7.0 Relative Merits of Routing Options

The Power Plant Siting Act requires the Commission to locate transmission lines "in an orderly manner compatible with environmental preservation and the efficient use of resources" that minimizes "adverse human and environmental impact[s]" while ensuring electric power reliability (Minnesota Statutes, section 216E.02). Minnesota Statute, section 216E.03, subdivision 7(b) identifies considerations that the Commission must take into account when designating transmission lines routes.

Minnesota Rules, part 7850.4100 lists 14 factors for the Commission to consider in its route permitting decisions, including effects on human settlements, effects on public health and safety, and effects on the natural environment (see Factors Considered by the Commission for Transmission Line Route Permits sidebar). In this section, the information gathered during the environmental review process, as presented in the preceding chapters of this environmental impact statement (EIS), is applied to these factors. This section discusses the routing options examined in this EIS and their merits relative to the routing factors of Minnesota Rules, part 7850.4100.

The discussion here uses text and a stoplight motif graphic to describe the relative merits of specific routing options (Figure 7-1). For routing factors where impacts are anticipated to vary with routing options, the graphic represents these anticipated impacts and compares them across routing options. For routing factors that express the State of Minnesota's interest in the efficient use of resources (for example, the use and paralleling of existing rights-of-way (ROWs)), the graphic represents the consistency of routing options with these interests and compares them one to the other.

The discussion here focuses on the first 12 routing factors of Minnesota Rules, part 7850.4100 (factors A through L). Routing factors M and N – the unavoidable and irreversible impacts of the project, including route alternatives and variations – are discussed at the end of this section.

Factors Considered by the Commission for Transmission Line Route Permits

In determining whether to issue a route permit for a high voltage transmission line, the Commission shall consider the following factors of Minnesota Rules, part 7850.4100:

A. Effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services;

B. Effects on public health and safety;

C. Effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining;

D. Effects on archaeological and historic resources;

E. Effects on the natural environment, including effects on air and water quality resources and flora and fauna;

F. Effects on rare and unique natural resources;

G. Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity;

H. Use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries;

I. Use of existing large electric power generating plant sites;

J. Use of existing transportation, pipeline, and electrical transmission systems or rights-of-way;

K. Electrical system reliability;

L. Costs of constructing, operating, and maintaining the facility which are dependent on design and route;

M. Adverse human and natural environmental effects which cannot be avoided; and

N. Irreversible and irretrievable commitments of resources.

Figure 7-1 Guide to Relative Merits of Routing Options

Anticipated Impact or Consistency with Routing Factor	Color / Shape
Impacts anticipated to be minimal with the general conditions in part 4.0 of the Commission's generic route permit template – OR – route/alternative/variation is very consistent with routing factor	●
Impacts anticipated to be minimal to moderate with general conditions in part 4.0 of the Commission's generic route permit template; special conditions may be required for mitigation – OR – route/alternative/variation is consistent with routing factor but less so than other routing options in this area	▲
Impacts anticipated to be moderate and unable to be mitigated – OR – route/alternative/variation is not consistent with routing factor or consistent only in part	■

As an initial matter, routing factor I, the use of existing large electric power generating plant sites, is not relevant to this project and is not discussed here. Routing factor G has several parts and speaks generally to environmental impacts ("mitigate adverse environmental impacts"). For purposes of discussion here, and with respect to routing factor G, it is assumed all routes, route alternatives and route variations are equal with regard to maximizing energy efficiencies and accommodating expansion of transmission capacity. With respect to environmental impacts, the examination of such impacts suggested by routing factor G is included in the discussion of other routing factors and elements that more specifically address an environmental impact (e.g., effects on flora and fauna, routing factor E).

Finally, routing factors H and J address similar issues, the use or paralleling of existing ROWs. Routing factor H relates to the use or paralleling of existing ROWs, but also includes items that do not have a ROW – survey lines, natural division lines and agricultural field boundaries. Routing factor I relates to the use of existing transportation, pipeline and electrical transmission ROWs. For purposes here, these factors will be considered as one – the use or paralleling of existing ROWs, where there is infrastructure that has a ROW. However, the discussion here includes, as appropriate, comment on the use of lines and boundaries by routing options.

7.1 Lakefield to Huntley

ITCM's proposed routes A and B extend from the Lakefield Junction substation to the proposed Huntley substation (LH segment). Route alternatives that utilize Interstate 90 (I-90), to varying extents, also extend across this segment and offer possible improvements on routes A and B (Section 6.1.1). All of the routes and route alternatives in this segment require an expanded Lakefield Junction substation, a new Huntley substation and the reconfiguration of local lines to connect to the Huntley substation. Four sets of route variations are included in this segment as possible means to improve on routes A and B – Jackson Municipal Airport (JA), Fox Lake (FL), Lake Charlotte (LC) and Center Creek Wildlife Management Area (WMA) (CC) (Section 6.1.2).

The relative merits of these routes, route alternatives and route variations are discussed here. The relative merits of possible Huntley substation sites and configurations of local lines are included in the discussion of routes and route alternatives in this segment.

7.1.1 Routes, Route Alternatives and Associated Facilities

Routes A-LH and B-LH and the I90 route alternatives proceed in a fairly similar manner, over a fairly homogeneous agricultural landscape from the Lakefield Junction substation to the proposed Huntley substation or the alternative southern Huntley substation. All cross the Des Moines River and proceed north of the Jackson Municipal Airport to avoid interference with airport operations. Route A-LH and the I90 alternatives proceed south of Fox Lake; Route B-LH proceeds north of Fox Lake. All routes and route alternatives proceed south of Lake Charlotte. All routes and route alternatives require a new Huntley substation and the reconfiguration of local lines to connect to the Huntley substation. All routes and route alternatives are constructible and none contains a fatal flaw that would make them not permittable.

Potential impacts in this segment are anticipated to be minimal and to not vary significantly between the routes and route alternatives relative to five routing factors. These are:

- Effects on public health and safety – including the factor elements electric and magnetic fields, implantable medical devices, stray voltage, induced voltage, air quality and environmental contamination
- Effects on rare and unique natural resources
- Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity
- Costs that are dependent on design and route

Potential impacts for these routing factors are mitigated by the general conditions in part 4.0 of the Commission's generic route permit template. With respect to costs (routing factor L), there are differences in costs between routes and route alternatives; however, these differences are not significant given that costs estimates have a range of plus or minus 30 percent.

In addition, impacts are anticipated to be minimal and to not vary significantly with the routes and route alternatives for elements of three routing factors. These are:

- Effects on human settlements – for the factor elements noise, property values, displacement,

electronic interference, public services, and zoning and land use compatibility

- Effects on the land-based economies – for the factor elements forestry, recreation and tourism, and mining
- Effects on the natural environment – for the factor elements soil, air and water quality and for effects on flora.

Potential impacts for these routing factor elements are mitigated by the general conditions in part 4.0 of the Commission's generic route permit template.

As discussed in Section 5.1.4, though property value impacts are not well correlated with transmission line ROWs, it is likely that there is a linkage between aesthetic impacts and property value impacts. Harmony with existing infrastructure not only minimizes aesthetic impacts, it likely also minimizes property value impacts. To the extent that new investments (i.e., a new 345 kilovolt (kV) line) are harmonious with current investments, impacts to property values are likely minimized in the project area. Aesthetic impacts are discussed further here; these impacts could reasonably be interpreted as aesthetic-property value impacts.

Natural resources within the routes and route alternatives in this segment vary across routing options. However, impacts to these resources can be mitigated through (1) the general conditions in part 4.0 of the Commission's generic route permit template, (2) prudent pole placement and placement of the alignment within the permitted route and (3) associated downstream permit requirements. For example, all routes and route alternatives in this segment have watercourse and wetland crossings. However, impacts to these resources are anticipated to be minimal as watercourses can be spanned and all wetlands (excepting one) can also be spanned.

However, the impacts relative to two routing factors and elements of three other routing factors are anticipated to vary with the routes and route alternatives, and could be mitigated, to some extent, by the selection of a specific routing option or imposition of special permit conditions. These are:

- Effects on human settlements – for the factor elements aesthetics and private airstrips
- Effects on land-based economies – for the factor element agriculture
- Effects on archaeological and historic resources
- Effects on the natural environment – for the factor element fauna
- Use or paralleling of existing ROWs
- Electrical systems reliability

Impacts to aesthetics and agriculture and the use of existing ROWs are tightly linked in this segment of the project (Figure 7-2). As discussed in Section 6.0, use of existing ROWs can minimize aesthetic impacts by placing new infrastructure where there is already infrastructure. Additionally, using existing ROWs can minimize new impacts to agricultural fields. However, as discussed in Section 6.0, the agricultural impacts associated with using existing transmission line ROW are anticipated to be much less than with using the I-90 ROW.

Human Settlements – Aesthetics. All routing options in this segment, except route B-LH, have about the same proximity to homes. However, because route A-LH and route alternative I90-2 make the best use of existing transmission line ROW, their aesthetic impacts are anticipated to be less than route B-LH and other I90 route alternatives. Route B-LH is closer to relatively more homes and does not utilize existing ROW well. Placement of the line along I-90 east of the city of Sherburn would create two transmission line ROWs in the area – the existing 161 kV line and the new 345 kV line. Route alternatives I90-3 and I90-5 Option 1 require associated facilities that following existing ROWs only in part.

Human Settlements – Private Airstrips. All of the routes and route alternatives are anticipated to avoid impacts with current and future operations at the Jackson Municipal Airport. As is discussed in Section 5.2.4, low-profile specialty structures may be required in this area, depending on additional FAA analysis. Route A-LH is the only routing option in this segment that impacts local airstrips. Route A-LH would significantly impact a private airstrip in Fox Lake Township, and impact to an uncertain degree a private airstrip in Rutland Township, both in Martin County. These impacts appear to be unavoidable with route A-LH. Mitigation could possibly be achieved by moving or otherwise reconfiguring the airstrips. Mitigation for the airstrip in Rutland Township may be possible with low-profile specialty structures.

Land-Based Economies – Agriculture. Because of its transmission line ROW sharing, route A-LH is anticipated to have the fewest agricultural impacts. The I90 route alternatives share a high percentage of their lengths with transmission line and roadway ROWs. However, paralleling I-90 has greater

Figure 7-2 Relative Merits of Routes, Route Alternatives and Associated Facilities – Lakefield to Huntley

Routing Factor / Element	A-LH	B-LH	I90-1	I90-2	I90-3	I90-4	I90-5 Option 1	I90-5 Option 2	Summary
Human settlements / Aesthetics	●	■	●	●	▲	●	▲	●	A-LH and I90-2 best utilize existing transmission line ROW. B-LH is near more homes and poorly utilizes existing ROW.
Human settlement / Private airstrips	■	●	●	●	●	●	●	●	A-LH impacts two private airstrips in Martin County
Land-based economies / Agriculture	●	■	▲	●	▲	▲	▲	▲	A-LH uses existing transmission line ROW, which minimizes agricultural impacts. Using I-90 does not mitigate agricultural impacts as well as using transmission line ROW. B-LH proceeds cross country, primarily along roadways and field lines.
Archaeological and historic resources	▲	●	▲	▲	●	▲	●	●	A-LH, I90-1, I90-2 and I90-4 contain known archaeological resources in their ROWs.
Natural environment / Fauna	▲	▲	▲	▲	▲	▲	▲	▲	All routing options would impact avian species through collisions with conductors. Impacts could be mitigated by the use of bird flight diverters near lakes and watercourses.
Use or paralleling of existing ROWs	●	■	●	●	▲	●	▲	●	Route B-LH makes the least use of existing ROW. I90-3 and I90-5 have associated facilities that use existing ROW only in part.
Electrical systems reliability	●	●	●	●	●	■	●	■	I90-4 and I90-5 Option 2 negatively impact electrical systems reliabilty.

agricultural impacts compared with paralleling the existing Lakefield to Border 161 kV line (route A). Additionally, the replacement of H-frame structure along route A-LH with single poles structures would likely have a positive impact on agricultural operations by minimizing impediments to cultivation and management. I90-2, because it follows the existing 161 kV line west of the city of Sherburn (like route A-LH), is most similar to route A-LH with respect to minimizing agriculture impacts.

Agricultural impacts that occur where the transmission line parallels and uses some of the I-90 ROW could be minimized through a special permit condition requiring that the line, when paralleling the I-90 ROW, use the ROW to the maximum extent feasible, consistent with Minnesota Department of Transportation's (MnDOT's) accommodation policy.

Archaeological and Historic Resources. Route A-LH and route alternatives I90-1, I90-2 and I90-4 contain known archaeological resources within their ROWs. These resources could be impacted by construction of the project. Impacts could be mitigated by prudent pole placement such that these resources are spanned. Impacts could also be mitigated by measures developed in consultation with the Minnesota State Historic Preservation Office (SHPO) and by training of construction workers regarding archaeological resources. To affect these mitigations, special conditions would likely be needed in the Commission's route permit.

Natural Environment – Fauna. With respect to fauna, direct impacts to fauna are anticipated to be minimal. There are lands managed for wildlife in the project area (e.g., Krahmer WMA, Fox Lake Wildlife Refuge). However, direct impacts to fauna in or near these lands are anticipated to be minimal, as impacts to habitat are anticipated to be minimal. There would likely be indirect impacts to fauna as a result of all routing options in this segment. These would be an incremental increase in impacts to avian species as a result of collisions with transmission line conductors. All routes and route alternatives in this segment proceed near and around Fox Lake. Routes A-LH and B-LH and route alternatives I90-1 and I90-2 proceed near Lake Charlotte and the Chain of Lakes area generally. Introducing a new transmission line near these lakes would likely increase the probability of avian impacts – essentially increasing from one to two, the number of transmission line obstacles that must be crossed in these areas (the existing 161 kV line being number 1; the new 345 kV line being number 2). Impacts to avian species can be mitigated through the use of bird flight diverters (Section 5.6.3). Impacts can also be mitigated through structure design that places conductors in relatively flat profile, and by limiting the number of separate transmission lines near these lakes – i.e., by double-circuiting across the lakes or around the lakes.

Use or Paralleling of Existing ROWs. With respect to the use and paralleling of existing ROWs, route A-LH and the I90-1, I90-2, I90-4 and I90-5 Option 2 route alternatives are most consistent with this interest. Route alternatives I90-3 and I90-5 Option 1 have associated facilities that do not use or parallel existing ROWs or do so only in part. Route B-LH utilizes the least amount of existing ROW.

Electrical Systems Reliability. Impacts to electrical system reliability are anticipated to minimal, and generally positive, with the exception of route alternatives I90-4 and I90-5 Option 2 ("Electric System Reliability" section of Section 6.1.1). These alternatives place several transmission lines in close proximity such that the risk of a multiple-line outage is likely higher than other routing options and the time to repair such an outage likely greater than other routing options. These route alternatives already anticipate using ROWs that do not overlap; thus, there appears to be little in the way of additional mitigation that could be applied.

Removing the 161 kV line from Fox Lake and Lake Charlotte

As discussed in Section 6.1.1, there are positive impacts that would accrue if the existing 161 kV line were removed from Fox Lake and Lake Charlotte and double-circuited along route alternative I90-1 or I90-2. The removal would positively impact aesthetics at both lakes, and generally in the area, by creating one transmission line ROW instead of two near the lakes. The removal would have a positive impact on agricultural operations along the 161 kV line. The removal would decrease avian impacts at both lakes. The removal would create new impacts related to transmission facilities necessary to affect the double-circuiting and would create incremental aesthetic and avian impacts along route alternative I90-1 or I90-2 (Section 6.1.1).

7.1.2 Route Variations

The impacts of routes A-LH and B-LH could be mitigated, to some extent, by modifying these routes to avoid impacts in certain areas. Route variations in four areas along routes A-LH and B-LH are discussed here – Jackson Municipal Airport (JA), Fox Lake (FL), Lake Charlotte (LC) and Center Creek WMA (CC). All route variations are constructible and none contains a fatal flaw that would make them not permittable.

Jackson Municipal Airport

There are three route variations (JA -1, JA-2, JA-3) and a segment of route A (A-JA) in the area north of the Jackson Municipal Airport. All of these routing options bump north to avoid impacting the airport and all cross the Des Moines River. For all of these routing options except route variation JA-1, the existing 161 kV line would be removed and double-circuited with the new 345 kV line along the route or route variation selected. For route variation JA-1, the 161 kV line would remain in place, and the new 345 kV line would proceed independently along JA-1.

The routing factors and elements of routing factors for which the potential impacts in this area are anticipated to be minimal and to not vary significantly between the route variations are very similar to those for the entire LH segment (discussed above). In this area, impacts related to archaeological and historic resources (routing factor D) and electrical systems reliability (routing factor K) are anticipated to be minimal and to not vary among routing options.

The impacts relative to one routing factor and elements of three other routing factors are anticipated to vary with route variations in this area and could be mitigated, to some extent, by the selection of a specific routing option or imposition of special permit conditions. These are:

- Effects on human settlements – for the factor element aesthetics
- Effects on land-based economies – for the factor element agriculture
- Effects on the natural environment – for the factor elements flora and fauna
- Use or paralleling of existing ROWs

Human Settlements – Aesthetics. Route variation JA-2 is furthest from residences in the area and follows the existing 161 kV line for the greatest length; thus, JA-2 best minimizes aesthetic impacts in the area (Figure 7-3). Route variation JA-1 would create two transmission line ROWs in the area.

Land-Based Economies – Agriculture. Route variation JA-1 is the longest variation in this area and does not use existing transmission line ROW. Accordingly, route variation JA-1 has the greatest impacts to agriculture in the area. Route variation JA-2 proceeds the furthest east along the existing 161 kV line before turning north, thus minimizing agricultural impacts. Route A-JA runs parallel to 820th St. and this paralleling minimizes agricultural impacts. However, route A-JA has the potential to significantly interfere with a well on the north side of 820th St. that is used for animal housing units (also along 820th St.). This impact could be mitigated by an alignment away from the well and animal housing units; however, this alignment would likely place the line further into agricultural fields, thus increasing agricultural impacts.

Natural Environment – Flora and Fauna. All routing options in this area cross the Des Moines River. All options cross the river at the existing 161 kV crossing except for route variation JA-1. Thus, JA-1 is anticipated to have relatively greater impacts to flora and fauna near the river. Though forest vegetation is limited in the area, route variation JA-2 best minimizes impacts to forested areas near the

Figure 7-3 Relative Merits of Route Variations – Jackson Municipal Airport

Routing Factor / Element	JA-1	JA-2	JA-3	A-JA	Summary
Human Settlements / Aesthetics	■	●	▲	▲	JA-2 is near fewer homes and better utilizes existing transmission line ROW. JA-1 is near the the most number of homes, is relatively longer, and would create two transmssion line ROWs.
Land-Based Economies / Agriculture	▲	●	▲	▲	JA-2 best utilizes existing transmission line ROW. A-JA utilizes roadway ROW but impacts a well and associated animal housing units.
Natural Environment / Flora and Fauna	▲	●	▲	▲	JA-2 is furthest from flora and fauna along the Des Moines River.
Use or paralleling of existing ROWs	●	●	▲	●	A-JA best utilizes existing ROWs. JA-1 utilizes roadway ROW.

river by proceeding along the existing 161 kV line for the furthest distance east. Route A-JA and route variation JA-3 proceed parallel to and close by the river through areas of significant biodiversity. Thus, route variation JA-2 best minimizes impacts to flora and fauna in the area.

There would be new conductors over the Des Moines River in this area, and these conductors could incrementally increase avian impacts. Impacts could be mitigated, in part, by bird flight diverters and structure design.

Use or Paralleling of Existing ROWs. Route A-JA best utilizes existing transmission line and roadway ROW in the area. Route A-JA and route variation JA-2 best utilize existing transmission line ROW. Route variation JA-1 best utilizes existing roadway ROW in this area.

Fox Lake

There are six route variations (FL-1 through FL-6) and a segment of route A (A-FL) in the Fox Lake area. The routing factors and elements of routing factors for which the potential impacts in this area are anticipated to be minimal and to not vary significantly between the route variations, are very similar to those for the entire LH segment (discussed above). In this area, impacts related to archaeological and historic resources (routing factor D) and electrical systems reliability (routing factor K) are anticipated to be minimal and to not vary among routing options.

There is one routing factor and four elements of routing factors where impacts are anticipated to vary with route variations in this area and could be mitigated, to some extent, by the selection of a specific routing option or imposition of special permit conditions. These are:

- Effects on human settlements – for the factor elements aesthetics and private airstrips
- Effects on land-based economies – for the factor element agriculture
- Effects on the natural environment – for the factor elements fauna
- Use or paralleling of existing ROWs

Human Settlements – Aesthetics. As with the LH segment as a whole, impacts to aesthetics and agriculture and the use of existing ROWs are closely linked in the Fox Lake area (Figure 7-4). With respect to aesthetic impacts, the indicators analyzed in Section 6.2.2 point in slightly different directions. Route variation FL-2 has the fewest number of residences near the line (zero; A-FL has one). Route variations FL-1 and FL-6 minimize aesthetic impacts by following existing transmission line and roadway ROW. It is anticipated that the relatively greater use of existing ROW by route variations FL-1 and FL-6 makes these the variations that best minimize aesthetic impacts. Of these two, route variation FL-1 best minimize aesthetics impacts overall because it does not introduce a new transmission line ROW into the area. Rather, it places the new 345 kV line where there is already an existing 161 kV line. In this sense, route variation FL-1 is most harmonious with existing infrastructure and development in the area.

Human Settlements – Private Airstrips. Route variations FL-2 and FL-3 and route A-FL would significantly impact a private airstrip in Section 23 of Fox Lake Township, Martin County. These routing options abut the end of the airstrip on its western end. The impact to the airstrip with these routing options appears to be unavoidable. Mitigation could possibly be achieved by moving or otherwise reconfiguring the airstrip.

Land-Based Economies – Agriculture. Route variation FL-1 best minimizes impacts to agriculture by using the existing 161 kV transmission line ROW across Fox Lake and then north and east until reconnecting with route A. As this is an existing transmission line ROW, double-circuiting the 345 kV line would create a minimal, incremental impact to agricultural land along the variation. Additionally, the new double-circuit line would replace existing H-frame structures with single pole structures, thus increasing the acreage that can be managed and lessening potential difficulties with operating equipment in adjacent fields. With respect to prime farmland in the area, those route variations on the eastern side of the lake (FL-2, FL-3, FL-4 and A-FL) have a relatively higher percentage of prime farmland than those on the western side (FL-1, FL-5 and FL-6).

Natural Environment – Fauna. There would likely be indirect impacts to fauna as a result of all routing options in the Fox Lake area. These would be incremental increases in impacts to avian species as a result of collisions with transmission line conductors. All route variations in this area proceed very near Fox Lake; route variation FL-1 crosses Fox Lake. Given that there is an existing 161 kV transmission line across the lake and assuming that it remains there, it is anticipated that route variation FL-1 would best minimize avian impacts in area. FL-1 would be a double-circuit crossing whether there is already a crossing of the lake; thus, any avian impacts would be incremental. The crossing by route variation FL-1 would use a flat profile design

Figure 7-4 Relative Merits of Route Variations – Fox Lake

Routing Factor / Element	FL-1	FL-2	FL-3	FL-4	FL-5	FL-6	A-FL	Summary
Human settlements / Aesthetics	●	●	▲	▲	▲	●	▲	FL-2 and A-FL are near relatively fewer homes, but both introduce a new transmission line ROW. FL-1 and FL-6 best utilize existing transmission line and roadway ROW.
Human settlements / Private airstrips	●	■	■	●	●	●	■	FL-2, FL-3 and A-FL impact a private airstrip in Fox Lake Township.
Land-based economies / Agriculture	●	▲	▲	▲	▲	●	▲	FL-1 and FL-6 best utilize existing ROW, thus minimizing agricultural impacts. Along FL-1, H-frame structures would be replaced with single pole structures.
Natural environment / Fauna	▲	▲	▲	▲	▲	▲	▲	Avian impacts could be mitigated for all routing options by the use of bird flight diverters. FL-1 would require specialty structures for crossing Fox Lake; the design of these structures could minimize avian impacts.
Use or paralleling of existing ROWs	●	▲	▲	▲	▲	●	▲	FL-1 and FL-6 utilize existing transmission line and roadway ROW for their entire lengths.

that is believed to minimize avian impacts. Finally, route variation FL-1 maintains the status quo for transmission line obstacles in the area – it keeps the number of transmission line ROWs near the lake at one. All other routing options introduce a second transmission line ROW near Fox Lake. Impacts to avian species could be mitigated for all routing options by the use of bird flight diverters.

Use or Paralleling of Existing ROWs. Route variations FL-1 and FL-6 best utilize existing transmission line and roadway ROW in the area. Both variations follow existing transmission line or roadway ROW for their entire lengths. All other route variations share or parallel approximately 70-90 percent of their lengths with transmission line or roadway ROW.

Removing the 161 kV line from Fox Lake

As discussed in Section 6.2.2, there are positive impacts that would accrue if the existing 161 kV line were removed from Fox Lake and double-circuited on route variation FL-3 or FL-4 until reconnecting with route A northeast of Fox Lake. The removal would positively impact aesthetics at Fox Lake and generally in the area, by creating one transmission line ROW instead of two near the lake. The removal would have a positive impact on agricultural operations along the existing 161 kV line. The removal would decrease avian impacts at the lake. The removal would create new adverse impacts related to transmission facilities necessary to affect the double-circuiting and would create incremental aesthetic and avian impacts along route variations FL-3 and FL-4.

Lake Charlotte

There are five route variations (LC-1 through LC-5) and a segment of route A (A-LC) in the Lake Charlotte area. The routing factors and elements of routing factors for which the potential impacts in this area are anticipated to be minimal and to not vary significantly between the route variations, are very similar to those for the entire LH segment (discussed above). In this area, impacts related to archaeological and historic resources (routing factor D) and electrical systems reliability (routing factor K) are anticipated to be minimal and to not vary among routing options.

There is one routing factor and four elements of routing factors where impacts are anticipated to vary with route variations in this area and could be mitigated, to some extent, by the selection of a specific routing option or imposition of special permit conditions. These are:

- Effects on human settlements – for the factor elements aesthetics and private airstrips
- Effects on land-based economies – for the factor element agriculture
- Effects on the natural environment – for the factor element fauna
- Use or paralleling of existing ROWs

Human Settlements – Aesthetics. As with the LH segment as a whole, impacts to aesthetics and agriculture and the use of existing ROWs are closely linked in the Lake Charlotte area (Figure 7-5). With respect to aesthetic impacts, route variation LC-3 is near the fewest number of homes. Route variations LC-1 and LC-4 best utilize existing transmission line and roadway ROW; route variation LC-4 makes the best use of existing transmission line ROW by following the existing 161 kV line across the lake. On whole, it is anticipated that route variation LC-4 would best minimize aesthetic impacts in the area by utilizing existing transmission line ROW. Additionally, it is anticipated that a double-circuit crossing of Lake Charlotte, as opposed to a parallel crossing, would best minimize aesthetic impacts.

Human Settlements – Private Airstrips. Route variations LC-1, LC-2 and LC-4 and route A-LC would likely impact an airstrip in Section 18 of Rutland Township, Martin County. The magnitude of this impact is uncertain. The airstrip currently operates successfully with the existing 161 kV line running parallel to and just south of the airstrip. Mitigation could possibly be achieved by moving or otherwise reconfiguring the airstrip or its operations. Specialty structures (shorter structures) may also mitigate impacts.

Land-Based Economies – Agriculture. Route variation LC-4 best minimizes impacts to agriculture by using the existing 161 kV transmission line ROW across Lake Charlotte. As this is an existing transmission line ROW, double-circuiting the 345 kV line would create a minimal, incremental impact to agricultural land along the variation. Additionally, the new double-circuit line would replace existing H-frame structures with single pole structures, thus increasing the acreage that can be managed and lessening potential difficulties with operating equipment in adjacent fields. Route variation LC-4 has the least amount of prime farmland in its ROW; route variations LC-2 and LC-3 and route A-LC contain the most, with more than 90 percent prime farmland.

Natural Environment – Fauna. Direct impacts to fauna are anticipated to be minimal. There would

Figure 7-5 Relative Merits of Route Variations – Lake Charlotte

Routing Factor / Element	LC-1	LC-2	LC-3	LC-4	LC-5	A-LC	Summary
Human settlements / Aesthetics	●	▲	●	●	▲	▲	LC-3 is near relatively fewer homes. LC-1 and LC-4 best utilize existing transmission line and roadway ROW.
Human settlement / Private airstrips	▲	▲	●	▲	●	▲	LC-1, LC-2, LC-4 and A-LC may impact an airstrip in Rutland Township.
Land-based economies / Agriculture	●	▲	▲	●	▲	▲	LC-1 and LC-4 best utilize existing ROW, thus minimizing agricultural impacts. Along LC-4, H-frame structures would be replaced with single pole structures.
Natural environment / Fauna	▲	▲	▲	▲	▲	▲	Avian impacts could be mitigated for all routing options by the use of bird flight diverters. LC-4 would require specialty structures for crossing Lake Charlotte; the design of these structures could minimize avian impacts.
Use or paralleling of existing ROWs	●	▲	■	●	▲	▲	LC-1 and LC-4 best utilize existing transmission line and roadway ROW. LC-3 shares less than 30 percent of its length with transmission line and roadway ROW.

likely be indirect impacts to fauna as a result of all routing options in the Lake Charlotte area. These would be an incremental increase in impacts to avian species as a result of collisions with transmission line conductors. All route variations in this area proceed very near Lake Charlotte and neighboring lakes; route variation LC-4 crosses Lake Charlotte. Given that there is an existing 161 kV line across the lake and assuming that it remains there, it is anticipated that route variation LC-4, with a double-circuit crossing of Lake Charlotte, would best minimize avian impacts in area. Route variation LC-4 would be a crossing whether there is already a crossing of the lake; thus, any avian impacts would be incremental. The crossing by route variation LC-4 would use a flat profile design that is believed to minimize avian impacts. Finally, route variation LC-4 maintains the status quo for transmission line obstacles in the area – it keeps the number of transmission line ROWs near the lake at one. All other routing options introduce a second transmission line ROW near Lake Charlotte. Impacts to avian species could be mitigated for all routing options by the use of bird flight diverters.

Use or Paralleling of Existing ROWs. Route variations LC-1 and LC-4 best utilize existing transmission line and roadway ROW in the area. Route variation LC-4 makes the best use of existing transmission line ROW by following the 161 kV line across Lake Charlotte. All other routing options share about 70 percent of their lengths with existing transmission line and roadway ROW with the exception of route variation LC-3, which shares only 30 percent.

Removing the 161 kV line from Lake Charlotte

As discussed in Section 6.1.2, there are positive impacts that would accrue if the existing 161 kV line were removed from Lake Charlotte and double-circuited on a route variation that proceeds around the southern edge of Lake Charlotte. The removal would positively impact aesthetics at Lake Charlotte and generally in the area, by creating one transmission line ROW instead of two near the lake. The removal would have a positive impact on agricultural operations along the existing 161 kV line. The removal would decrease avian impacts at the lake. The removal would create new adverse impacts related to transmission facilities necessary to affect the double-circuiting and would create

incremental aesthetic and avian impacts along the route variation selected for double-circuiting.

Center Creek WMA

There is one route variation (CC-1) and a segment of route B (B-CC) in the Center Creek WMA area. The routing factors and elements of routing for which the potential impacts in this area are anticipated to be minimal and to not vary significantly between the route variations, are similar to those for the entire LH segment (discussed above). Additionally, in this area, impacts related to archaeological and historic resources (routing factor D), the natural environment (routing factor E) and electrical systems reliability (routing factor K) are anticipated to be minimal and to not vary among routing options.

There is one routing factor and two elements of routing factors where impacts are anticipated to vary with route variations in this area and could be mitigated, to some extent, by the selection of a specific routing option or imposition of special permit conditions. These are:

- Effects on human settlements – for the factor element aesthetics
- Effects on land-based economies – for the factor element agriculture
- Use or paralleling of existing ROWs

Human Settlements – Aesthetics. Route B-CC is furthest from homes in the area and best minimizes aesthetic impacts. Route variation CC-1 proceeds along 265th Ave., but this roadway has several residences along it and thus paralleling this existing roadway ROW does not minimize aesthetic impacts (Figure 7-6).

Land-Based Economies – Agriculture. Impacts to agriculture are anticipated to be similar for route variation CC-1 and route B-CC. Both proceed for their entire lengths through agricultural fields. Route variation CC-1 would have some ability to mitigate agricultural impacts if the alignment for the route variation were placed closer to 265th Ave. Doing so, however, would increase aesthetic impacts to homes along 265th Ave.

Use or Paralleling of Existing ROWs. Route B-CC does not use or parallel existing transmission line or roadway ROW. Route variation CC-1 parallels 265th Ave.; however, it does so at such a distance that use of the roadway ROW is minimal.

7.2 Huntley to Iowa Border

ITCM's proposed routes A and B extend from the proposed Huntley substation to the Iowa border (HI segment). If the Huntley substation was sited at the alternative southern Huntley substation site, a sub-segment of routes A and B could be utilized for the project. These sub-segments are indicated in this EIS as route alternatives A2-HI and B2-HI. In the discussion here, route A1-HI and route alternative A2-HI are sometimes referred to as the A ROW; and likewise, route B1-HI and route alternative B2-HI the B ROW. Five route variations are included in this segment as possible means to improve on routes A and B (HI-1 through HI-5). The relative merits of these routes, route alternatives and route variations are discussed here.

7.2.1 Routes and Route Alternatives

Routes A1-HI and B1-HI and route alternatives A2-HI and B2-HI proceed in a fairly similar manner, over a fairly homogeneous agricultural landscape from a Huntley substation site south of the city of Winnebago (either the proposed Huntley substation site or the alternative southern Huntley substation site) to the Iowa border. All routes and route alternatives parallel, at varying distances, the Blue Earth River. Route A1-HI crosses the Blue Earth River. The primary difference between the routes and route alternatives is that the A ROW follows the existing 161 kV Lakefield to Border transmission line for the entirety of it length. The B ROW proceeds primarily

Figure 7-6 Relative Merits of Route Variations – Center Creek WMA

Routing Factor / Element	CC-1	B-CC	Summary
Human Settlements / Aesthetics	■	●	B-CC is furthest from homes; CC-1 is near 4 homes.
Land-Based Economies / Agriculture	▲	▲	Both routing options proceed through agricultural fields
Use or paralleling of existing ROWs	▲	■	CC-1 follow existing roadway ROW, but uses it minimally. B-CC follows no existing ROW other than field lines.

along field lines. All routes and route alternatives are constructible and none contains a fatal flaw that would make them not permittable.

There are six routing factors for which impacts in this segment are anticipated to be minimal and to not vary significantly between the routes and route alternatives. These are:

- Effects on public health and safety – including the factor elements electric and magnetic fields, implantable medical devices, stray voltage, induced voltage, air quality and environmental contamination
- Effects on the natural environment
- Effects on rare and unique natural resources
- Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity
- Costs that are dependent on design and route
- Electrical systems reliability

Potential impacts for these routing factors are mitigated by the general conditions in part 4.0 of the Commission's generic route permit template. With respect to costs (routing factor L), there are differences in costs between routes and route alternatives; however, these differences are not significant given that costs estimates have a range of plus or minus 30 percent.

In addition, impacts are anticipated to be minimal and to not vary significantly with the routes and route alternatives for elements of two routing factors. These are:

- Effects on human settlements – for the factor elements noise, property values, displacement, electronic interference, public services, and zoning and land use compatibility
- Effects on the land-based economies – for the factor elements forestry, recreation and tourism, and mining

Potential impacts for these routing factor elements are mitigated by the general conditions in part 4.0 of the Commission's generic route permit template.

As discussed in Sections 5.1.4, though property value impacts are not well correlated with transmission line ROWs, it is likely that there is a linkage between aesthetic impacts and property value impacts. Harmony with existing infrastructure not only minimizes aesthetic impacts it likely also minimizes property value impacts. To the extent that new investments (i.e., a new 345 kV line) are harmonious with current investments, impacts to property values are likely minimized in the project area. Aesthetic impacts are discussed further here; these impacts could reasonably be interpreted as aesthetic-property value impacts.

Natural resources within the routes and route alternatives in this segment vary across routing options. However, impacts to these resources can be mitigated through (1) the general conditions in part 4.0 of the Commission's generic route permit template, (2) prudent pole placement and placement of the alignment within the permitted route and (3) associated downstream permit requirements. Additionally, these impacts are anticipated to be minimal because they are incremental. For example, though route A1-HI crosses the Blue Earth River, it does so where there are existing crossings. And where the A ROW crosses the Pilot Grove Lake Waterfowl Production Area (WPA), it does so at an existing crossing.

Thus, there are two routing factors and elements of two routing factors where impacts are anticipated to vary with the routes and route alternatives, and could be mitigated, to some extent, by the selection of a specific routing option or imposition of special permit conditions. These are:

- Effects on human settlements – for the factor element aesthetics
- Effects on land-based economies – for the factor element agriculture
- Effects on archaeological and historic resources
- Use or paralleling of existing ROWs

As with the LH segment, impacts to aesthetics and agriculture and the use of existing ROWs are closely linked in the HI segment of the project (Figure 7-7).

Human Settlements – Aesthetics. With respect to aesthetic impacts, the indicators analyzed in Section 6.2.1 point in different directions. The B ROW has significantly fewer residences near the line. This is because the B ROW proceeds primarily cross country along field lines. The A ROW minimizes aesthetic impacts by following an existing transmission line ROW for it entire length. It is anticipated that because the A ROW utilizes existing transmission line ROW, it best minimizes aesthetic impacts. If the B ROW were utilized for the project,

Figure 7-7 Relative Merits of Routes and Route Alternatives - Huntley to Iowa Border

Routing Factor / Element	A1-HI	A2-HI	B1-HI	B2-HI	Summary
	A ROW		B ROW		
Human Settlements / Aesthetics	●		▲		A ROW best utilizes existing ROW. B ROW is nearer fewer homes.
Land-Based Economies / Agriculture	●		▲		A ROW utilizes existing transmission line ROW, thus minimizing agricultural impacts. B ROW proceeds along field lines.
Archaeological and Historic Resources	▲		●		Route A1-HI contains a known archaeological resource in its ROW.
Use or paralleling of existing ROWs	●		■		A ROW utilizes existing transmission line ROW for its length. B proceeds along field lines.

it would create two parallel transmission line ROWs about 1 mile apart, for a length of about 18 miles.

Land-Based Economies – Agriculture. Because the A ROW utilizes existing transmission line ROW, it best minimizes agricultural impacts in this segment. The B ROW proceeds cross country through agricultural fields. The B ROW also has a relatively higher percentage of prime farmland.

Archaeological and Historic Resources. Route A1-HI contains a known archaeological resource within its ROW near the Blue Earth River. This resource could be impacted by construction of the project. Impacts could be mitigated by prudent pole placement such that this resource is spanned. Impacts could also be mitigated by measures developed in consultation with the Minnesota State Historic Preservation Office (SHPO) and by training of construction workers regarding archaeological resources. To affect these mitigations, special conditions would likely be needed in the Commission's route permit.

Use or Paralleling of Existing ROWs. The A ROW best utilizes existing ROW, as it follows an existing 161 kV line for the entirety of its length. The B ROW proceeds primarily along field lines.

7.2.2 Route Variations

The impacts of routes A1-HI and B1-HI could be mitigated, to some extent, by modifying these routes to avoid impacts in certain areas. Five route variations are discussed here for this segment of the project HI1 through HI5. All route variations are constructible and none contains a fatal flaw that would make them not permittable.

Route Variation HI-1

Route variation HI-1 and a segment of route A (A-HI1) are located near the Blue Earth River, just south of the proposed Huntley substation site. Route A-HI1 crosses the Blue Earth River following existing 161 kV line crossings. Route variation HI-1 skirts to the west of route A-HI1 and crosses tributaries of the Blue Earth River. If route variation HI-1 were selected as the route for the project, the existing 161 kV line be removed from the Blue Earth River and double-circuited with the 345 kV line.

The routing factors and elements of routing factors for which the potential impacts in this area are anticipated to be minimal and to not vary significantly between the route variations, are similar to those for the entire HI segment (discussed above). In this area, however, impacts related to the flora and fauna, though incremental, are anticipated to be non-minimal and to vary between the routing options.

Thus, there are two routing factors and four elements of routing factors for which impacts are anticipated to vary with routing options in this area and could be mitigated, to some extent, by the selection of a specific routing option or imposition of special permit conditions. These are:

- Effects on human settlements – for the factor element aesthetics
- Effects on land-based economies – for the factor element agriculture

- Effects on archaeological and historic resources
- Effects on the natural environment – for the factor elements flora and fauna
- Use or paralleling of existing ROWs

Human Settlements – Aesthetics. Aesthetic impacts in this area appear to be, more than usual, viewpoint dependent. There is one home within 500 feet of the anticipated alignment of route A-HI1. If route variation HI-1 were utilized it would move the line away from this one home, but closer to a home, west of HI-1. Route A-HI1 utilizes existing transmission line ROW; thus, it is most harmonious with existing infrastructure in the area. However, from the viewpoint of someone using the Blue Earth River, route variation HI-1 improves the aesthetics in the area by removing the 161 kV line from the river. Thus, there is some uncertainty as to which routing option best minimize aesthetic impacts in the area. However, based on its use of existing transmission line ROW, it appears that route A-HI1 best minimizes aesthetic impacts.

Land-Based Economies – Agriculture. Because route A-HI1 follows an existing 161 kV line for its length, it best minimizes impacts to agriculture in the area (Figure 7-8). Though route variation HI-1 runs along the edge of forested areas near the Blue Earth River, it does proceed almost entirely through agricultural fields.

Archaeological and Historic Resources. Both route variation HI-1 and route A-HI1 contain a known archaeological resource within their ROWs near the Blue Earth River. This resource could be impacted by construction of the project. Impacts could be mitigated by prudent pole placement such that this resource is spanned. Impacts could also be mitigated by measures developed in consultation with SHPO and by training of construction workers regarding archaeological resources. To affect these mitigations, special conditions would likely be needed in the Commission's route permit.

Natural Environment – Flora and Fauna. Route variation HI-1 minimizes impacts to flora and fauna by placing the new 345 kV line outside of the Blue Earth River and removing the existing 161 kV line from the river. It is anticipated that direct and indirect (avian collisions) impacts to fauna would be reduced by route variation HI-1. The impacts of route A-HI1 to flora and fauna would be incremental. There is already an existing 161 kV ROW approximately 150 feet in width. The ROW for a double-circuit 345/161 kV line along route A-HI1 would be 200 feet. Impacts along route variation A-HI1 could be mitigated by bird flight diverters. Impacts could also be mitigated by the use of specialty structures that place conductors in a relatively flat plane. To affect these mitigations, special conditions would likely be needed in the Commission's route permit.

Use or Paralleling of Existing ROWs. Route A-HI1 uses existing transmission line ROW for its entire length. Route variation HI-1 proceeds cross county, with a small portion of the variation utilizing roadway ROW.

Figure 7-8 Relative Merits of Route Variations – HI-1 Area

Routing Factor / Element	HI-1	A-HI1	Summary
Human Settlements / Aesthetics	●	●	A-HI1 utilizes existing ROW.
Land-Based Economies / Agriculture	▲	●	A-HI1 utilizes existing ROW, thus minimizing agricultural impacts. HI-1 proceeds across fields.
Archaeological and Historic Resources	▲	▲	HI-1 and A-HI1 both contain a known archaeological resource in their ROWs.
Natural Environment / Flora and Fauna	●	▲	HI-1 removes the 345 and 161 lines from the Blue Earth River. Avian impacts for A-HI1 (and possibly HI-1) could be mitigated by bird flight diverters. A-HI1 could mitigate avian impacts with specialty structures.
Use or paralleling of existing ROWs	■	●	A-HI1 utilizes existing transmission line ROW for its length. HI-1 proceeds across fields.

Route Variation HI-2

Route variation HI-2 and and a portion of route A (A-HI2) are located just south of the Faribault substation. In this area the existing 161 kV line connects to the Faribault substation. The new 345 kV line does not connect to this substation and proceeds independently around the eastern side of the substation and then rejoins the 161 kV line south of the substation. Route variation HI-2 brings the 345 kV line back to the 161 kV line at a location further south than the anticipated alignment for route A-HI2.

The routing factors and elements of routing factors for which the potential impacts in this area are anticipated to be minimal and to not vary significantly between the route variations, are similar to those for the entire HI segment (discussed above). In this area, impacts to archaeological and historic resources (routing factor D) are anticipated to be minimal and to not vary among routing options.

There is one routing factors and two elements of routing factors for which impacts are anticipated to vary with routing options in this area and could be mitigated, to some extent, by the selection of a specific routing option or imposition of special permit conditions. These are:

- Effects on human settlements – for the factor element aesthetics
- Effects on land-based economies – for the factor element agriculture
- Use or paralleling of existing ROWs

Human Settlements – Aesthetics. Route variation HI-2 places the 345 kV line at a greater distance from a residence along the existing 161 kV line than does route A-HI2. Route A-HI2 best utilizes existing transmission line ROW; however, doing so brings the 345 kV line closer to the residence along the line. Thus, route variation HI-2 likely best mitigates aesthetic impacts in this area (Figure 7-9).

Land-Based Economies – Agriculture. Though route variation HI-2 and route A-HI2 both proceed through agricultural fields around the Faribault substation, route A-HI2 better utilizes the existing 161 kV line ROW and thus best minimizes impacts to agriculture in this area.

Use of Paralleling of Existing ROWs. Route A-HI2 uses existing transmission line ROW for approximately 20 percent of its length. Route variation HI-2 proceeds cross county for its entire length. Both alignments proceed around the Faribault substation, thus limiting the extent of ROW sharing that can occur with the existing 161 kV line.

Route Variation HI-3

Route variation HI-3 and a segment of route B (B-HI3) are located just northeast of the Pilot Grove Lake WPA. In this area, route B-HI3 proceeds around the eastern side of a residence; Route variation HI-3 proceeds around the western side of the residence. It appears that the primary reason for route variation HI-3 proceeding around the western edge of the residence is to limit aesthetic impacts of the line.

The routing factors and elements of routing factors for which the potential impacts in this area are anticipated to be minimal and to not vary significantly between the route variations, are similar to those for the entire HI segment (discussed above). In this area, impacts to agriculture are not anticipated to vary among routing options. Impacts to archaeological and historic resources (routing factor D) are anticipated to be minimal and to not vary among routing options. Additionally, use or paralleling or existing ROWs is not anticipated to vary among routing options.

Thus, there is only one element of a routing factor for which impacts are anticipated to vary with the routing options in this area and could be mitigated, to some extent, by the selection of a specific routing option. This is:

Figure 7-9 Relative Merits of Route Variations – HI-2 Area

Routing Factor / Element	HI-2	A-HI2	Summary
Human Settlements / Aesthetics	●	▲	HI-2 places the 345 kV line at a greater distance from a residence. A-HI2 best utilizes existing ROW.
Land-Based Economies / Agriculture	▲	●	A-HI2 best utilizes existing ROW, thus minimizing agricultural impacts. HI-2 proceeds across fields.
Use or paralleling of existing ROWs	■	▲	A-HI2 utilizes existing transmission line ROW for20 percent of its length. HI-2 proceeds across fields.

- Effects on human settlements – for the factor element aesthetics

Human Settlements – Aesthetics. Route B-HI3 proceeds around the eastern side of the residence in this area; HI-3 proceeds around the western side of the residence. It appears that the residence and associated farmstead buildings and windbreak are oriented to face the east. Thus, route variation HI-3 best minimizes aesthetic impacts in this area by placing the line to the west of the residence where it is relatively less visible (Figure 7-10).

Route Variation HI-4

Route variation HI-4 and a segment of route A (A-HI4) provide routing options at the Pilot Grove Lake WPA. Route variation HI-4 would leave route A north of the Pilot Grove Lake WPA, proceed east to route B, south on route B and then back west to rejoin route A south of the Pilot Grove Lake WPA. In this manner, route variation HI-4 goes around the WPA. In contrast, route A-HI4 crosses the WPA following the existing 161 kV line across WPA. If route variation HI-4 were selected, the 161 kV line would be removed from the Pilot Grove Lake WPA and double-circuited with the 345 kV line around the WPA.

The routing factors and elements of routing factors for which the potential impacts in this area are anticipated to be minimal and to not vary significantly between the route variations, are similar to those for the entire HI segment (discussed above). In this area, impacts to archaeological and historic resources (routing factor D) are anticipated to be minimal and to not vary among routing options. In this area, however, impacts related to the flora and fauna, though incremental, are anticipated to be non-minimal and to vary between the routing options. Additionally, costs of construction (routing factor L) are anticipated to vary between the routing options.

Thus, there are two routing factors and four elements of routing factors for which impacts are anticipated to vary with routing options in this area and could be mitigated, to some extent, by the selection of a specific routing option or imposition of special permit conditions. These are:

- Effects on human settlements – for the factor element aesthetics
- Effects on land-based economies – for the factor element agriculture
- Effects on the natural environment – for the factor elements flora and fauna
- Use or paralleling of existing ROWs
- Costs that are dependent on design and route

Human Settlements – Aesthetics. There are no residences in close proximity to route variation HI-4 or route A-HI4. Thus, the only indicator of aesthetic impacts in this area is use of existing ROW. Route variation HI-4 proceeds cross country following, in part, field lines. Route A-HI4 follows an existing transmission line ROW for its entire length. Thus, route A-HI4 best minimizes aesthetic impacts in this area (Figure 7-11).

Land-Based Economies – Agriculture. Because route A-HI4 follows an existing 161 kV line for its length, it best minimizes impacts to agriculture in this area. Route variation HI-4 proceeds cross country, through and along fields.

Natural Environment – Flora and Fauna. Route variation HI-4 would avoid the Pilot Grove Lake WPA, thus minimizing direct impacts to flora in the WPA and to fauna that utilize the WPA. Additionally, there would be positive impacts associated with removing the existing 161 kV line from the WPA and double-circuiting it around the WPA. Impacts to flora and fauna for route A-HI4 would be incremental. There is already an existing 161 kV line across the WPA. ITCM indicates that it would utilize the 161 kV line's 100-foot ROW to cross the WPA (Section 6.2.2). Thus, incremental impacts would be limited to construction impacts in the WPA and indirect avian impacts due to a second set of conductors across the WPA. It is uncertain whether avian impacts related to a second set of conductors across the WPA (A-HI4) would be more or less than those with a second set of conductors that went around the WPA (HI-4). Impacts to avian species could be mitigated for route A-HI4 (and possibly route variation HI-4) by the use of bird flight diverters.

Figure 7-10 Relative Merits of Route Variations – HI-3 Area

Routing Factor / Element	HI-3	B-HI3	Summary
Human Settlements / Aesthetics	●	▲	HI-3 places the 345 kV line around the western edge of a residence where it is less visible.

Figure 7-11 Relative Merits of Route Variations – HI-4 Area

Routing Factor / Element	HI-4	A-HI4	Summary
Human Settlements / Aesthetics	▲	●	A-HI4 utilizes existing ROW. HI-4 follows field lines in part.
Land-Based Economies / Agriculture	▲	●	A-HI4 utilizes existing ROW, thus minimizing agricultural impacts. HI-4 proceeds cross country, through and along fields.
Natural Environment – Flora and Fauna	●	▲	HI-4 avoids the Pilot Grove Lake WPA. A-HI4 crosses the WPA using the existing 161 kV transmission line ROW.
Use or paralleling of existing ROWs	■	●	A-HI4 utilizes existing ROW. HI-4 proceeds cross country, through and along fields.
Costs Dependent on Design and Route	▲	●	HI-4 costs more to construct than A-HI4

Use or Paralleling of Existing ROWs. Route A-HI4 uses existing transmission line ROW for its entire length. Route variation HI-4 proceeds cross country, through and along fields.

Costs Dependent on Design and Route. Route variation HI-4 costs more to construct than route A-HI4, even with a cost estimate range of plus or minus 30 percent. Route variation HI-4 is about 3 miles in length and costs approximately $7.1 million to construct. A-HI4 is about 0.77 mile in length and costs approximately $1.7 million to construct.

Route Variation HI-5

Route variation HI-5 and a segment of route A (A-HI5) provide routing options near the Iowa border. Route A-HI5 jogs east and then proceeds south to the Iowa border, following the existing Lakefield to Border 161 kV line. Route variation HI-5 proceeds south and then east to rejoin the existing 161 kV line. If route variation HI-5 were selected, the 161 kV line would be removed and double-circuited with the 345 kV line, eventually crossing into Iowa where the 161 kV line currently crosses into Iowa.

The routing factors and elements of routing factors for which the potential impacts in this area are anticipated to be minimal and to not vary significantly between the route variations, are similar to those for the entire HI segment (discussed above). In this area, impacts to archaeological and historic resources (routing factor D) are anticipated to be minimal and to not vary among routing options.

Thus, there is one routing factor and two elements of routing factors for which impacts are anticipated to vary with routing options in this area and could be mitigated, to some extent, by the selection of a specific routing option or imposition of special permit conditions. These are:

- Effects on human settlements – for the factor element aesthetics
- Effects on land-based economies – for the factor element agriculture
- Use or paralleling of existing ROWs

Human Settlements – Aesthetics. With respect to aesthetic impacts, the indicators analyzed in Section 6.2.2 for this area point in different directions. Route A-HI5 has three residences in close proximity to the line; route variation HI-5 has none. This is because route variation HI-5 proceeds primarily cross country. Route A-HI5 minimizes aesthetic impacts by following an existing transmission line ROW for it entire length. However, because there would be one transmission line ROW no matter which routing option is selected, route variation HI-5 best minimizes aesthetic impacts in this area (Figure 7-12).

Land-Based Economies – Agriculture. Because route A-HI5 follows an existing 161 kV line for its length, it best minimizes impacts to agriculture in this area. Route variation HI-5 proceeds primarily cross country, through and along fields.

Use or Paralleling of Existing ROWs. Route A-HI5 uses existing transmission line ROW for its entire length. Route variation HI-5 proceeds primarily cross country, through and along fields.

Figure 7-12 Relative Merits of Route Variations – HI-5 Area

Routing Factor / Element	HI-5	A-HI5	Summary
Human Settlements / Aesthetics	●	▲	HI-5 is near fewer homes. A-HI5 utilizes existing ROW, but doing so puts it in close proximity to homes.
Land-Based Economies / Agriculture	▲	●	A-HI5 utilizes existing ROW, thus minimizing agricultural impacts. HI-5 proceeds cross country, through and along fields.
Use or paralleling of existing ROWs	■	●	A-HI5 utilizes existing ROW. HI-5 proceeds cross country, through and along fields.

7.3 Unavoidable Impacts

Transmission lines are large infrastructure projects that have adverse human and environmental impacts. The character of these impacts and the ways in which they can be mitigated are discussed in this document in Sections 5.0 and 6.0. Even with mitigation strategies, such as prudent routing, there are adverse impacts of the project which cannot be avoided. These impacts are anticipated to occur for all routes, route alternatives and route variations and to vary, if at all, as discussed above.

Aesthetic impacts cannot be avoided. The project would introduce new and relatively taller transmission line structures and new 345 kV transmission line conductors. These structures and conductors would be visible; therefore, they would have an adverse aesthetic impact. Temporary construction-related impacts also cannot be avoided. These include construction-related noise and dust generation, and disruption of traffic near construction sites.

Impacts to soils and agriculture cannot be avoided. The project requires the placement of concrete footings and the construction of transmission line structures in a project area that is predominantly agricultural in nature. This is an unavoidable direct impact. The direct soil impacts would in turn create indirect impacts to agricultural production. These indirect impacts include soil compaction, loss of tillable acreage, potential reduction in yields in disturbed soils and constraints on the layout and management of field operations. The structures themselves, independent of soil impacts, would constrain agricultural spraying performed with aircraft.

Finally, impacts to the natural environment cannot be avoided. Even if impacts can be limited to the ROW for the project, construction and operation of the transmission line would require tree removal and brush trimming, as well as clearing at structure sites. These are unavoidable impacts to vegetation. Unavoidable impacts to wildlife include the removal or fragmentation of habitat, and the creation of edge habitats. Transmission line conductors adversely affect avian species by creating opportunities for collisions with the conductors. These collisions would occur despite mitigation strategies such as structure design and the use of bird flight diverters.

7.4 Irreversible and Irretrievable Commitments of Resources

The commitment of a resource is irreversible when it is impossible or very difficult to redirect that resource to a different future use. An irretrievable commitment refers to the use or consumption of a resource such that it is not recoverable for later us by future generations. These types of commitments are anticipated to occur for all routes, route alternatives and route variations and not to vary significantly between routing options.

The commitment of land for a transmission line ROW is likely an irreversible commitment. In general, lands in the ROWs for large infrastructure projects such as railroads, highways and transmission lines remain committed to these projects for a relatively long period. Even in instances where a ROW is abandoned, the land within the ROW is typically repurposed for a different infrastructure use, such as a rails-to-trails program, and is not returned to a previous land use. For transmission lines, however, abandoned ROWs can be returned to an existing or previous use (e.g., row crop, pasture) in certain circumstances.

There are few commitments of resources associated with the project that are irretrievable. These commitments include the steel, concrete and hydrocarbon resources committed to the project, though it is possible that the steel could be recycled at some point in the future. Labor and fiscal resources required for the project are also irretrievable commitments.