIST OF TABLES

Page No.

Table 4-1: Total Population in Cities Near ACA Routes 4-7
Table 4-2: Population and Housing Data in Affected Counties 4-8
Table 4-3: Employment Data 4-9
Table 4-4: Federal and State Protected Species Known or Likely to Occur in ACA Study Area 4-10
Table 5-1: Potential Impact Summary Table for L&D 11 ACA Route 5-19
Table 5-2: Potential Impact Summary Table for Highway 151 Bridge ACA Route 5-29
Table 5-3: Potential Impact Summary Table for Julien Dubuque Bridge ACA Route 5-38
Table 5-4: Potential Impact Summary Table for Galena 161 kV Line ACA Route 5-45
Table 5-5: Potential Impact Summary Table for L&D 10 ACA Route 5-53
Table 5-6: Potential Impact Summary Table for Stoneman ACA Route 5-63
Table 5-7: Potential Impact Summary Table for Nelson Dewey ACA Route 5-73
Table 7-1: USFWS Meetings 7-1
Table 7-2: USACE Meetings 7-2
Table 7-3: Iowa Utilities Board Meetings 7-3
Table 7-4: Iowa Department of Natural Resources Meetings 7-3
Table 7-5: Public Service Commission of Wisconsin and Wisconsin Department of Natural Resources Meetings 7-3
Table 7-6: City of Dubuque Meetings 7-4
Table 7-7: City of East Dubuque Meetings 7-4
Table 7-8: Village and Township of Cassville Meetings 7-4
Table 7-9: City of Guttenberg Meetings 7-5
Table 7-10: Iowa Environmental Council Meetings 7-5
Table 7-11: Center for Rural Affairs in Iowa 7-5
Table 8-1: Routing Constraints Associated with Stoneman and Nelson Dewey ACA Routes 8-3

LIST OF FIGURES

Page No.

Figure 1-1: Cardinal-Hickory Creek Initial Study Area 1-3
Figure 1-2: ITC Typical Proposed 345 kV/345 kV Structure 1-6
Figure 1-3: ITC Typical Proposed 345 kV Structure 1-7
Figure 1-4: Proposed ITC Low-Profile 345 kV/345 kV Double-Circuit Structure 1-9
Figure 1-5: Proposed ITC Mississippi River Crossing 345 kV/345 kV Structure 1-10
Figure 1-6: ACA Study Area and Alternative Crossing Locations 1-13
Figure 2-1: UMTDI Wind Zones and Renewable Energy Transmission Corridors 2-2
Figure 2-2: RGOS Wind Zones 2-5
Figure 3-1: Non-Refuge ACA Routes 3-7
Figure 3-2: Refuge ACA Routes 3-11
Figure 4-1: Watersheds in the ACA Study Area 4-3
Figure 4-2: Surface Water in the ACA Study Area 4-5
Figure 4-3: Upper Mississippi River National Wildlife and Fish Refuge 4-13
Figure 4-4: State, County, and Local Lands and Parks 4-19
Figure 4-5: South Port Redevelopment Rendering 4-23
Figure 5-1: Overview of Non-Refuge ACA Routes 5-13
Figure 5-2: Lock & Dam No. 11 ACA Route 5-17
Figure 5-3: Lock & Dam No. 11 ACA Route Technical/Safety Exclusion Area 5-23
Figure 5-4: Highway 151 Bridge ACA Route 5-27
Figure 5-5: Julien Dubuque Bridge ACA Route 5-35
Figure 5-6: Galena 161 kV ACA Route 5-43
Figure 5-7: Lock & Dam No. 10 ACA Route 5-51
Figure 5-8: Lock & Dam No. 10 ACA Route Technical/Safety Exclusion Areas 5-57
Figure 5-9: Stoneman ACA Route 5-61
Figure 5-10: Nelson Dewey ACA Route 5-71
Figure 8-1: Preliminary Plan and Profile of Nelson Dewey ACA Route in the Refuge 8-5
Figure 8-2: Wing Dam Locations 8-7
Figure 8-3: Conceptual Revegetation Area 8-11

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

(This page intentionally left blank)

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

(This page intentionally left blank)

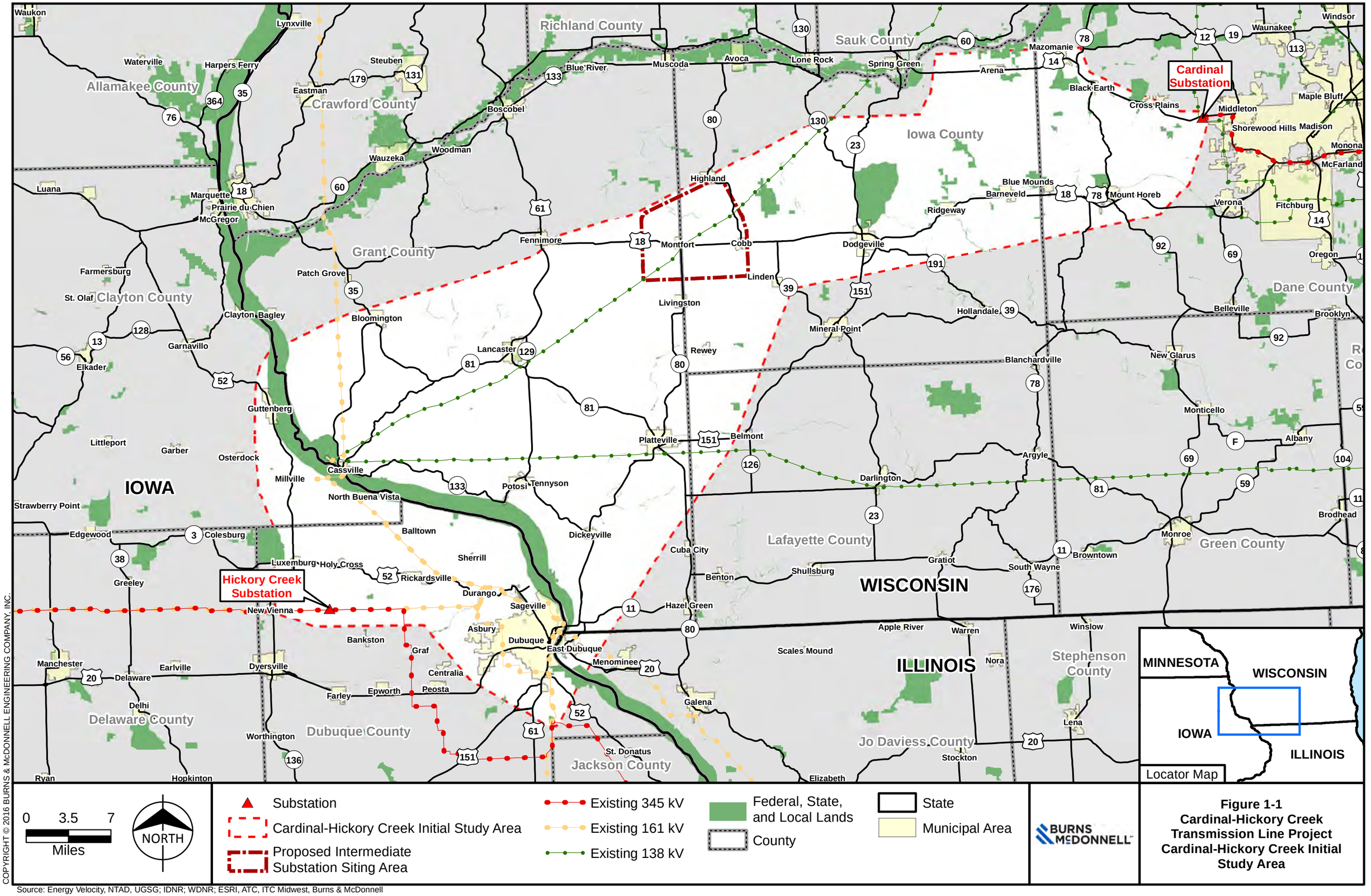


Figure 1-1
Cardinal-Hickory Creek Transmission Line Project
Cardinal-Hickory Creek Initial Study Area

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

(This page intentionally left blank)

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

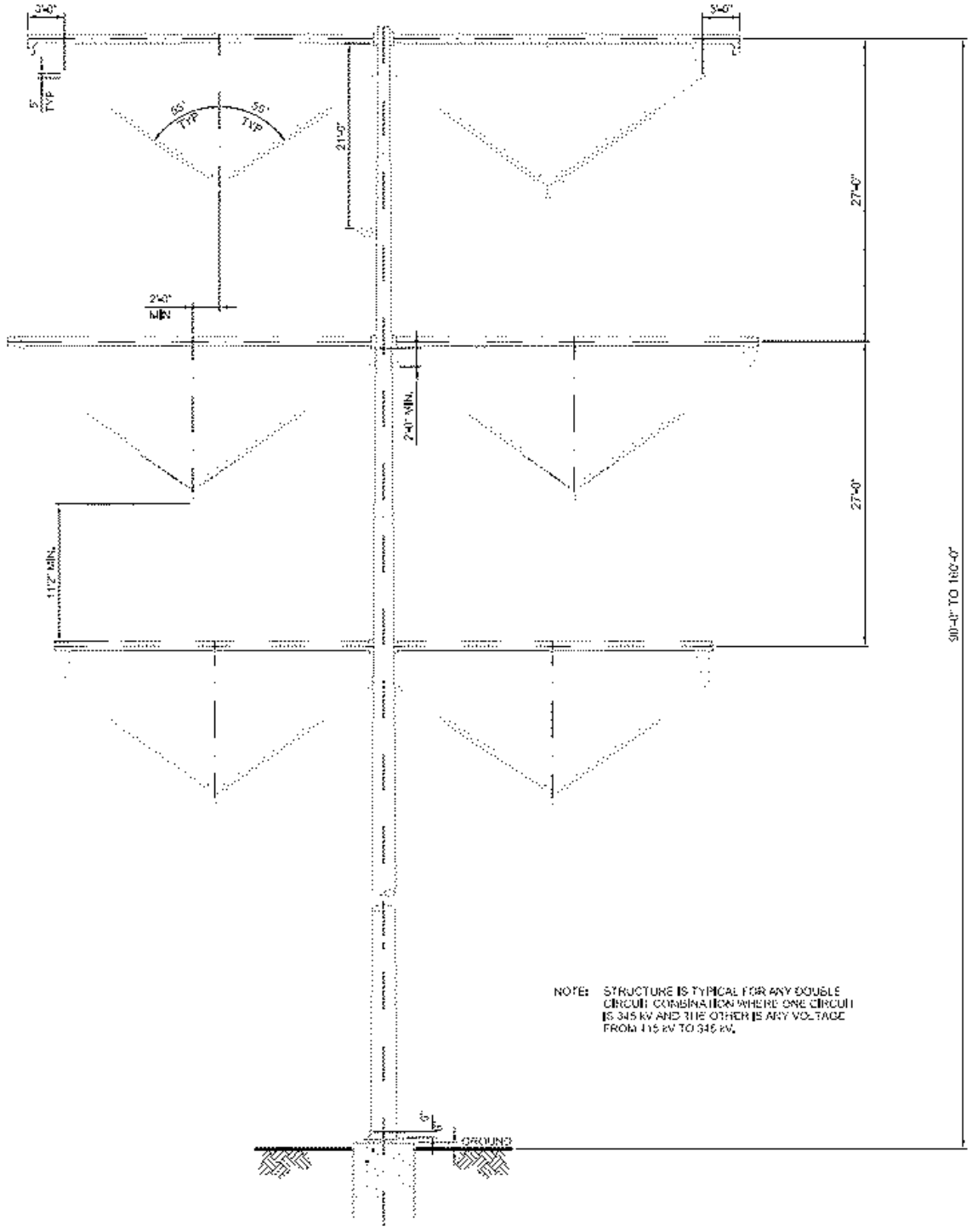
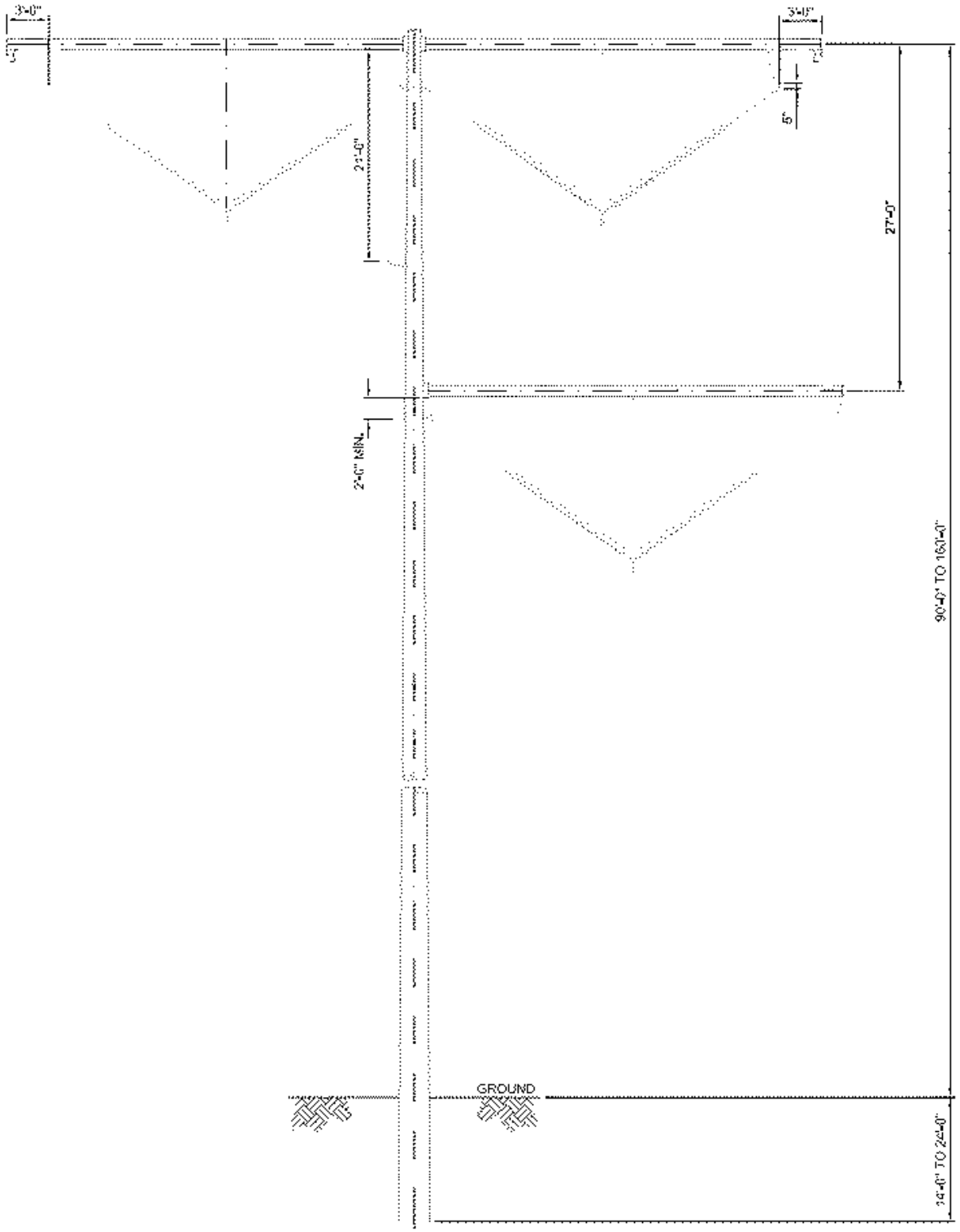


Figure 1-3: ITC Typical Proposed 345 kV Structure



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

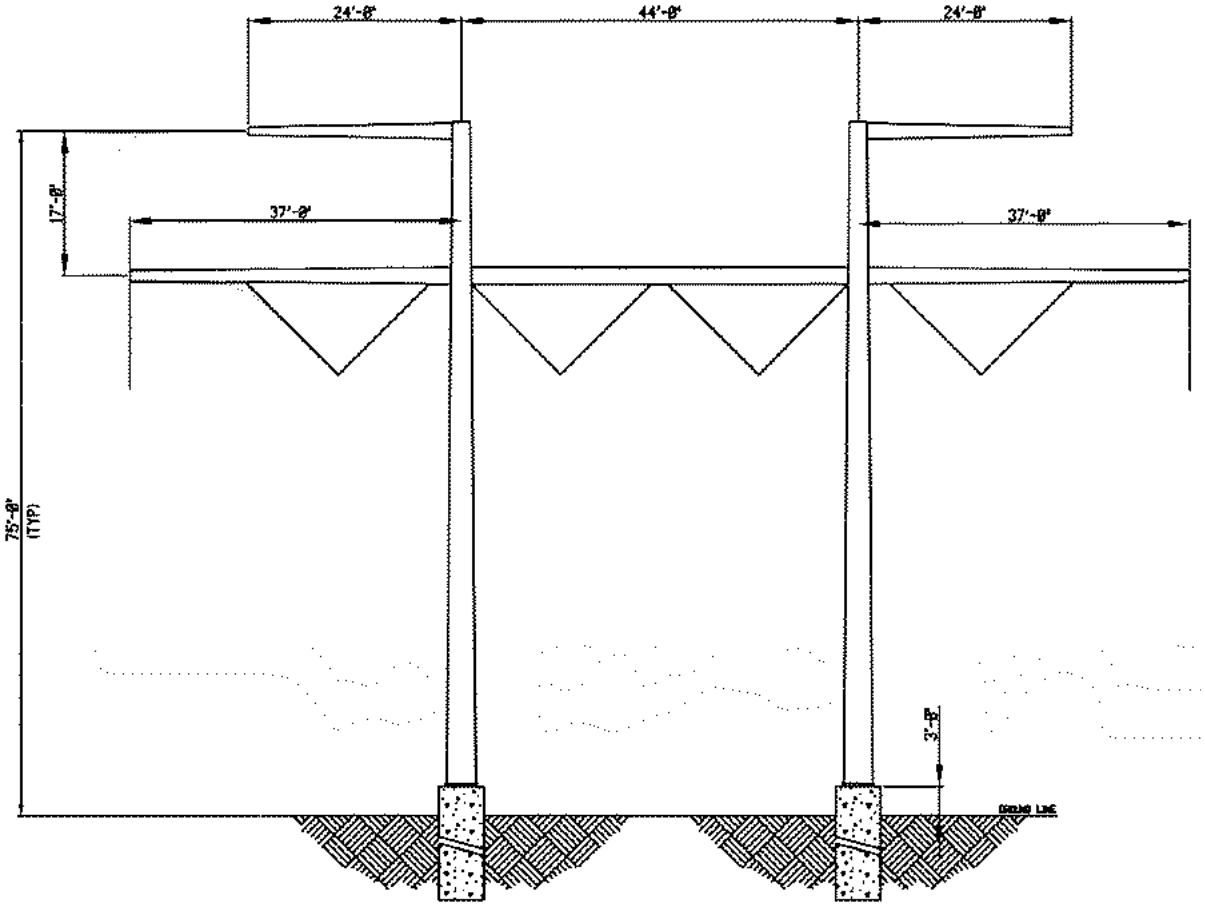
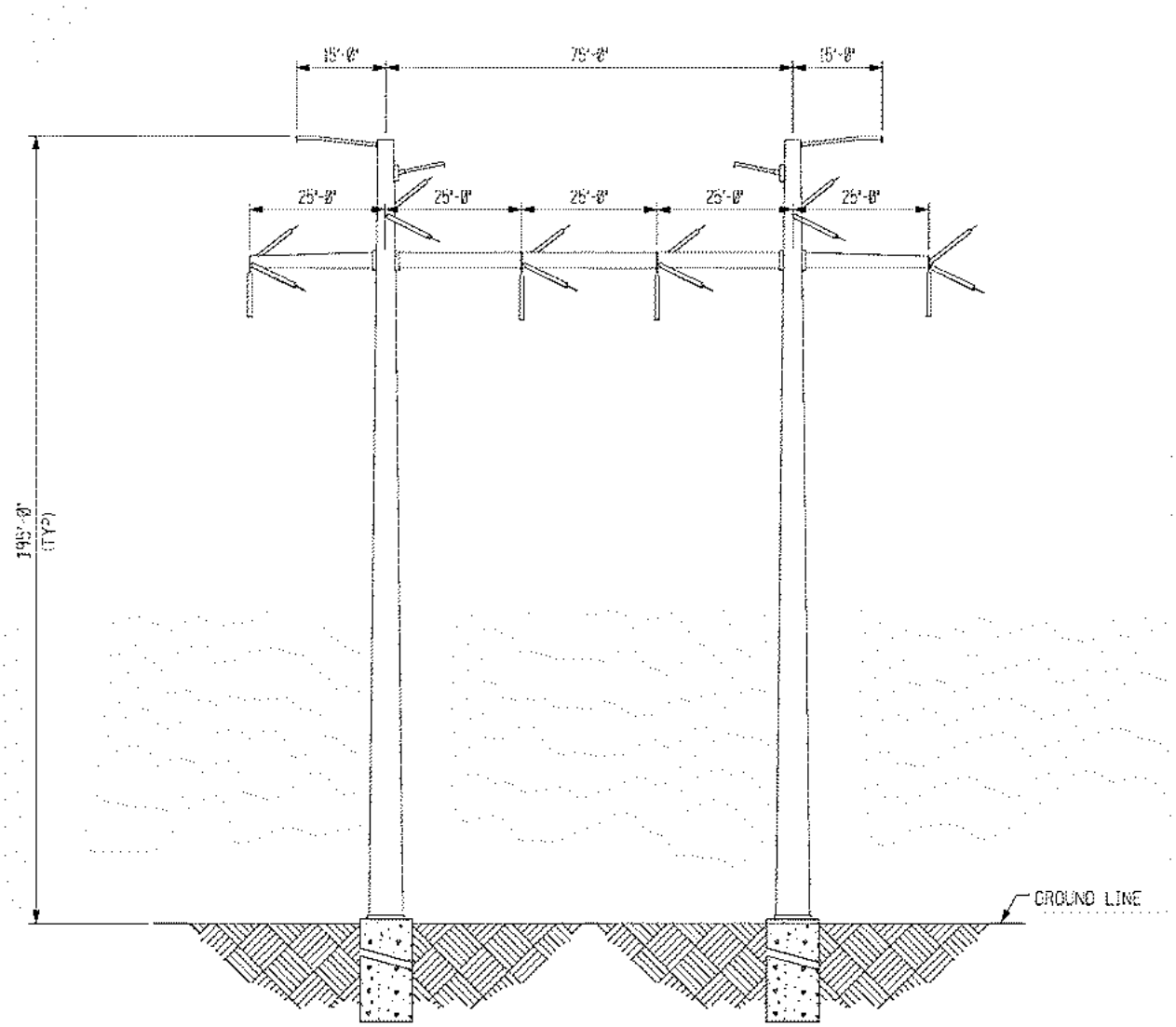


Figure 1-5: Proposed ITC Mississippi River Crossing 345 kV/345 kV Structure



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.

(This page intentionally left blank)

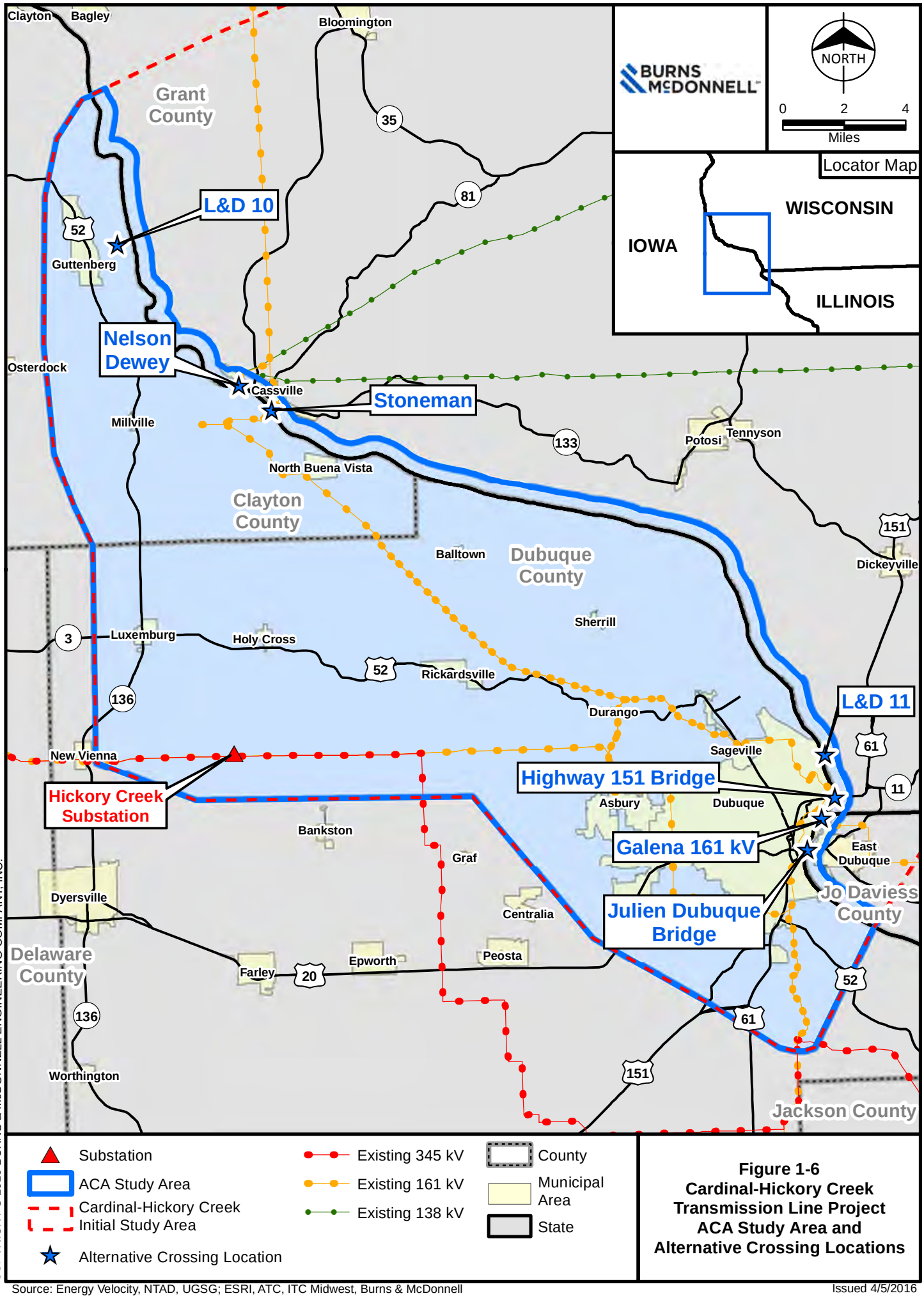


Figure 1-6
Cardinal-Hickory Creek Transmission Line Project
ACA Study Area and Alternative Crossing Locations

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

Issued 4/5/2016

(This page intentionally left blank)

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

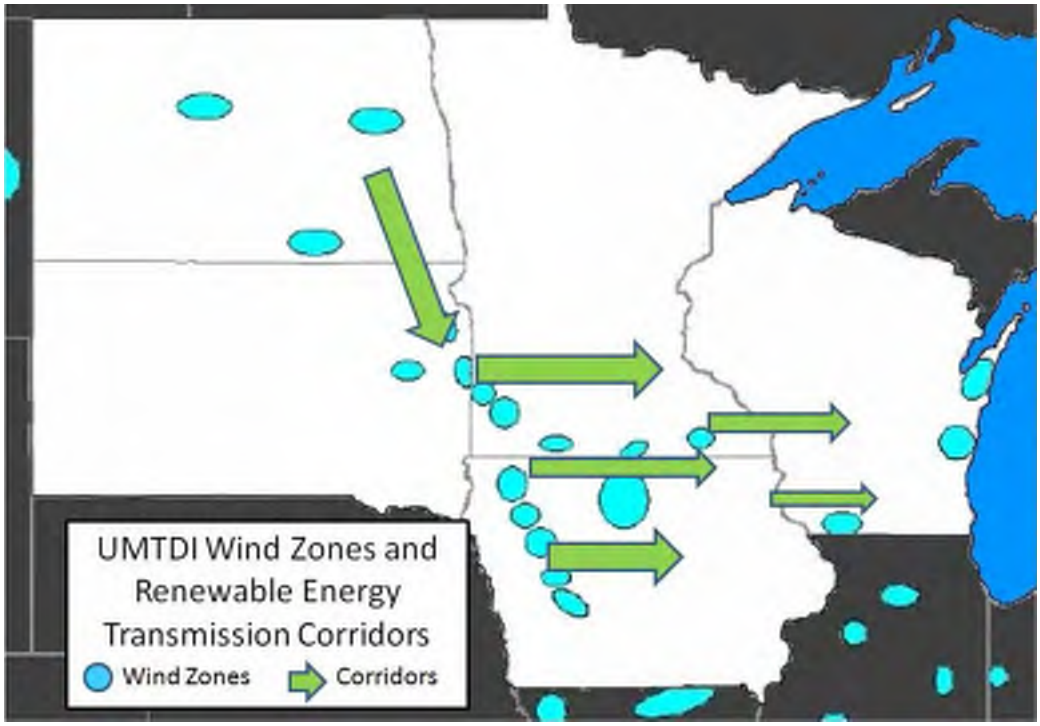
The need for additional capacity on the transmission system serving Midwest states to reliably and cost-effectively integrate renewable wind generation has been under study for more than a decade. As discussed in this and the next section, study efforts aimed at identifying solutions to address this 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):

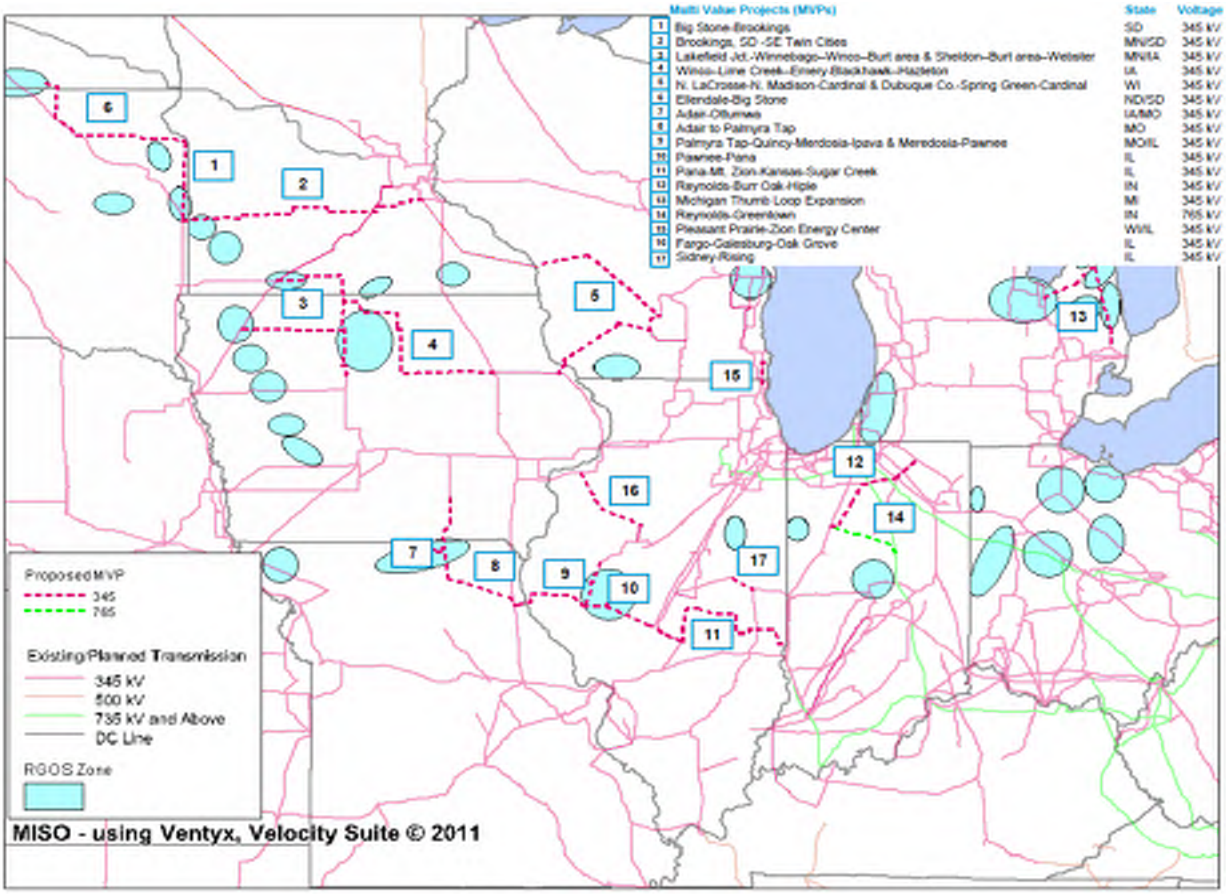
- Criterion 1: The MVP must enable the transmission system to deliver energy reliably and economically in support of documented federal or state energy policy mandates or laws.
- Criterion 2: The MVP must provide multiple types of economic value across multiple pricing zones with a total cost/benefit 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.

[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, will not materially interfere 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.

Lock & Dam No. 11
Eagle Point Park
L&D 11
Upper Mississippi River
National Wildlife
and Fish Refuge
Dubuque
Highway 151 Bridge
Iowa
Wisconsin
Galena 161 kV
Illinois
61
Great River Road
Julien Dubuque Bridge
20
East Dubuque
52
NORTH
0 750 1,500
Feet
BURNS McDONNELL
WISCONSIN
IOWA
ILLINOIS
Locator Map
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

(This page intentionally left blank)

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.

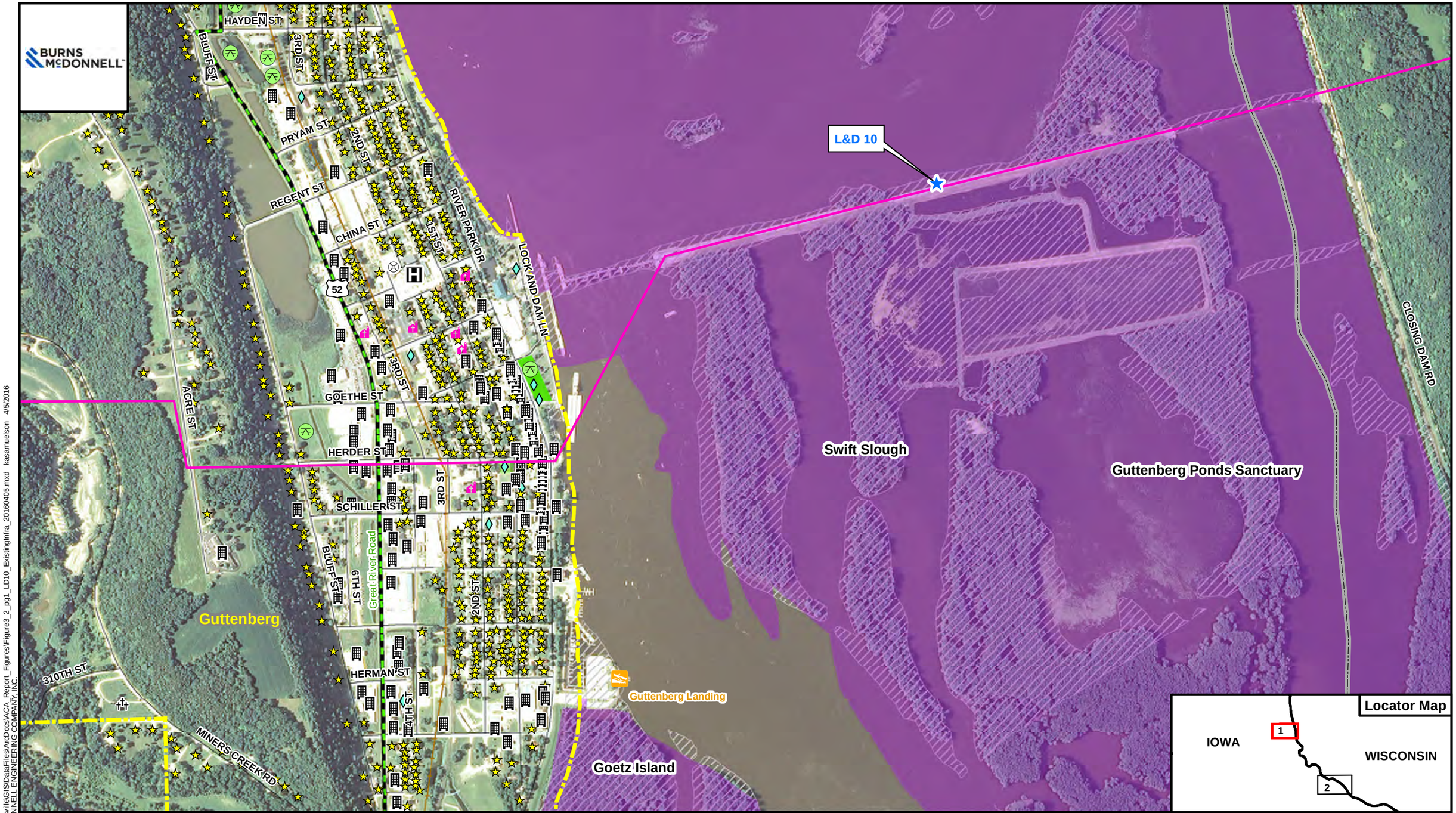
The Nelson Dewey ACA route utilizes open areas within the Refuge near Oak Road and crosses near the Cassville Car Ferry landing in Iowa to the existing Nelson Dewey Substation near the retired Nelson Dewey Power Plant in Wisconsin. Stoneman, the other southern Refuge ACA route, follows where the existing 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).

(This page intentionally left blank)



0 375 750
Feet

NORTH

- L&D 10 ACA Route*
- Alternative Crossing Location
- Substation
- 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

*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

(This page intentionally left blank)

Grant County, WI

Clayton County, IA

Nelson Dewey Substation

Nelson Dewey

Cassville

Stoneman Substation

Stoneman

Turkey River Substation

Turkey River Mounds State Preserve

DIETRICH HEIGHT

DENNISTON ST

MULBERRY DR

W FRONT ST

WIOTA ST

W DEWEY ST

W AMELIA ST

SCHOOL ST

FREDRICK ST

E BLUFF ST

E AMELIA ST

E FRONT ST

PRIME ST

CEDAR ST

PENNSYLVANIA ST

E CRAWFORD ST

OAK RD

360TH ST

Great River Road

GREAT RIVER RD

IOWA

WISCONSIN

1

2

Locator Map

NORTH

0 500 1,000

Feet

ACA Study Area

ACA Routes*

Alternative Crossing Location

Substation

Existing 161 kV

Existing 138 kV

Existing 69 kV

Scenic Byway

FWS

INHF Land

State Land

House

Business/ Commercial

Cemetery

Church

School

Airport

Daycare

Park

Tower

Rail

County

Municipal Area

*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

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

(This page intentionally left blank)

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.

(This page intentionally left blank)

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.

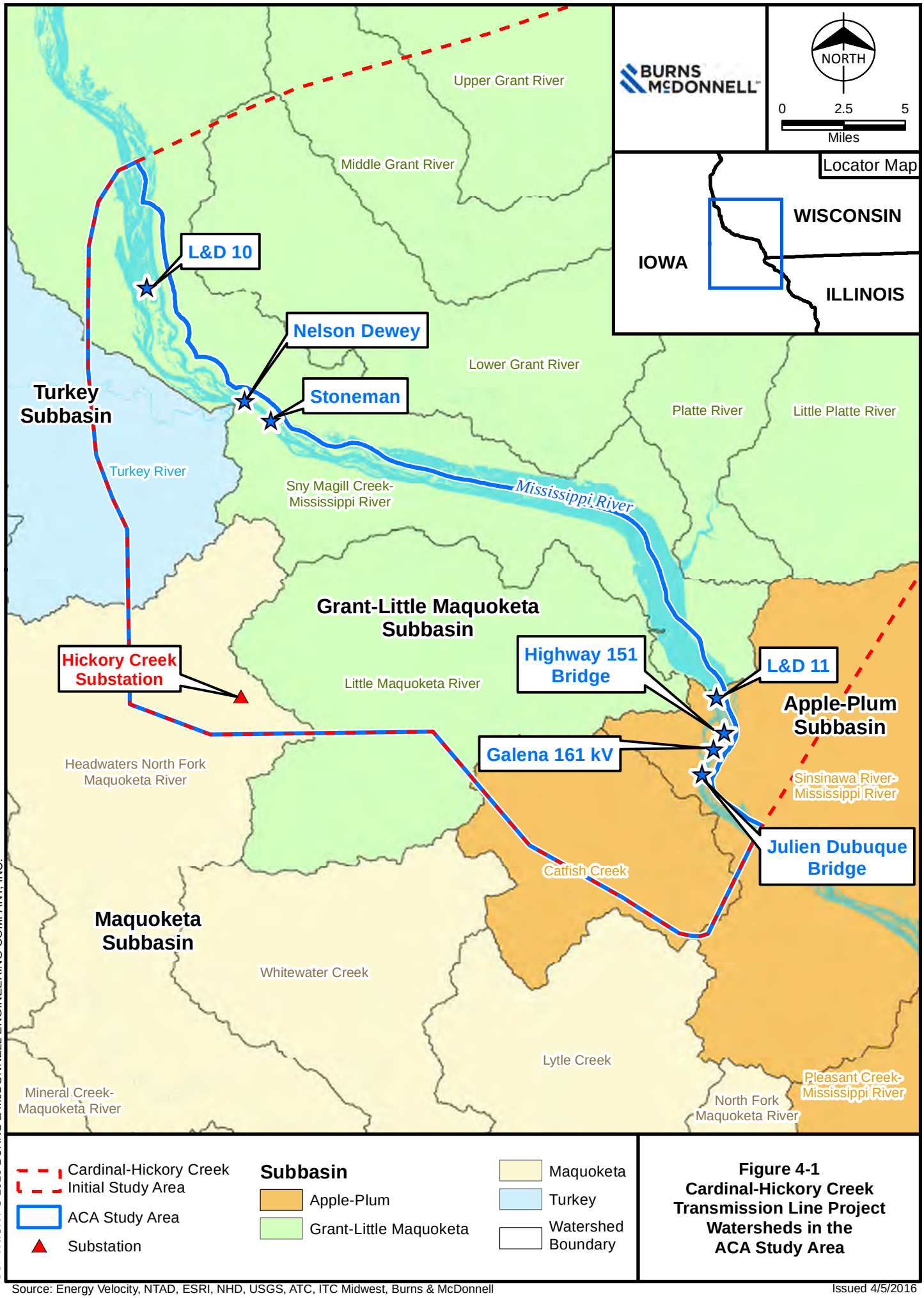


Figure 4-1
Cardinal-Hickory Creek Transmission Line Project
Watersheds in the ACA Study Area

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

Issued 4/5/2016

(This page intentionally left blank)

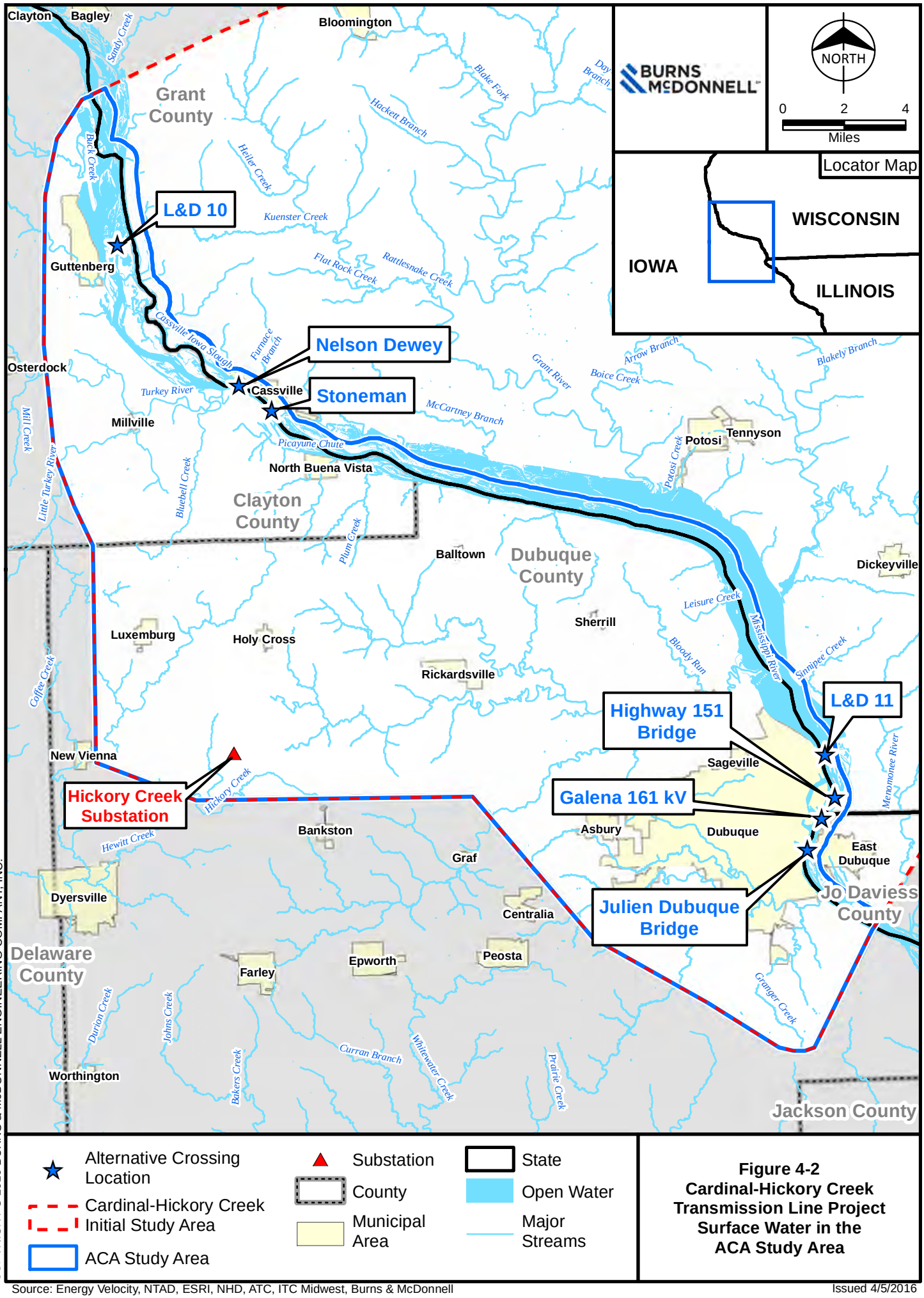


Figure 4-2
Cardinal-Hickory Creek Transmission Line Project
Surface Water in the ACA Study Area

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

Issued 4/5/2016

(This page intentionally left blank)

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).

NORTH

0 7 14

Miles

Pepin County
Buffalo County
Trempealeau County
Clark County
Wood County
Wisconsin Rapids
Jackson County
Wabasha County
Waushara County
Winona
Winona County
Monroe County
Adams County
Juneau County
Marquette County
Olmsted County
La Crosse County
La Crosse
Fillmore County
Houston County
Vernon County
Columbia County
MINNESOTA
WISCONSIN
Baraboo
Sauk County
Richland County
Howard County
Winneshiek County
Allamakee County
Crawford County
Dane County
IOWA
Chickasaw County
Clayton County
Grant County
Iowa County
Cardinal Substation
Fayette County
Bremer County
Green County
Platteville
Hickory Creek Substation
Lafayette County
Dubuque
Buchanan County
Delaware County
Dubuque County
Stephenson County
Jo Daviess County
Black Hawk County
ILLINOIS
Linn County
Jackson County
Ogle County
Jones County
Carroll County
Benton County
Marion
Cedar Rapids
Clinton County
Clinton
Whiteside County
Lee County
Cedar County
Scott County
Rock Island County
Bettendorf
Davenport
East Moline
Rock Island
Henry County
Bureau County
Muscatine County
Iowa City

Locator Map
WISCONSIN
IOWA
ILLINOIS

ACA Study Area
Cardinal-Hickory Creek Initial Study Area
Substation
State
County
Municipal Area
Upper Mississippi River National Wildlife and Fish Refuge

BURNS McDONNELL

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.

Issued: 4/5/2016

Path: R:\ITC\74417_Hickory_Crk_Cassville\GIS\DataFiles\ArcDocs\ACA_Report_Figures\Figure4_3_NWR_20160405.mxd kasamuelson 4/5/2016

(This page intentionally left blank)

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.

(This page intentionally left blank)

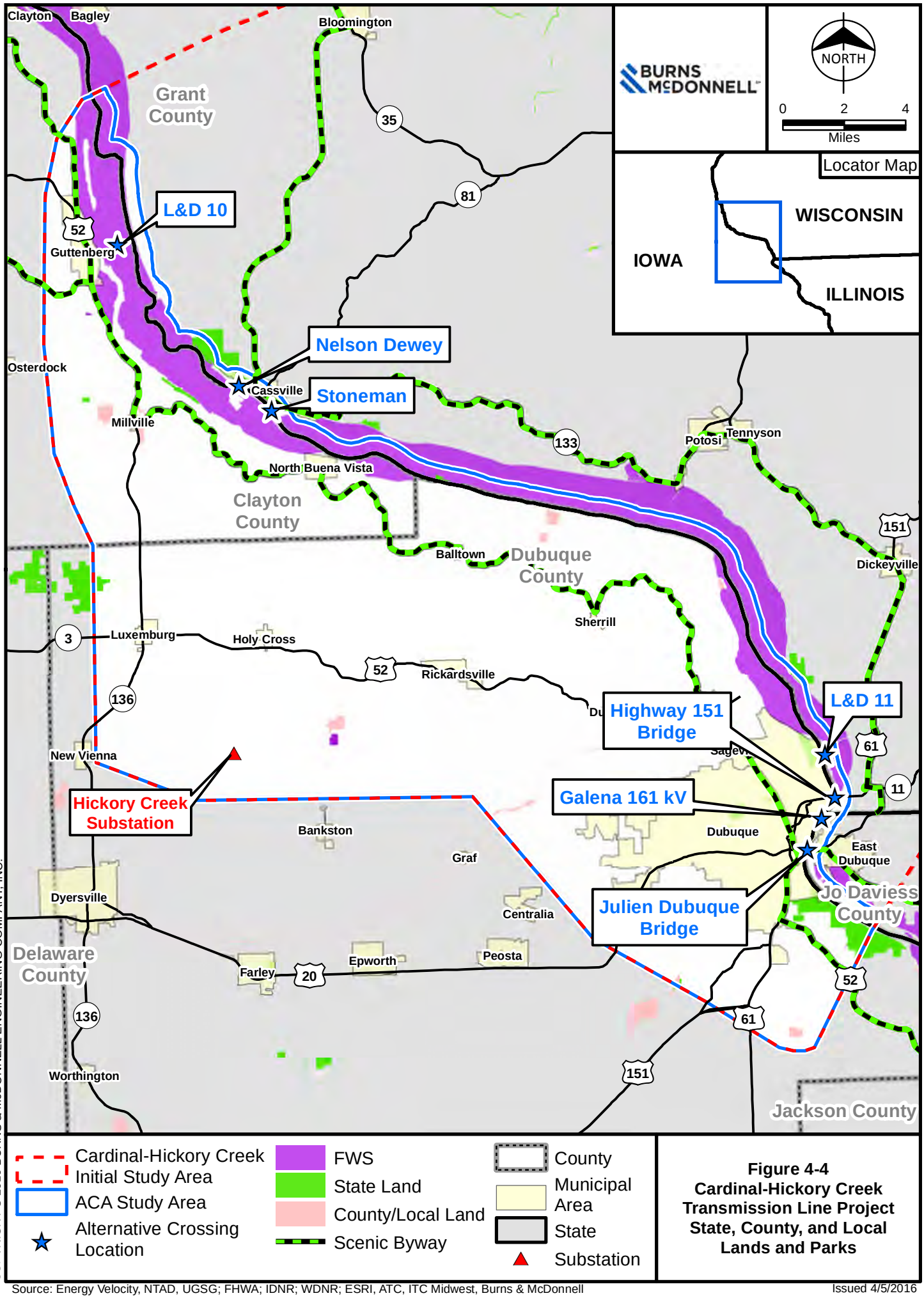


Figure 4-4
Cardinal-Hickory Creek Transmission Line Project
State, County, and Local Lands and Parks

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

Issued 4/5/2016

(This page intentionally left blank)

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

[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.

(This page intentionally left blank)

WISCONSIN
IOWA
ILLINOIS
Upper Mississippi River National Wildlife and Fish Refuge
Grant County
Kieler
WDNR
Sherrill
Holy Cross
Rickardsville
52
Durango
366
Bankston Park
Bankston Unit
Hickory Creek Substation
Great River Road
L&D 11
Sandy Hook
Eagle Point Park
Sageville
Highway 151 Bridge
Avenue Prairie
Bunker Hill Golf Course
61
Dubuque
Flora Park
Galena 161 kV
Great River Road
35
East Dubuque
20
Julien Dubuque Bridge
Jo Daviess County
151
Mines of Spain State Recreation Area
Dubuque County
Heritage Trail
Asbury
Bankston
Graf
Centralia
Epworth
Peosta

0 3,500 7,000
Feet

NORTH

Locator Map

WISCONSIN
IOWA
ILLINOIS

ACA Study Area
Alternative Crossing Location
Non-Refuge ACA Routes*
Existing 345 kV
Existing 161 kV
Existing 138 kV
Existing 69 kV
Highway
Scenic Byway
FWS
State and Local Lands
County Land
INHF Land
Substation
Municipal Area
State

*ACA Routes are for conceptual purposes only

BURNS McDONNELL

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

Issued: 4/5/2016

Path: R:\ITC\74417_Hickory_Crk_Cassville\GIS\DataFiles\ArcDocs\ACA_Report_Figures\Figure5_1_NonRefuge_Routes_20160405.mxd kasamuelson 4/5/2016

(This page intentionally left blank)

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.

(This page intentionally left blank)

BURNS McDONNELL

NORTH

0 600 1,200

Feet

Lock & Dam No. 11

Eagle Point Park

Upper Mississippi River National Wildlife and Fish Refuge

L&D 11 ACA Route

Iowa

Dubuque

Iowa

Wisconsin

61

Illinois

East Dubuque

WISCONSIN

IOWA

ILLINOIS

Locator Map

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

(This page intentionally left blank)

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

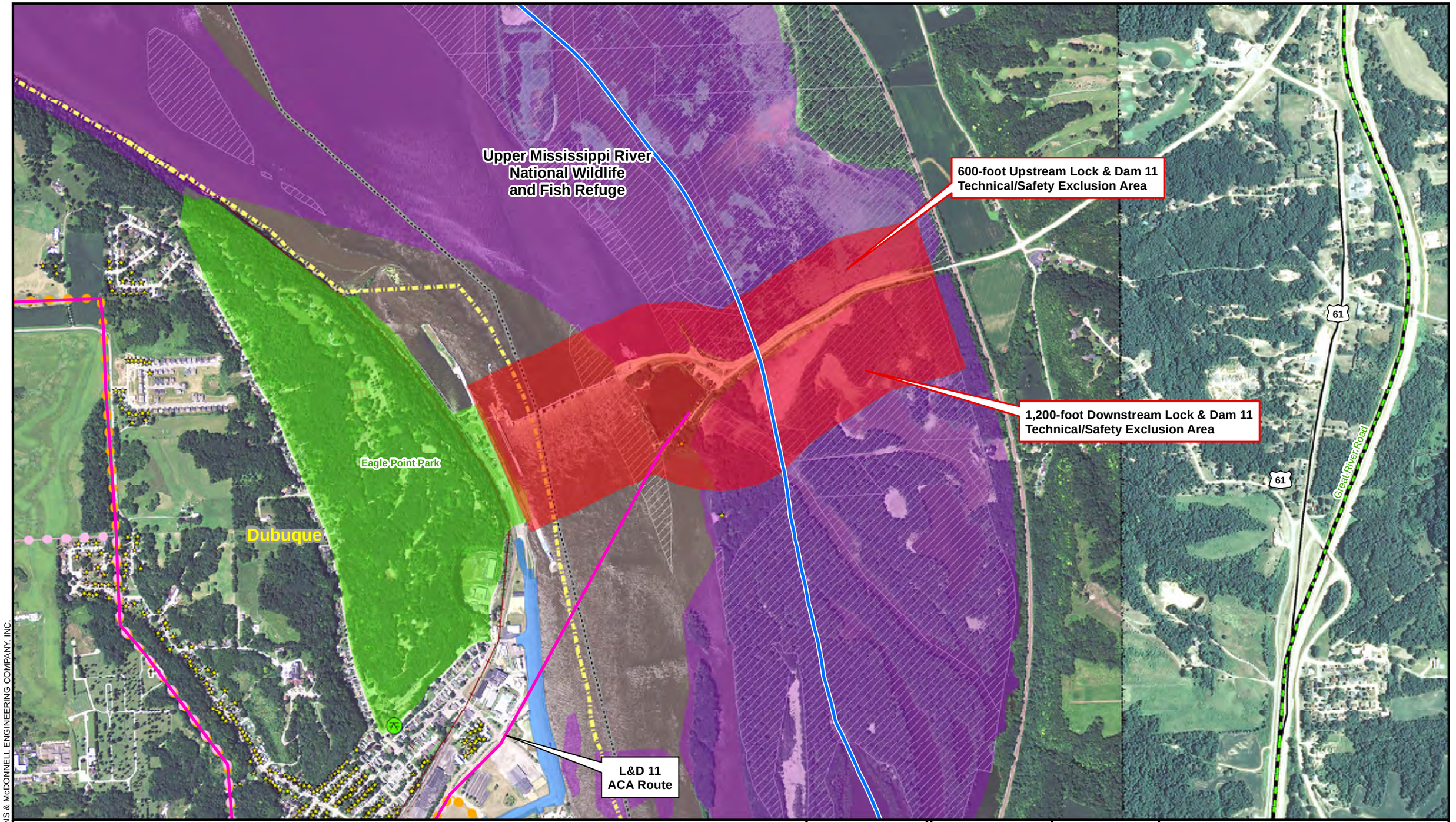
L&D 10 and 11 crossing locations. Previously, in December 2014, the Utilities provided USACE with a preliminary design for a 345 kV transmission line crossing located near Lock and Dam No. 11. Both the Rock Island and St. Paul USACE districts reviewed this preliminary design pursuant to the Rivers and 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

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

(This page intentionally left blank)

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.

BURNS McDONNELL

NORTH

0 600 1,200

Feet

Eagle Point Park

Upper Mississippi River National Wildlife and Fish Refuge

Dubuque

Highway 151 Bridge ACA Route

Wisconsin

Iowa

61

Great River Road

Illinois

East Dubuque

Locator Map

WISCONSIN

IOWA

ILLINOIS

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

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_4_Hwy151_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

(This page intentionally left blank)

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.

(This page intentionally left blank)

BURNS McDONNELL

NORTH

0 600 1,200

Feet

Wisconsin

61

Julien Dubuque Bridge
ACA Route

Dubuque

East Dubuque

52

20

Iowa

Upper Mississippi River
National Wildlife
and Fish Refuge

Great River Road

Illinois

Mines of Spain State Recreation Area

Locator Map

WISCONSIN

IOWA

ILLINOIS

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

(This page intentionally left blank)

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.

(This page intentionally left blank)

BURNS McDONNELL

NORTH

0 600 1,200

Feet

Eagle Point Park

Upper Mississippi River National Wildlife and Fish Refuge

Wisconsin

Dubuque

Iowa

Galena 161 kV ACA Route

61

Great River Road

52

20

East Dubuque

Illinois

Locator Map

WISCONSIN

IOWA

ILLINOIS

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

(This page intentionally left blank)

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.

(This page intentionally left blank)

BURNS McDONNELL

Locator Map

WISCONSIN

IOWA

ILLINOIS

L&D 10

WISCONSIN

Guttenberg

Grant County

Nelson Dewey State Park

Upper Mississippi River National Wildlife and Fish Refuge

133

81

Osterdock

Great River Road

Cassville

Nelson Dewey

Turkey River Mounds State Preserve

Merrit Forest State Preserve

Clayton County Conservation Board

Cassville

Stoneman

Millville

Clayton County Conservation Board

INHF

52

Clayton County

IOWA

INHF

North Buena Vista

Ram Hollow WMA

White Pine Hollow State Preserve

Dubuque County

Luxemburg

Holy Cross

3

Delaware County

136

Bankston Park

Driftless Area NWR

New Vienna

Hickory Creek Substation

NORTH

0 3,000 6,000

Feet

ACA Study Area

Alternative Crossing Location

L&D 10 ACA Route*

Substation

Existing 345 kV

Existing 161 kV

Existing 138 kV

Existing 69 kV

FWS

INHF Land

County Land

State Land

Municipal Area

County

State

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

Source: IDNR, Energy Velocity, NTAD, IDOT, INHF, WDNR, Clayton County, FHA, ESRI, ITC Midwest, Burns & McDonnell

(This page intentionally left blank)

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.

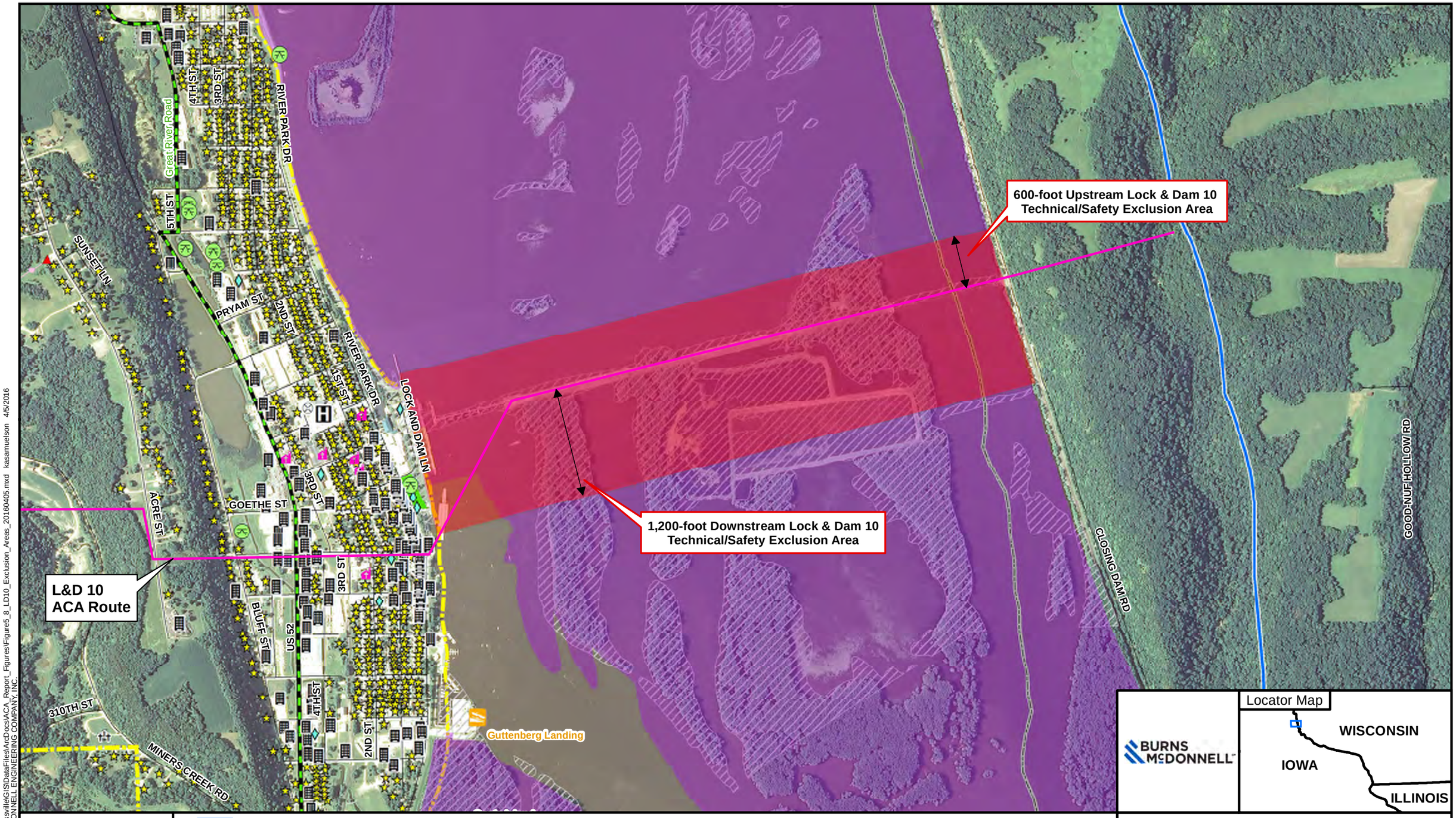
5.7.1.2.2 Archaeological and Historic Resources

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

BURNS McDONNELL

Locator Map

WISCONSIN

IOWA

ILLINOIS

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

(This page intentionally left blank)

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.

BURNS McDONNELL

Locator Map
WISCONSIN
IOWA
ILLINOIS

Upper Mississippi River National Wildlife and Fish Refuge
Nelson Dewey State Park
Great River Road
81
Grant County
Cassville
Nelson Dewey
Turkey River Mounds State Preserve
Cassville
Merrit Forest State Preserve
Clayton County Conservation Board
Great River Road
133
Clayton CCB
Turkey River Substation
Millville
INHF Land
Stoneman
INHF Land
North Buena Vista
52
Clayton County
White Pine Hollow State Preserve
52
Dubuque County
Luxemburg
3
Holy Cross
52
136
Bankston Park
Driftless Area NWR
New Vienna
Hickory Creek Substation

NORTH
0 0.5 1
Miles

Alternative Crossing Locations
ACA Study Area
Stoneman ACA Route*
Existing 345 kV
Existing 161 kV
Existing 138 kV
Existing 69 kV
Scenic Byway
INHF Land
FWS
State Land
Clayton CCB
Substation
Municipal Area
County
State
Highway

*ACA Routes are for conceptual purposes only

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

Path: R:\ITC\74417_Hickory_Crk_Cassville\GIS\DataFiles\ArcDocs\ACA_Report_Figures\Figure5_9_Stoneman_Route_20160405.mxd kasamuelson 4/5/2016

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

Issued: 4/5/2016

(This page intentionally left blank)

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).

BURNS McDONNELL

Locator Map
WISCONSIN
IOWA
ILLINOIS

Upper Mississippi River National Wildlife and Fish Refuge
Nelson Dewey State Park
Great River Road
81
Grant County
Cassville
Nelson Dewey
Turkey River Mounds State Preserve
Cassville
Merrit Forest State Preserve
Clayton County Conservation Board
Great River Road
133
Stoneman
Clayton CCB
Turkey River Substation
Millville
INHF Land
INHF Land
North Buena Vista
52
Clayton County
White Pine Hollow State Preserve
52
Dubuque County
Luxemburg
Holy Cross
3
52
136
Bankston Park
Driftless Area NWR
New Vienna
Hickory Creek Substation

NORTH
0 0.5 1
Miles

ACA Study Area
Alternative Crossing Location
Nelson Dewey ACA Route*
Substation
Existing 345 kV
Existing 161 kV
Existing 138 kV
Existing 69 kV
INHF Land
FWS
State Land
Clayton CCB
Municipal Area
County
State
Highway
Scenic Byway
*ACA Routes are for conceptual purposes only

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

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

Issued: 4/5/2016

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

(This page intentionally left blank)

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).