6.1 Crossing the Mississippi River

An important factor in determining the route for the 345 kilovolt (kV) transmission line was the selection of the location where the transmission line would cross the Mississippi River. The river crossing establishes the eastern terminus of the transmission line in Minnesota, and therefore has a strong influence on the transmission line routes considered in Minnesota and Wisconsin. The selection of the crossing location requires analysis of feasible alternatives, since the Mississippi River is recognized as a valuable resource with designated habitat areas and many recreational opportunities.

A number of factors limit the number of feasible crossing location alternatives. These include the width of the Mississippi River, the topography of southeastern Minnesota's blufflands, the presence of natural areas including State and Federal properties, the presence of existing infrastructure crossing the river, and existing settlements.

On the Minnesota side, the approach to potential crossings would have to traverse blufflands that border the Mississippi River. On the Wisconsin side, the geographic area is similarly characterized by a rugged, hilly region dissected by rivers and streams, rocky outcroppings, and numerous small caves abutting the Mississippi River.

There are two designated wildlife refuges along the Mississippi River in the project area managed by the U.S. Fish and Wildlife Service (USFWS). These are the Upper Mississippi River National Fish and Wildlife Refuge (Refuge) and the Trempealeau National Wildlife Refuge. Any crossing of either refuge would require a Special Use Permit from USFWS.

The applicant identified and analyzed four potential crossing locations in the Route Permit Application (RPA). These are shown in Map 6.1-1, River Crossing Alternatives Considered, and are identified as:

- Alma, Wisconsin. The RPA identifies Alma, Wisconsin as an alternative for a crossing location. However, the draft EIS evaluates only the Minnesota portion of the project. Therefore, the Alma crossing is referred to as the Kellogg crossing in the draft EIS, after the Minnesota town nearest the crossing location.;
- Winona, Minnesota, referred to as the Winona crossing;
- La Crescent, Minnesota, referred to as the La Crescent crossing;
- Trempealeau, Wisconsin, referred to as the Trempealeau crossing.

Through a process of evaluation, consultation, and stakeholder input, the applicant determined that the crossing at Alma, Wisconsin (Kellogg crossing), just east of Kellogg, Minnesota, would best minimize potential human and environmental impacts.

6.1.1 Factors Supporting the Kellogg Crossing

The applicant evaluated the potential river crossing options using Geographic Information Systems (GIS) and on-site evaluations, agency consultation and stakeholder input. Factors that guided the crossing evaluation and selection process included:

- Non-proliferation
- Refuge & USFWS Concerns
- Engineering Challenges & Visual Impacts
- Substation Locations

The results of the applicant's evaluation are discussed here and summarized in Table 6.1.1.

Table 6.1-1 Factors supporting the Kellogg crossing

Factor	Kellogg	Winona	La Crescent
Use of Existing Corridors, Minnesota	No new corridor required	10 miles of new corridor required	15 miles new corridor required
Use of Existing Corridors, Wisconsin	Two feasible route options that follow existing transmission lines	Two feasible route options. One follows an existing transmission line and one follows property boundaries and roads	Route options may not be feasible due to potentially unpermittable wetland impacts and/or displacement of businesses
Length in Floodplain	1.4 miles	3.25 miles	2 miles
Existing ROW in Refuge	180 feet	100 feet	100 feet
USFWS Opinion	Preferred	Opposed	Alternative with additional permitting constraints
Engineering Considerations	Narrowest river crossing; Route follows existing transmission corridor through blufflands; Wider ROW through refuge property allows flexibility to design lower structures to mitigate potential impacts to birds and aesthetics	Widest river crossing, requiring multiple poles to be located in Mississippi River backwaters; New corridor required in blufflands, limited access; Narrow ROW through refuge property results in tall structures causing potential impacts to birds and aesthetics	New corridor required in blufflands, limited access; Narrow ROW through refuge property results in tall structures causing potential impacts to birds and aesthetics
Feasible Substation Locations	Three potential substation sites	Three potential substation sites	La Crosse Substation not feasible; other alternatives require business displacement or an upgraded line in the La Crosse Marsh

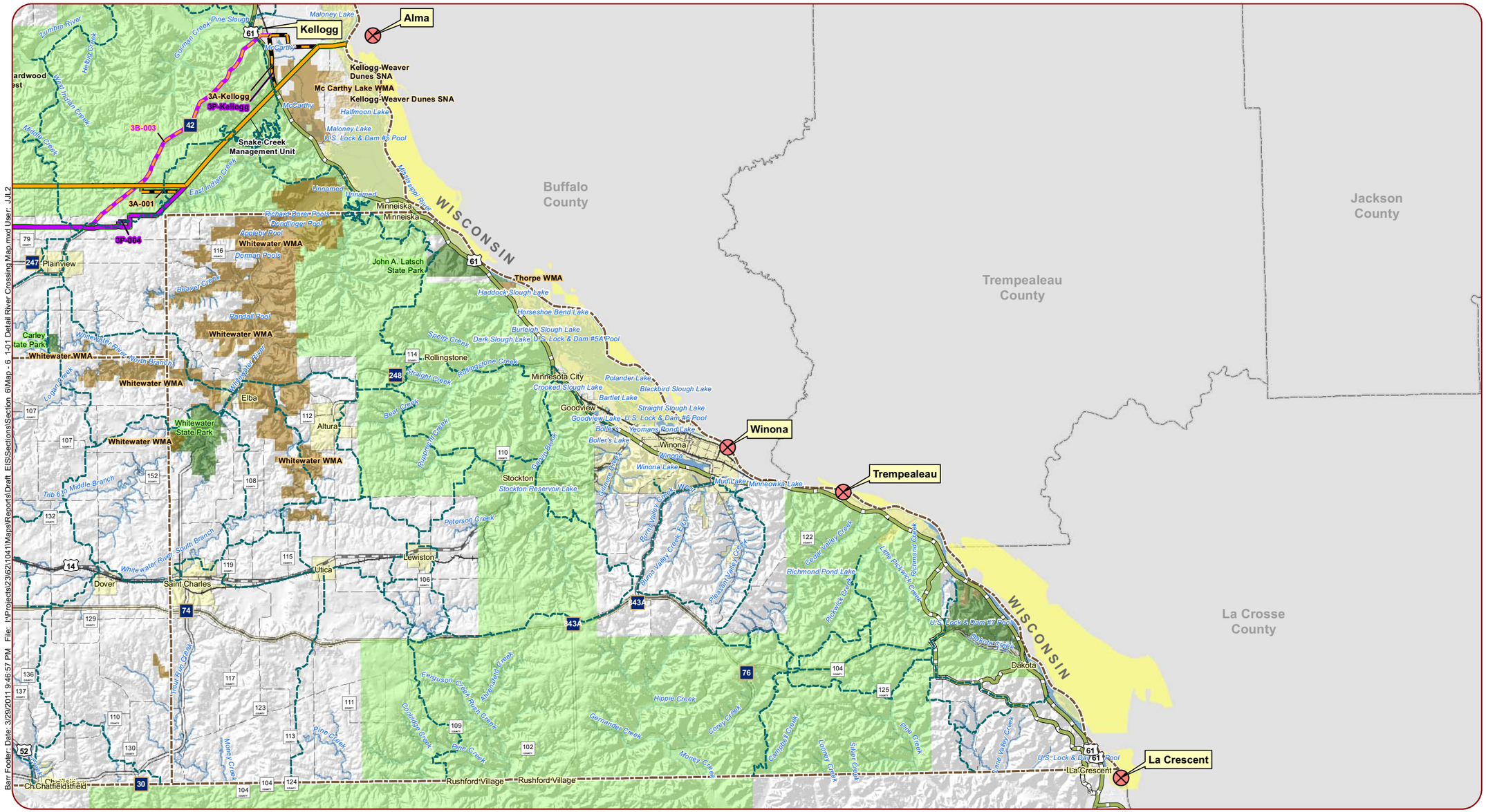
Minnesota Power Plant Siting Act

The Power Plant Siting Act (PPSA) directs the Public Utilities Commission (PUC) to locate transmission lines in a manner that "minimize[s] adverse human and environmental impact while ensuring continuing electric power system reliability and integrity and ensuring that electric energy needs are met and fulfilled in an orderly and timely fashion" (Minn. Stat. § 216E.02, subd.1). In furtherance of this objective, the PPSA and the PUC's implementing routing rules call upon the PUC to consider the utilization of existing transmission corridors in selecting transmission line routes (Minn. Stat. § 216E.03, subd.7.).

At the Kellogg crossing there is an existing 161 kV transmission line crossing the Mississippi river, with existing transmission line facilities on both sides of the river and through USFWS wildlife refuge property. The Kellogg crossing is the only crossing of those evaluated that follows an existing transmission line corridor through the blufflands in Minnesota. The Kellogg crossing then follows the 161/69 kV line corridor through the Upper Mississippi Wildlife and Fish Refuge. On the Wisconsin side, opportunities exist to follow existing transmission lines to the south to La Crosse (Dairyland Q-1 line), or to the east along a 161 kV corridor to Arcadia, and then south along an existing 69 kV line into the Galesville area. For the Kellogg Crossing, no new corridor would need to be created near or across the Mississippi River.

Refuge and USFWS Concerns

All potential crossings of the Mississippi River would affect USFWS-managed lands. There are two USFWS-managed lands potentially affected. The larger USFWS-managed property is the Upper Mississippi River National Fish and Wildlife Refuge (Refuge) which provides both recreational opportunities and habitat protection. The Refuge provides habitat for fish, mammals, amphibians, and reptiles. Moreover, it is located along a portion of the Mississippi Flyway, one of the four primary bird migration routes in North



0 1.5 3 6 Miles

0 2.5 5 10 Kilometers

- A Route
- P Route

Additional Alternative Routes

- Variation on P Route
- Variation on A Route
- Variation on Both
- Parallel Alignment
- County Boundaries
- Flyway Sites
- Scenic Byway
- State Existing Trail
- Snowmobile Trail
- Scientific and Natural Area
- Wildlife Management Area
- State Park
- State Forest
- Wildlife Refuge

Map 6.1-01
River Crossing Alternatives Considered

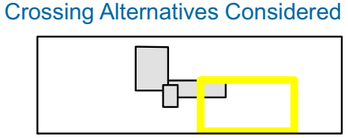
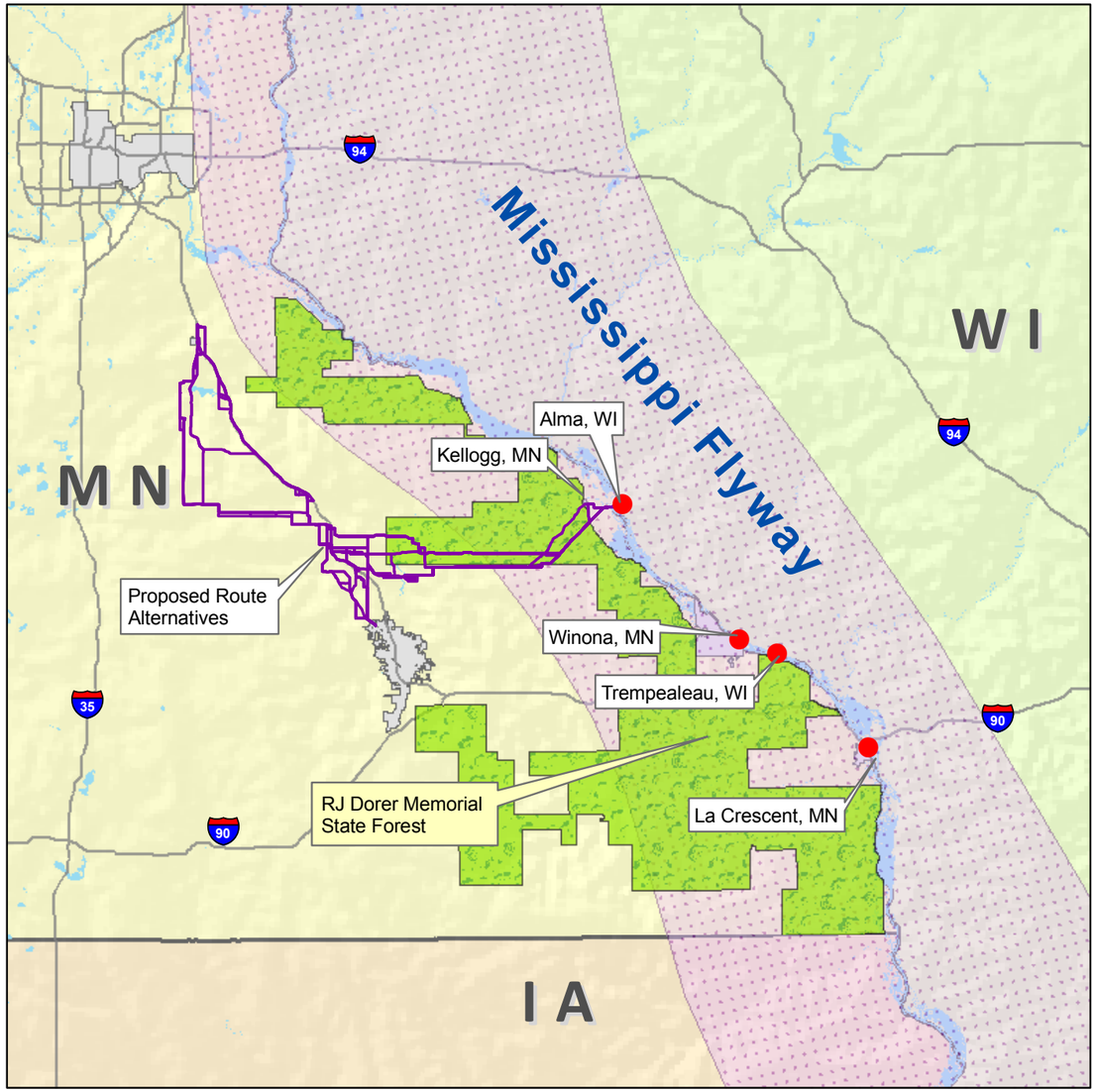


Figure 6.1-1 Project area showing approximate path of the Mississippi Flyway relative to the Kellogg crossing and the three other crossing alternatives considered



Source: Barr 2010 and Birdnature 1998

America (Figure 6.1-1). Trempealeau National Wildlife Refuge is smaller and located east of Winona, Minnesota.

Potential impacts to Refuge property include additional clearing that may be required through forested areas, potential bird impacts, aesthetic impacts, wetland impacts and temporary construction impacts. The length of the crossing and the height of structures are important considerations related to potential bird impacts. These impacts can be minimized by using the narrowest river and floodplain crossing area. Of the river crossings evaluated, the Kellogg crossing is located where the fewest miles of floodplain/Refuge (1.4 miles) would be crossed.

Throughout the route development process, the applicant sought input from USFWS regarding the crossings being considered. The USFWS is responsible for issuing a Special Use Permit for construction of a transmission line across Refuge property.

In a February 19, 2008, letter to the applicant, USFWS stated that the, "Alma (Kellogg) crossing may pose the least environmental impact." USFWS noted that no new right-of-way (ROW) may be required on Refuge property and that it "is also least likely to impact migratory birds since it is some distance from known bird concentration points." The USFWS also stated that neither the Winona nor the Trempealeau crossings should be considered. "[E]ach would likely involve new rights-of-way across portions of national wildlife refuges, and such ROW would likely not be approved since Service policy and regulations do not allow new uses that fragment habitat on refuges." With respect to the La Crescent crossing, USFWS stated it was the "second choice," but that the option presents concerns "due to its proximity to an active eagle nest and great blue heron colony approximately 0.3 mile north (Wisconsin side) and an important heron and egret feeding area adjacent to the line (Minnesota side)" (USFWS 2008).

Engineering Challenges and Visual Impacts

Crossing the Mississippi River channel and floodplain poses a unique engineering challenge because the river has a minimum clearance of approximately 90 feet that must be maintained for navigational purposes. Backchannels, wetlands and islands also are present at the crossings. The channel would require a long span. These factors may necessitate structures at the river crossing that are taller than the typical height of 150 feet. Federal Aviation Administration (FAA) regulations require structures exceeding 200 feet in height to have lights and/or be painted red and white to increase structure visibility. Structure heights of less than 200 feet are generally desired because lights on tall structures are known to have the potential to increase bird impacts, and painted structures would have greater visual impacts.

Of the river crossings evaluated, the Kellogg crossing has the widest existing ROW (180 feet) for a transmission line crossing the river. This width enables shorter river-crossing transmission structures. This width provides flexibility to work with the USFWS in developing appropriate structures to meet engineering requirements and to minimize bird and visual impacts.

Substation Locations

The 345 kV transmission line of the Hampton – Rochester – La Crosse project is proposed to terminate at an existing or new substation in the La Crosse, Wisconsin area. The Kellogg crossing provides flexibility in substation siting in the La Crosse area equal to or better than other river crossings evaluated. The applicant has identified three potential substation sites that could be used with the Kellogg crossing: (1) at or near the existing North La Crosse Substation, (2) at a new substation near Galesville, or (3) at a new substation near Holmen.

Factors Supporting the Kellogg Crossing

- Only option with no new corridor required through Minnesota blufflands
- Two options for following existing transmission lines in Wisconsin
- Shortest traverse through floodplains
- Preferred option of the USFWS
- Widest existing ROW within wildlife refuges
- Narrowest Mississippi River crossing
- Flexibility in selecting potential substation sites

6.2 The Mississippi River at Kellogg

Most of the route alternatives approaching the Kellogg crossing would follow the existing Dairyland Q-3 line corridor that traverses the blufflands west of the Mississippi River (part of

the geologic formation known as the "Driftless Area"), and several state and federal lands including the Snake Creek Management Area, McCarthy Lake Wildlife Management Area (WMA), and the Richard J. Dorer Memorial Hardwood State Forest (RJD State Forest). These resources are discussed in detail in Sections 8.3.4.7 and 8.4. Three route alternatives would not cross the McCarthy Lake WMA. These are route alternatives 3P-Kellogg, 3A-Kellogg and 3B-003. Route alternatives 3P-Kellogg and 3A-Kellogg would parallel the Canadian Pacific Railroad along the east side of US-61, beginning approximately 2.6 miles south of Kellogg. They would continue north approximately two miles, then turn east following road and property lines to the point where all route alternatives converge for the Kellogg crossing. Route alternative 3B-003 would follow Wabasha County Hwy 42 from near North County Road 14 northeast US-61 south of Kellogg. Approximately 0.5 mile after crossing US-61, route alternative 3B-003 would join route alternatives 3P-Kellogg and 3A-Kellogg, continuing east to the convergence with all other routes.

The Kellogg crossing area begins approximately 3.2 miles east-southeast of Kellogg, MN. All route alternatives converge near this point to follow the existing Dairyland Q-3 161 kV transmission line corridor toward the river crossing. At this point, the Dairyland Q-3 line is collocated with the Alma-Harmony 69 kV transmission line. The USFWS-authorized ROW is 180 feet for these facilities. The total width of the river floodplain crossed by the transmission facilities is approximately 1.4 miles. Approximately 2200 feet (0.4 mile) of the floodplain crossed is on the Minnesota side. The transmission line crossing enters Refuge property at an abrupt transition from agricultural land to wooded floodplain forest. This floodplain forest extends approximately 1,300 feet to the Zumbro River channel. The Zumbro River occupies a 350-foot channel that is separated from the main Mississippi River by a 500-foot-wide wooded floodplain peninsula. The Mississippi River channel is approximately 1,400 feet wide at the Kellogg crossing. The Minnesota boundary of the Kellogg crossing ends mid-river. (See Figure 6.2-1)

Most of the land cover within the route at the Kellogg crossing site is floodplain forest or aquatic habitat, primarily associated with the Refuge. The Minnesota Department of Natural Resources (DNR) classifies the dominant vegetation type as "southern Minnesota floodplain forest (FFs68)" (DNR 2005). There is also agricultural land west of the Refuge boundary and the Kellogg crossing.

There is a total of approximately 64 acres of wetlands within the route width at the Kellogg crossing site. There are two recorded occurrences of state-listed species, and no documented occurrences of federally-listed species.

The Kellogg crossing is in a relatively remote, unpopulated area. As a result, other resources identified along the overall 345 kV transmission line route are not present. This includes:

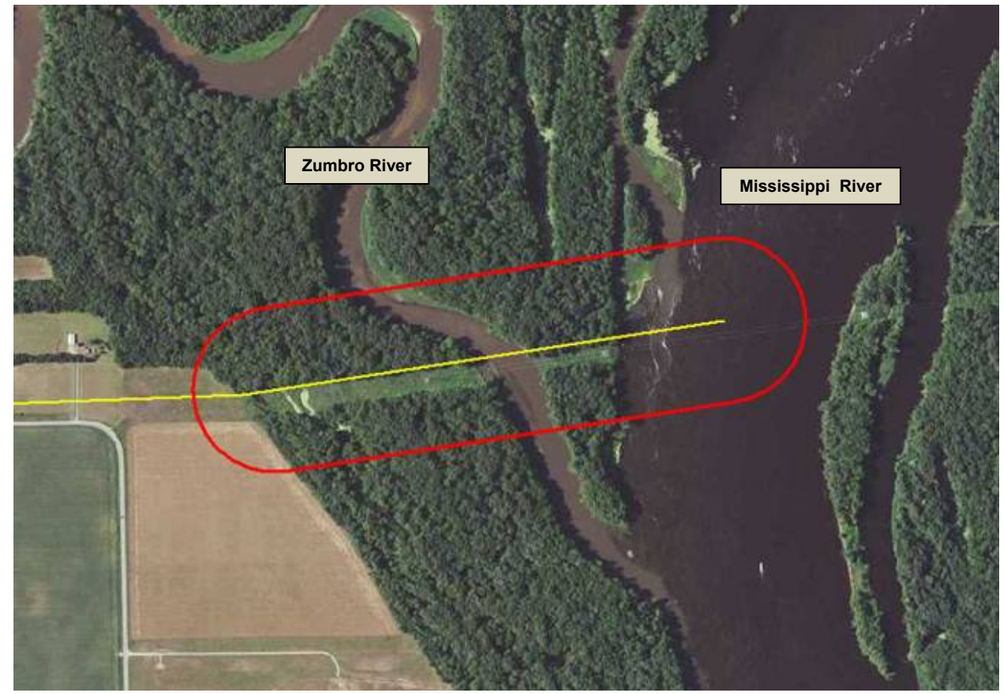
- residences, schools, hospitals, churches and cemeteries;
- land-based economic activities other than agriculture;
- lakes, trout streams, state conservation easements;
- recorded cultural resources;
- state, county or local parks, state forest lands, DNR or state park trials or boat accesses.

All resources present within the route at the Kellogg crossing site, as well as potential impacts to those resources, are discussed in detail in Section 8.4.

6.3 Crossing the Mississippi River at Kellogg

There are two ways for a transmission line to cross the Mississippi River at Kellogg – an aerial crossing or an underground crossing. These crossing options are discussed here; potential impacts and mitigations related to the aerial crossing options are detailed in Section 8.4.

Figure 6.2-1 Aerial photograph of Mississippi River at the proposed Kellogg crossing



The red oval shows the route width at the river crossing. Resources and potential impacts within that area are summarized here and detailed in Section 8.4.

Details provided in the applicant's route permit application on both aerial and underground crossings are provided in Appendix D.

6.3.1 Aerial River Crossing

An aerial crossing of the Mississippi River presents unique challenges that will require the use of multi-circuit specialty structures. An existing double-circuit transmission line crosses the Mississippi River and Refuge at the project's proposed crossing location. The existing line crosses approximately 0.5 mile of Refuge lands and includes two structures on Refuge property. The line is constructed on a 180-foot-wide permitted ROW. An area approximately 125 feet wide and 1,900 feet long is maintained cleared of trees. The two main existing river crossing structures are 180 feet tall.

An aerial crossing of the Mississippi River at Kellogg would require nine structures to carry the conductors. Four of these would be on the Minnesota side of the river, with the remainder on the Wisconsin side. Three of the four structures on the Minnesota side would be on Refuge property, and one would be on private property. The two structures closest to the river on either side must be at least 195 feet tall in order to span the approximately 1600-foot river width and maintain the 90-foot minimum conductor clearance above the river required by the US Army Corps of Engineers (USACE). The heights of the remaining structures are determined by the height of the two central structures.

The applicant has coordinated with USFWS to evaluate five different options for configurations of structures and lines for the proposed 345 kV transmission line in order to determine which option would minimize avian collisions. The five options vary in height of structures, width of cleared ROW, and number of horizontal planes in which the conductors are strung. Therefore,

depending on the option selected for erecting and configuring structures to carry the 345 kV and 161 kV transmission lines, additional clearing of the ROW may be required. The five options are diagrammed in Section 8.4, Figures 8.4.1-2 through 8.4.1-6.

A Special Use Permit from the USFWS will be required to cross the Refuge. Other impacts associated with the five aerial crossing options include clearing of additional ROW and the effect of clearing on existing vegetation and wildlife use of the area. These impacts are also discussed in detail in Section 8.4.

6.3.2 Underground River Crossing

Another possible alternative for crossing the Refuge and Mississippi River is to use an underground conduit and cable system. The applicant engaged an engineering firm to determine the feasibility of underground installation for the double circuit 345 kV line at the Kellogg river crossing.

Underground transmission cable, especially at high voltages such as 345 kV, is much different than underground distribution cable. Transmission cables are several inches in diameter and must be contained in 10 to 30-inch pipes. Multiple conductors per phase are required. When open trench methods place the conductors close to the surface, they must be encased in concrete or steel to protect them from potential damage.

The applicant considered two alternatives for underground installation of the transmission line. These are referred to as "extruded dielectric cable system" (XLPE) and "high-pressure fluid-filled pipe" (HPFF).

XLPE systems have the advantages of requiring low maintenance, high reliability at voltages of 230 kV and lower, higher allowable operating temperatures and easier repairs. Disadvantages include susceptibility to damage from excavations, limited use of the system at 345 kV, and technical issues that may reduce performance.

HPFF systems have the advantages of having a long experience record in the U.S., high reliability at higher voltages, steel casings that reduce damage from excavations, and shorter trench lengths during installation. Disadvantages include pipe susceptibility to corrosion, more difficult repair, higher maintenance needs and the need for specialized equipment and personnel for installation.

The applicant reviewed both XPLE and HPFF systems for cost, and found that the XPLE system would cost over twice as much as the HPFF system. As a result, the applicant's further analysis of the underground option included only the HPFF option.

Installing the proposed transmission line underground would require opening a series of trenches and establishing a work area alongside the alignment to avoid unintentional excavation damage. In this instance, the underground alternative results in a 235' wide cleared ROW containing eight 10-inch borings under the river spaced 25 feet apart. Map 6.3.2-1 shows the layout and ROW needs for the HPFF system.

In addition, the underground design would require transition stations. Similar to small fenced substations, a transition station is required at each end to transition from underground to overhead cable. Each transition station would be approximately one acre in size.

Whereas the Mississippi River and associated wetlands can be spanned by aerial transmission lines, an underground installation would require directional drilling under these resources. Where directional drilling is not feasible (potentially in some wetland areas), trenching would be required.

As with aerial installations, cleared ROW over an underground installation must be kept free of trees and other vegetation with deep woody roots. Both underground and aerial installation of transmission lines may require long-term vegetation control in the ROW.

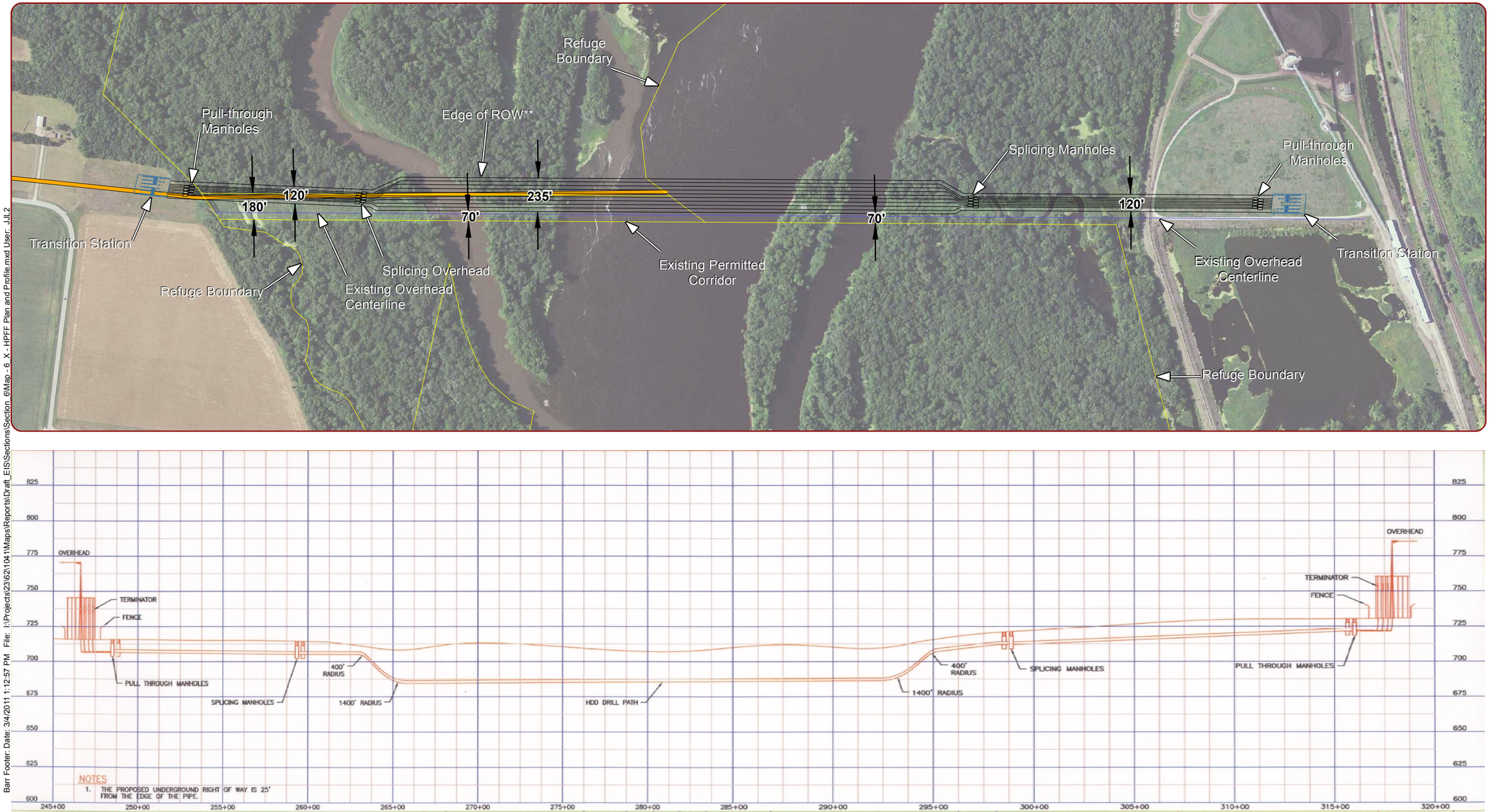
In general, aesthetic impacts and the risk of bird impacts can be reduced with underground construction. However, with the underground alternative studied, the existing double circuit 161 kV overhead line at the Kellogg Crossing would remain in place. Thus, the potential for avian impacts due to the existing line would remain.

Underground construction would involve more ground disturbance during construction than overhead alternatives due to the need to construct with horizontal directional drill and open trench methods. Temporary construction areas would require additional tree clearing. High pressure fluid-filled pipe technology contains a mineral oil dielectric coolant that, while manageable, is a potential environmental issue that is not present with overhead construction.

The underground alternative also has unique reliability concerns. Failures of underground cables take longer to locate and repair than overhead alternatives. Complete replacement of a span of cable, if necessary, could leave the transmission line out of service for several months.

The length of the underground alternative studied is 1.3 miles and has an estimated cost of $90 million. This is approximately $70 million per mile for underground double circuit 345 kV compared to approximately $2 million per mile for overhead.

Based on the engineer's analysis and the applicant's own experience, the applicant did not propose an underground crossing of the Mississippi River at Kellogg.



Barr Footer: Date: 3/4/2011 1:12:57 PM File: I:\Projects\23\62\1041\Maps\Reports\Draft_EIS\Sections\Section 6\Map - 6 X - HPFF Plan and Profile.mxd User: JJL2

0 150300 600 900 Feet

0 50 100 200 300 Meters

Proposed Crossing Route*

* All route alternatives follow the same crossing route

** The proposed underground right-of-way is 25' from the edge of the pipe

Map 6.3.2-01
Conceptual Underground Crossing Plan and Profile
High-Pressure Fluid-Filled Pipe (HPFF) Method