5.0 Affected Environment, Potential Impacts and Mitigation Measures

The construction of a transmission line involves short- and long-term impacts. Some impacts may be avoidable; some may be unavoidable but can be mitigated; others may be unavoidable and unable to be mitigated. Impacts can be mitigated by prudent routing (i.e., by avoiding specific human and environmental impacts) and by design and construction measures.

Short-term impacts of the project are anticipated to be similar to those of a large construction project – noise, dust, soil disturbance and compaction, clearing of flora. The project would require the use of heavy equipment to clear land, dig foundations, build structures and string conductors. The impacts of this equipment use are anticipated to be fairly independent of the route selected for the project. They would occur wherever the project is located; thus, they are not mitigated by prudent routing. However, these impacts can be mitigated by construction measures, for example, limiting construction work hours, using best management practices to control soil erosion, minimizing the removal of flora, remediating soil compaction and other soil disturbances.

Long-term impacts can exist for the life of the project and may include aesthetic impacts, health impacts, economic impacts, land use restrictions and impacts to flora and fauna. Long-term impacts are generally not well mitigated by construction measures (i.e., these impacts do not flow from how the project is constructed but rather where it is placed and its operational characteristics over time). Long-term impacts can be mitigated by prudent routing and design measures. Thus, certain categories of impacts can be avoided or mitigated, to a greater or less extent, based on the route selected for the project.

This section provides an overview of the resources and potential impacts and mitigation measures associated with the project. It discusses these resources in terms that are applicable to all of the alternatives analyzed in this environmental impact statement (EIS). For example, discussions of wetland functions or property values, which are subjects common to all alternatives, are provided here rather than being repeated for each of the alternatives. Section 6.0 includes further detail on resources, impacts and mitigation measures associated with specific alternatives, particularly with respect to those impacts that vary with the alternatives.

Impacts of the project to human settlements, public services, public health, land-based economies, and archaeological and historic resources are anticipated to be minimal. Impacts to two airstrips in the project area are anticipated to be moderate with certain routing options (Section 6.0). Aesthetic impacts (i.e., impacts resulting from taller structures and more conductors in the project area) are anticipated to be incremental and minimal. Impact to agricultural operations are anticipate to be minimal to moderate, with most impacts capable of being mitigated. Aesthetic impacts and impacts to agricultural operations can be mitigated by, among other means, prudent routing.

Impacts to the natural environment, including water resources, flora, fauna, and rare and unique natural resources, are anticipated to be minimal, with most impacts capable of being avoided or mitigated. Impacts to flora and fauna can be mitigated, to some extent, by prudent routing.

The Minnesota Public Utilities Commission (Commission), if and when it issues a route permit for the project, could require ITC Midwest LLC (ITCM) to follow a specific route and alignment for the project and to use specific mitigation measures or require that certain mitigation thresholds or standards be met through permit conditions (Appendix B).

5.1 Human Settlements

Transmission lines have the potential to negatively impact human settlements through a variety of means. Transmission line structures and conductors could change the aesthetics of the project area, displace homes or businesses, introduce new noise sources, lower property values, be incompatible with local zoning and interfere with electronic communications.

Impacts to human settlements resulting from the project are anticipated to be minimal. Impacts to human settlements could be minimized by prudent routing (i.e., by choosing routes and alignments that avoid residences, businesses and other places where citizens congregate). Impacts could also be mitigated by limiting the aesthetic impacts to the structures themselves, and by the use of structures which are, to the extent possible, harmonious with human settlements and activities.

5.1.1 Aesthetics

Aesthetic and visual resources include the physical features of a landscape such as land, water, vegetation, animals and structures. Determining the relative scenic value or visual importance of these features in a given area is a complex process that depends on what individuals may perceive as being beautiful. Viewers' responses are based on their psychological connection to the viewing area and their physical relationship to the view, including distance to the structures, perspective and duration of the view.

The existing landscape in the project area is characterized by nearly level to gently rolling plains dominated by crop and forage land. Viewsheds in the area are generally broad and uninterrupted, with only small scattered areas where it is defined by trees or topography. Dominant natural features in the landscape include numerous lakes and the Des Moines and Blue Earth rivers and their associated tributaries, floodplains and wooded riparian corridors.

The visual character of the project area is also shaped by the built environment. Horizontal elements, such as highways and county roads, are consistent with the long and open viewsheds in the area. Vertical elements such as overhead transmission and distribution lines and wind turbines are visible from considerable distances and are the tallest and often the most dominant visual feature on the landscape. Residences and farmsteads are scattered across these viewsheds. In the small towns across the project area, the built environment, including homes, businesses, street signs and traffic signals, defines the visual character of the area.

New or different transmission line structures or conductors and new or expanded rights-of-way (ROWs) would have visual impacts. The degree of these impacts depends upon:

- Proximity to homes, populated areas and highways, where relatively more observers are present to experience any potential impacts
- Presence of terrain and vegetation that could shield views of the transmission line
- Use of existing ROW where the project would have a marginal impact relative to existing human modification to the landscape

Mitigation - Aesthetics

The primary strategy for minimizing aesthetic impacts is prudent routing (i.e., choosing routes where a transmission line is most harmonious with the landscape). Other mitigation measures include:

- Selecting route alternatives that maximize ROW sharing with existing linear ROW (e.g., transmission lines, roadways and railroads) to minimize visual impacts in open spaces and developed areas alike
- Avoiding routing through areas with high quality, distinctive viewsheds
- Crossing rivers and streams using the shortest distance possible (i.e., perpendicular to the water body)
- Using uniform structure types to the extent practical
- Reducing height of structures to minimize impacts within scenic areas
- Using construction methods that minimize destruction, scarring or defacing of the natural surroundings in the vicinity of the work
- Placing structures to take advantage of existing natural screening to reduce the view of the line from nearby residences and roadways, where practicable
- Avoiding placing poles directly in front of residences
- Including specific conditions in individual easement agreements with landowners along the route (e.g., new plantings or landscaping)
- **Utilizing the protections of Minnesota Statute 216E.12, subdivision 4 (commonly known as the "Buy the Farm" statute), where available, to move residents away from potential aesthetic impacts**

5.1.2 Displacement

For electrical safety code and maintenance reasons, utilities generally do not allow residences or other buildings within the ROW of a transmission line. Any residences or other buildings located within a proposed ROW are generally removed, or "displaced." Displacements are relatively rare and are more likely to occur in densely populated areas where avoiding all residences and businesses is not always feasible.

As is discussed further in Section 6.0, there are no residences or other buildings within the ROWs of the routes, route alternatives, and route variations studied in this EIS. There are some residences and buildings (e.g., farm structures and animal sheds) that are near the ROW. However, the project area is relatively sparsely populated, and adequate space is generally available to allow the alignment of the transmission line to be adjusted so that no buildings would, ultimately, be located within the ROW. Therefore, no displacements are anticipated as a result of the project.

5.1.3 Noise

Noise is generally defined as unwanted sound. Noise is commonly measured in units of decibel (dB) on a logarithmic scale. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more "weight." The A-weighted decibel scale (dBA) scale is used to emphasize the range of sound frequencies that are most audible to the human ear (i.e., between 1,000 and 8,000 cycles per second) (Reference 8).

The Minnesota Pollution Control Agency (MPCA) has established standards for the regulation of daytime and nighttime noise levels for areas of residential, commercial and industrial land use. These noise standards are expressed as a range of permissible dBA within a one hour period; L50 is the dBA that may be exceeded 50 percent of the time within an hour, while L10 is the dBA that may be exceeded 10 percent of the time within one hour. Appendix F provides additional background information on noise and noise standards in Minnesota.

In the project area, noise from construction and operation of the project would primarily affect rural residences located near the high voltage transmission line (HVTL) or substations. Ambient noise in the project area currently consists of noise from agricultural equipment, wind turbines, rustling vegetation and vehicle traffic.

Potential noise from the project can be grouped into three categories:

- **Construction noise.** During the construction of the project, temporary, localized noise from heavy equipment and increased vehicle traffic is expected to occur along the ROW during daytime hours. Construction activity and crews would be present at a particular location during daytime hours for a few days at a time but on multiple occasions throughout the period between initial ROW clearing and final restoration. Construction noise could temporarily affect residences, schools, churches, businesses, libraries, etc., that are close to the ROW.

- **Noise associated with HVTL operation.** Generally, activity-related noise levels during the operation and maintenance of transmission lines are minimal. Noise from HVTLs is primarily associated with the "corona effect," small electrical discharges which ionize surrounding air molecules, causing a cracking or hissing noise that may be audible from directly below the transmission line, especially during damp conditions.

- **Noise associated with substation operation.** Substation operating noise results from vibrations associated with magnetic forces inside substation transformers and from cooling fans and pumps that control transformer temperature. Most of the other equipment at a substation is either silent or generates minimal noise in comparison to the transformers.

Table 5-1 compares noise associated with construction, transmission line operation and substation operation to Minnesota noise standards for residential areas. The range of values provided below for construction represents minimum and maximum noise levels from a range of possible construction equipment types. Appendix F provides a more detailed breakdown of potential construction equipment noise levels. Depending on their distance from construction activity, the nearest homes and businesses are expected to experience noise levels much lower than these reported values.

The transmission line operation values provided below encompass the range of voltages and structure types proposed for the project. Substation operation values shown in Table 5-1 represent the range of values that resulted from modeling of substation noise associated with new equipment at the proposed Huntley substation (Reference 1). Noise standards are taken from MPCA's Guide to Noise Control in Minnesota (Reference 8).

Construction noise would occur during daytime hours, so only daytime standards would apply.

Table 5-1 Project-Related Noise Levels in Comparison to Minnesota Residential Noise Standards

Noise levels for the project are anticipated to be below Minnesota noise standards.

Noise Standards		Noise Level (dBA)
Minnesota noise standards (Residential – Noise Area Classification 1)	**Daytime L_{50}**	**60**
	Daytime L_{10}	**65**
	Nighttime L_{50}	**50**
	Nighttime L_{10}	**55**
Minnesota noise standards (Non-Residential – Noise Area Classification 2)	**Daytime L_{50}**	**70**
	Daytime L_{10}	**65**
	Nighttime L_{50}	**70**
	Nighttime L_{10}	**65**
Minnesota noise standards (Non-Residential – Noise Area Classification 3)	**Daytime L_{50}**	**80**
	Daytime L_{10}	**75**
	Nighttime L_{50}	**80**
	Nighttime L_{10}	**75**
Predicted Noise Levels		**Noise Level (dBA)**
Construction equipment noise at a distance of 50 feet	Minimum	65
	Maximum	98
Conductor noise at a distance of 0 feet	L_{50} Minimum	1
	L_{50} Maximum	41
Conductor noise at a distance of 100 feet	L_{50} Minimum	0
	L_{50} Maximum	39
Huntley substation noise at nearest non-residence receptor (460 feet)	Maximum	51.1
Huntley substation noise at nearest residence receptor (1,650 feet)	Maximum	3.7

Source: ITCM Noise Modeling Data and Reference 8

Limited construction could occur outside of daytime hours or on weekends if ITCM is required to work around customer schedules, line outages or other impediments to daytime construction, if such construction is allowable under the Commission's route permit for the project.

Because construction noise is intermittent and levels decrease by 6 dBA with a doubling of distance, noise levels at residences along the route are not expected to exceed Minnesota's daytime noise standards. Noise levels resulting from operation of the project are also expected to be below Minnesota noise standards. Route permits issued by the Commission require compliance with Minnesota's noise standards (Appendix B).

Mitigation - Noise

Noise impacts from the project are anticipated to be minimal and within Minnesota's noise standards. However, this does not mean that noise impacts would not occur. Even if the operational noise levels for the project are within state standards, the project would introduce a new noise source that, in certain situations (e.g., a calm evening) may be heard by residents in the project area. The primary means of mitigating this noise impact is prudent routing to avoid areas where residents in the project area live, work and congregate. **Noise impacts from substation operation could be mitigated by natural or built sound barriers, e.g., berms, plantings.**

5.1.4 Property Values

The placement of HVTLs and associated facilities near human settlements could potentially affect property values. In general, three main factors could affect property values:

- The presence of HVTLs in the viewshed could adversely affect the aesthetics of a property, thereby deterring certain buyers. Potential aesthetic impacts are discussed in Section 5.1.1.
- The real or perceived risks associated with electric and magnetic fields (EMF) may discourage certain buyers. Potential health impacts of EMF are discussed in Section 5.3.1.
- HVTL structures, when placed in an agricultural field, displace very little farmland. However, they have the potential to interfere with farming operations. Impacts on crop yields and crop choices could affect property values. Potential interference with farming operations is discussed in Section 5.4.1.

Proximity to HVTLs is only one of the many interconnected factors that influence property value, so the magnitude of this impact is difficult to isolate. The relationship between property values and proximity to HVTLs has been researched for decades, using a variety of methodologies to try to pinpoint the impact of nearby transmission lines. Some general conclusions can be drawn from this body of literature. Property values, however, are influenced by the complex interaction of factors specific to each individual piece of real estate as well as local and national market conditions; the effect of one particular project on the value of one particular property is nearly impossible to quantify. This section highlights relevant outcomes of property value research with additional detail provided in Appendix G.

Research on the relationship between property values and proximity to transmission lines has not identified a clear cause and effect relationship, but has revealed trends which are generally applicable to properties near transmission lines, including:

- Proximity to transmission lines does not always cause property values to go down. When property values do go down, the potential reduction in value is in the range of 1 to 10 percent.
- Property value impacts decrease with distance from a line, and thus impacts are usually greater on smaller properties than on larger ones.
- Adverse impacts diminish over time.
- Other amenities, such as proximity to schools or jobs, lot size, square footage of the home and neighborhood characteristics, tend to have a much greater effect on sale price than the presence of a HVTL.
- The value of agricultural property decreases when transmission line poles interfere with farming operations.

Mitigation - Property Values

Impacts to property values could be mitigated by reducing aesthetic impacts, EMF health risks and agricultural impacts. Choosing routes and alignments that maximize use of existing ROWs or place the transmission line away from residences and out of agricultural fields could address these concerns, thereby minimizing or avoiding impacts to property values. **Impacts could also be mitigated by utilizing the protections of Minnesota Statute 216E.12, subdivision 4 (commonly known as the "Buy the Farm" statute), where available, to move residents away from potential property value impacts.** Additional discussion of relevant mitigation measures are provided in Section 5.1.1 (Aesthetics), Section 5.3.1 (Electric and Magnetic Fields) and Section 5.4.1 (Agriculture).

5.1.5 Zoning and Land Use Compatibility

Zoning is a regulatory device used by local governments to geographically restrict or promote certain types of land uses. Minnesota statutes provide local governments with zoning authority to promote the public health and general welfare.

ITCM's transmission line project, however, is subject to Minnesota's Power Plant Siting Act (PPSA). Under this statute, the route permit issued for a HVTL "shall be the sole site or route approval required to be obtained by the utility. Such permit shall supersede and preempt all zoning, building or land use rules, regulations or ordinances promulgated by regional, county, local and special purpose government." (Minnesota Statute, section 216E.10). Therefore, ITCM is not required to seek permits or variances from local governments to comply with applicable zoning codes. Nonetheless, impacts to local zoning are clearly impacts to human settlements, both current and planned settlements, and the Commission considers impacts to human settlements as a factor in selecting transmission line routes. Impacts to local zoning due to ITCM's project are anticipated to be minimal.

The routes and route alternatives for this project pass through portions of Jackson, Martin and Faribault counties that are primarily rural, with commercial, industrial and residential land uses concentrated in several cities and towns, including Jackson and Lakefield in Jackson County, Fairmont, Trimont and Sherburn in Martin County, and Blue Earth in Faribault County.

Land within the project area is primarily used for agriculture, although several wind farms have been developed in the area. Beyond agricultural operations and wind farm developments there are relatively few commercial or industrial land uses in the area, and these are located in cities and towns. Land-based economies are discussed further in Section 5.4. Conservation easements and preserve land are scattered throughout the project area, particularly in the Des Moines and Blue Earth river areas, Fox Lake area and near Center Creek.

Each of the counties in the project area has adopted land-use plans and zoning ordinances or development codes. Jackson County's goals for overall growth focus on preserving commercial agriculture, protecting major natural resource areas for recreation and tourism and preventing urban sprawl (Reference 9). The Jackson County development code establishes zoning districts to further support these goals with the objective of minimizing urban-rural conflicts by allowing urban growth near the cities while protecting the prime agricultural land in the county (Reference 10).

Martin County's land use plan sets goals for parks and recreation, transportation, natural resources, urban and rural cooperation and feedlot regulation (Reference 11). The Martin County zoning ordinance establishes eight zoning districts to support the orderly development of residential, business, industrial, recreational and public areas (Reference 12).

Faribault County's zoning ordinance divides the county into zoning districts to minimize conflict between incompatible uses and to provide for orderly development and encourage the most appropriate use of the land (Reference 13).

Mitigation

The primary means of mitigating land use impacts is to utilize existing ROWs as much as possible. Although land use would be affected in areas around substations, in general, land use along the route that is ultimately selected by the Commission is not expected to change significantly as a result of construction and operation of the project. The majority of land under or adjacent to the HVTL could still be used for agricultural practices following construction.

5.1.6 Electronic Interference

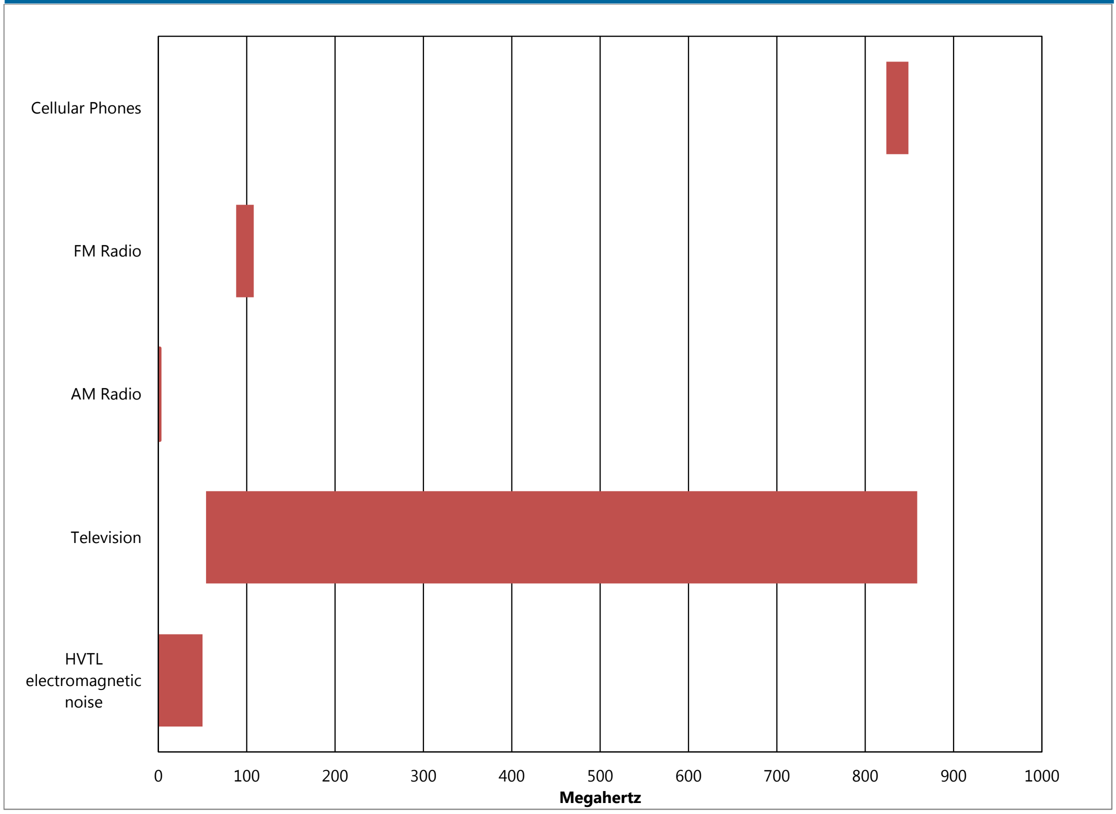
Electronic interference could result from electromagnetic noise created by the ionization of air molecules surrounding conductors. This ionization is commonly known as corona. Interference could also result from transmission-line poles which block line-of-sight communications. This section summarizes the potential impacts of the project on electronic communication and similar devices, including radios, televisions and microwave communications. Global positioning system (GPS)-based agricultural navigation systems are discussed in Section 5.4.1, and medical electronic devices are discussed in Section 5.3.2.

No impacts to electronic devices are anticipated as a result of the project. Interference due to electromagnetic noise is not anticipated. Interference due to line-of-sight obstruction could occur in select areas but could be mitigated by prudent placement of transmission line poles and electronic antennas. **In situations where interference with electronic devices does occur and is caused by the presence or operation of the transmission line,** route permits issued by the Commission require permittees to take those actions which are feasible to restore electronic reception to pre-project quality (Appendix B).

Electromagnetic noise from HVTLs may interfere with electronic communications when it is generated at the same frequencies as communication and media signals. This noise could interfere with the reception of these signals depending on the frequency and strength of the signal and distance from the electromagnetic noise source (Reference (14). Corona interference from transmission lines causes the greatest disturbance in a relatively narrow frequency spectrum, in the range of about 0.1 to 50 megahertz (MHz) (Reference 15). Because many communication and media signals are transmitted at higher frequencies, impacts to communication signals would be limited. Figure 5-1 compares

Figure 5-1 Frequencies of Electronic Communications Compared with Frequencies of Electromagnetic Noise Created by Transmission Lines

Electromagnetic noise from transmission lines does not interfere with electronic communications, except for AM radio.



Source: Reference 16, Reference 17, Reference 15

the spectrum of transmission frequencies for several communication and media signals to the peak intensity disturbance associated with electromagnetic noise from HVTLs. Additional discussion is provided below for each major type of media or communication signal.

Radio

Electromagnetic interference could affect amplitude modulated (AM) and frequency modulated (FM) radio receivers. As shown on Figure 5-1, however, the electromagnetic interference peak intensity disturbance overlaps only with AM radio frequency. This interference typically occurs directly under a transmission line and dissipates rapidly to either side. Otherwise, satisfactory reception could be obtained by appropriately modifying or moving the receiving AM antenna.

FM radio receivers usually do not pick up interference from transmission lines because corona-generated electromagnetic noise is quite small in the FM broadcast band (88-108 MHz) and because FM radio systems have excellent interference rejection properties making them virtually immune to amplitude-type disturbances.

Two-way radios used for emergency services typically operate at frequencies greater than 150 MHz (Figure 5-1) (Reference 18). Minnesota is currently moving to a statewide emergency communications system that operates at 800 MHz (Reference 18). Corona-generated electromagnetic noise is minimal at these frequencies and no impacts to these radio systems are anticipated.

Television

As shown in Figure 5-1, television broadcast frequencies, which occur in the 54-806 MHz range, are high enough that they are relatively immune to corona-generated noise. Additionally, digital transmissions are not dependent on waveforms to transfer broadcast content, but rather on packets of binary information, which, in general, are less susceptible to corruption and can be corrected for errors. Satellite television is transmitted in the Ku band of radio frequencies (12,000-18,000 MHz) and is likewise immune to corona-generated noise.

Both digital and satellite television reception could be affected by multipath reflections (shadowing) generated by nearby towers. An outdoor antenna might be necessary to resolve issues with multipath reflections. Satellite television is susceptible to line-of-sight interference due to transmission line structures. However, reception could usually be restored by moving the affected satellite antenna to a slightly different location.

Cable television is a redistributed form of satellite broadcast and is generally not susceptible to interference due to the use of shielded coaxial cable. Cable broadcasts could suffer interference if the satellite broadcast suffers interference (e.g., line-of-sight obstruction).

Internet and Cellular Phones

Wireless internet and cellular phones use frequencies in the 900 MHz ultra-high frequency (UHF) range – a range for which impacts from corona-generated noise are anticipated to be negligible. If internet service at a residence or business is provided by a satellite antenna, this service could be impacted by a line-of-sight obstruction. As with other satellite reception, any interference due to an obstruction could be resolved by moving the satellite antenna to a slightly different location.

Microwave Communication

Electromagnetic "noise" from transmission lines is not an issue for microwave communications. However, microwave communication can be physically blocked by taller transmission structures. Microwave pathways can extend as close as 150 feet to the ground, and the transmission line structures for this project are 100 feet to 190 feet tall; therefore, interference with microwave communications is possible. This potential impact could be avoided during detailed project design on any selected route by identifying the microwave pathways in the project area and siting the transmission line structures at locations where they would not interfere with any identified pathways.

5.2 Transportation and Public Services

Transmission line projects have the potential to negatively impact public services (e.g., roads, utilities and emergency services). These impacts are typically temporary in nature, e.g., the inability to fully use a road or utility while construction is in process. However, impacts could be more long term if they change the project area in such a way that public service options are foreclosed or limited.

This section summarizes the project's potential impacts on local roadways, utilities, emergency services and airports. Methods for mitigating these impacts are also summarized here. Temporary impacts to public services resulting from the project are anticipated to be minimal. Long-term impacts to public services are not anticipated if mitigation measures are employed. Specific impacts and mitigation measures for select areas of the project are discussed in Section 6.0.

5.2.1 Roadways

The primary roadways within the project area include U.S. Interstate 90 (I-90), U.S. Highway 71, State Highway 4 and State Highway 15. As shown on Map 3-4, portions of some route alternatives would run parallel to or across I-90, which extends west to east through Jackson, Martin and Faribault counties. All route alternatives also have some portions that would run parallel to or cross county and township roads.

The project could impact roadways and roadway users in several ways, including:

- Cause temporary traffic delays, detours and congestion during construction
- Possibly interfere with future roadway expansions or realignments
- Possibly impair the safe operation and maintenance of roadways
- Possibly cause safety risks during severe weather, where roadways are within the fall distance of transmission line structures

Construction could occasionally cause lanes or roadways to be closed, although those closures would only last for the duration of the construction activity in a given area. Construction equipment and delivery vehicles would increase traffic along roadways in the project area, with effects lasting from a few minutes to a few hours, depending upon the complexity and duration of the construction activities, and drivers could experience increased travel times. In cities, construction vehicles could temporarily block public access to streets and businesses.

Transmission lines that parallel roads could affect future road expansions or realignments because poles placed along the road ROW might need to be moved to preserve a safe distance between poles and the edge of the expanded roadway. Except along I-90, ITCM plans to locate poles approximately 10 feet outside of road ROWs. Along I-90, poles must be located such the entire structure, including davit arms, is outside of the highway ROW. Thus, for the structures proposed for this project, poles must be placed approximately 30 feet outside the I-90 ROW. **Conductors may move in and out of the highway ROW as a result of high winds (see the transmission line conductor blowout diagram in Appendix C).**

ITCM indicate**d in its route permit application** that it plans to locate the structures along I-90 at least 65 feet, and in most places 100 feet, from the edge of the Minnesota Department of Transportation (MnDOT) ROW. **Subsequently, ITCM has indicated that structures for modified route A could be located as close as 30 feet to the I-90 ROW (e.g., along the north side of I-90 just east of Sherburn) and up to 100 feet from the I-90 ROW (e.g., along the south side of I-90, also near Sherburn).**

Severe weather, including high winds, ice and snow storms and tornados, could possibly create safety hazards on any roadways located within the designed fall distance of an overhead transmission line. Snow and ice accumulation and high winds could increase a structure's weight, making it more susceptible to failure or collapse.

Right-of-way Sharing

Siting transmission lines along existing ROWs can minimize the proliferation of new utility ROW and the effects on private landowners. In order to share or occupy ROW, however, the applicant would have to acquire necessary approvals from the ROW owner (like a railroad) or the agency overseeing use of a particular ROW (like MnDOT).

When a transmission line parallels roads, railroads or other transmission lines, the easement required from an adjacent landowner is relatively smaller. When paralleling existing roadways, for example, the general practice is to place the poles on the adjacent private property, a few feet outside the existing ROW. So, although the pole is still located on private property, the transmission line can share or occupy some of the public ROW, thereby reducing the size of the easement required from the private landowner. If the normally required ROW width is 200 feet, for example, and the pole is placed 10 feet off an existing road ROW, only a 110-foot easement would be required from the landowner. The roadway and transmission line would share the other 90-foot-wide section of ROW.

MnDOT's utility accommodation policy outlines the policies and procedures governing use of state trunk highway ROWs by utilities. The policy was developed in accordance with the requirements of state and federal law (*Code of Federal Regulations*, title 23, part 645, subpart B). It is designed to ensure that the placement of utilities does not interfere with the flow of traffic or the safe operation of vehicles.

MnDOT is responsible for preserving the public investment in the transportation system and for ensuring that non-highway uses of the ROW do not interfere with the ability of the state to make long-term highway improvements, such as adding lanes, interchanges or bridges, or to safely operate and maintain the existing system. The requirements of MnDOT's accommodation policy vary based on whether the utility is crossing the highway or running parallel to it and on the type of highway. The percentage and type of shared (or "accommodated") ROW for each route alternative and route variation is discussed in Section 6.0 of this EIS.

Mitigation - Roadways

The primary means of mitigating potential impacts to roadways is by coordinating with roadway authorities and by taking into account the need for roadways to be safely operated and maintained. ITCM has proposed transmission line routes in such a way as to cross MnDOT ROWs at existing transmission line crossings wherever possible and to co-locate the proposed line with the existing lines.

Route alternatives and their associated road crossings would need to be designed to meet MnDOT guidelines, and a permit from MnDOT would be required for the use of any state highway ROWs. MnDOT has a formal policy and procedures for accommodating utilities within or as near as feasible to highway ROWs. ITCM indicates that it would continue to work with MnDOT to ensure that the project meets all applicable guidelines during permitting and final design, and has committed to coordinating with county and township road departments to minimize impacts on local roads and highways.

5.2.2 Public Utilities

Public utilities that serve residents and businesses in the project area include both electric and natural gas services. In addition, there are a number of power-generating facilities located in the project area, including several wind turbine facilities and Alliant Energy's natural-gas-fired Fox Lake Generating Station near Sherburn.

Electric services are provided by a variety of suppliers throughout the project area. Blue Earth Light and Water, a division of the city of Blue Earth, provides electricity for the residents of Blue Earth. The city of Fairmont provides electricity and steam heat to the city's residents and businesses and electricity to more than 200 rural customers. The city of Jackson purchases its electricity from Western Area Power Administration and Missouri River Energy Service, and the city of Sherburn purchases electricity from Alliant Energy. In some rural areas, Federated Rural Electric Association, South Central Electric Association and BUNCO Electric also provide services to customers in Jackson, Martin and Faribault counties. ITCM and Xcel Energy own and operate electric transmission facilities throughout the project area.

Natural gas in the project area is primarily provided by CenterPoint Energy, although Minnesota Energy Resources provides natural gas to residents of Sherburn.

Project construction and operation should not affect any of these public utilities. In specific areas, the route would cross over existing transmission lines, follow existing transmission line ROWs and likely cross small power distribution lines. Where the project parallels existing power lines, the lines could be co-located to minimize the number of transmission structures on the landscape and to reduce the amount of ROW required. **If the project follows an existing electrical distribution line, the distribution line would likely be placed underground at a cost of approximately $80,000 dollars per mile.** As no impacts to public services are anticipated, no mitigation measures are necessary.

5.2.3 Emergency Services

Law enforcement services are provided by the Faribault, Martin and Jackson County sheriff's offices and by municipal police departments in nearby towns. Fire services are provided by city and community fire departments, volunteer fire departments, rural fire departments and fire protection districts. Emergency medical response services are provided by various ambulance districts in the project area.

Hospitals in the project area include: the United Hospital District in Blue Earth; the Mayo Clinic Health System in Fairmont; and the Sanford Jackson Medical Center in Jackson. Additional medical services are provided by Sacred Heart Mercy Health Care Center, the Prairie Rehab & Fitness Center, Jackson Community Health Services, Griffin Medical Clinic, Southern Minnesota Surgical, Inc., and various dental offices, eye clinics and chiropractors.

Two private heliports are located within five miles of the project – at the Jackson County Medical Center in Jackson and at the United Hospital District in Blue Earth. These heliports provide landing locations for air emergency responders.

The project should not affect emergency services in the project area. Any temporary road closures required during construction would be coordinated with local jurisdictions to provide for safe access of police, fire and other rescue vehicles. Any accidents that might occur during construction of the project would be handled through local emergency services. Due to the relatively small number of construction workers on the project, the existing emergency services should have sufficient capacity to respond to any emergencies.

5.2.4 Airports

There are several municipal airports and private landing strips located in the project area, including the Jackson Municipal Airport, Fairmont Municipal Airport, Blue Earth Municipal Airport and two private grass landing strips. The locations of these airports and air strips are shown on the resource maps in Section 6.0.

HVTL structures and conductors could conflict with the safe operation of these public airports and airstrips if they are too tall for the applicable safety zones. Different classes of airports have different safety zones depending on several characteristics, including runway dimensions, classes of aircraft they could accommodate, and navigation and communication systems. These factors determine the necessary take-off and landing glide slopes, which in turn determine the setback distance of transmission line structures.

The Federal Aviation Administration (FAA) and MnDOT have each established development guidelines on the proximity of tall structures to public use airports. The FAA has also developed guidelines for the proximity of structures to very-high-frequency omni-directional range (VOR) navigation systems. Transmission lines near public airports are limited by FAA height restrictions, which prohibit transmission line structures above a certain height, depending on the distance from the specific airport. Regulatory obstruction standards only apply to those airports that are available for public use and are listed in the FAA airport directory. Private airports and personal use airports, including landing strips, cannot be used in commercial transportation or by the general public and are therefore not subject to FAA regulatory obstruction standards.

In addition, MnDOT has established separate zoning areas around airports. The most restrictive safety zones are Safety Zone A, which does not allow any buildings or temporary structures, places of public assembly or transmission lines, and Safety Zone B, which does not allow places of public or semi-public assembly such as churches, hospitals or schools. Permitted land uses in both zones include agricultural uses, cemeteries and parking lots (Minnesota Rules, chapter 8800). As with FAA regulations, MnDOT zoning requirements only apply to public airports.

The only public airport regulated by FAA and MnDOT that could be affected by the project is the Jackson Municipal Airport. There are two private landing strips in the area: one in Section 23 of Fox Lake Township and one in Section 18 of Rutland Township in Martin County. The other two public airports in the project area, the Fairmont and Blue Earth airports, are too far from the project to be affected by it.

The FAA recently approved a layout plan for expanding the Jackson Municipal Airport, which includes a new and longer runway and upgraded instrumentation to accommodate additional types of aircraft. The new runway would be located northeast of the existing runway and would extend 5,000 feet in length, and it would likely be constructed between 2015 and 2018. The new runway would allow larger airplanes, including small jets, to operate at the airport; this would likely increase air traffic in and around the airport. Any final route and structure heights selected in the area north of the Jackson Municipal Airport would, therefore, have to account for the safe navigation of aircraft using the new runway.

Mitigation - Airports

Potential impacts to airports could be mitigated by using shorter structures in the vicinity of an airport and by choosing routes that do not impair safe operation of an airport. To ensure safe operation, structures must not impinge on airport glide slopes, safety zones or setbacks.

Using appropriate setback distances could also mitigate effects on navigational aids like VORs. FAA Order 6820.10 specifies that overhead transmission lines should be more than 1,200 feet away from a navigational aid to avoid electronic interference. In addition, the height of steel transmission line structures are also limited near these navigation aids. However, the only known navigational aid in the area is located at the Jackson Municipal Airport itself, about one and one-half miles south of route A. The FAA has not indicated that this navigational aid would be affected by the project.

Once a route is selected by the Commission, ITCM would file the necessary notice requirements with FAA and would work with both FAA and MnDOT to ensure compatibility between the transmission lines and air navigation stations and equipment and to identify any additional mitigation measures. Route alternatives that could mitigate potential impacts to airports in the project area are discussed in Section 6.0.

5.3 Public Health and Safety

Transmission line projects have the potential to negatively impact public health and safety during both construction and operation of the project. As with any project involving heavy equipment and high voltage transmission lines, there are safety issues to consider during construction. Potential health and safety impacts include injuries due to falls, equipment use and electrocution. Potential health impacts related to the operation of the project include health impacts from EMF, stray voltage, induced voltage, impaired air quality, environmental contamination and electrocution.

Impacts to public health and safety resulting from project are anticipated to be minimal. No adverse health impacts due to EMF, stray voltage, induced voltage, or air emissions are anticipated. The project would have protective devices to safeguard the public from the line if an accident occurred and a structure or conductor fell to the ground. These protective devices are circuit breakers and relays located within connecting substations. The protective

Table 5-2 Typical Magnetic Fields of Common Appliances

Source	Distance from Source:	Typical Magnetic Fields (mG)			
		0.5 foot	1 foot	2 feet	4 feet
Baby Monitor		6	1	-	-
Computer Displays		14	5	2	-
Fluorescent Lights		40	6	2	-
Copy Machines		90	20	7	1
Microwave Ovens		200	4	10	2
Vacuum Cleaner		300	60	10	1
Color Televisions		NA	7	2	-

Source: Reference (19)

equipment would de-energize the transmission line, should such an event occur.

5.3.1 Electric and Magnetic Fields

EMFs are invisible regions of force resulting from the presence of electricity, and are produced by all electric devices, including transmission and distribution lines. Naturally occurring EMFs are caused by the earth's weather and geomagnetic field. Man-made EMFs are caused by electrical devices and are characterized by the frequencies at which they alternate, that is, the rate at which the fields change direction each second. All electrical lines in the United States have a frequency of 60 cycles per second or 60 Hertz (Hz). EMFs at this frequency level are known as extremely low frequency (ELF) EMF.

Electric fields on a transmission line are solely dependent upon the voltage of the line, not the current. Electric field strength is measured in kilovolts per meter (kV/m), and the strength of an electric field decreases rapidly as the distance from the source increases. Electric fields are easily shielded or weakened by most objects and materials, such as trees or buildings.

Magnetic fields are created by the electrical current (measured in amps) moving through a transmission line. The strength of a magnetic field is proportional to the electrical current, and is typically measured in milliGauss (mG). As with electric fields, the strength of a magnetic field decreases rapidly as the distance from the source increases. Unlike electric fields, however, magnetic fields are not easily shielded or weakened by objects or materials.

This section summarizes the potential health impacts of transmission line EMF, regulatory standards and predicted EMF levels from this project. Appendix H1 provides detailed background on EMF health impact research. Appendix H2 provides the results of ITCM's modeling of predicted EMF levels at various distances and loading levels.

Magnetic Field Background Levels

The wiring and appliances located in a typical home could produce an average background magnetic field of between 0.5 mG and 4 mG (National Cancer Institute, 2005; USEPA 1992). A U.S. government study conducted by the EMF Research and Public Information Dissemination Program determined that most people in the United States are on average exposed daily to magnetic fields of two mG or less (Reference 19). Typical magnetic field strengths near common appliances are shown in Table 5-2.

Health Studies and Potential Health Impacts

A concern related to EMF is the potential for adverse health effects due to EMF exposure. In the 1970s, epidemiological studies indicated a possible association between childhood leukemia and EMF levels. Since then, various types of research have been conducted to examine EMF and potential health effects, including animal studies, epidemiological studies, clinical studies and cellular studies. Scientific panels and commissions have reviewed and studied this research data (Appendix H1). In general, these studies concur that:

- Based on epidemiological studies, there is an association between childhood leukemia and EMF exposure. There is no consistent association between EMF exposure and other diseases in children or adults.

- Laboratory, animal and cellular studies fail to show a cause and effect relationship between disease and EMF exposure at common EMF levels. A biological mechanism for how EMF might cause disease has not been established.

- Because a cause and effect relationship cannot be established, and yet an association between childhood leukemia and EMF exposure has been shown, there is:

  - Uncertainty as to the potential health effects of EMF

  - No methodology for estimating health effects based on EMF exposure

  - A need for further study of the potential health effects of EMF

  - A need for a **prudent avoidance** approach in the design and use of all electrical devices, including transmission lines.

Regulatory Standards

There are currently no federal regulations for allowable electric or magnetic fields produced by transmission lines. A number of states, however, have developed state-specific regulations (Table 5-3), and a number of international organizations have adopted standards for EMFs (Table 5-4).

The Commission has established a standard that limits the maximum electric field under transmission lines to 8 kV/m. All transmission lines in Minnesota must meet this standard (Appendix B). The Commission has not adopted a magnetic field standard for transmission lines. The Commission has, however, adopted a **prudent avoidance** approach in routing transmission lines and, on a case-by-case basis, considers mitigation strategies for minimizing EMF exposure levels associated with transmission lines.

Some public health scientists have questioned whether state and international EMF guidelines sufficiently protect public health. These scientists have urged state utility commissions to be more rigorous in applying a precautionary or prudent avoidance approach. Dr. David Carpenter, a public health physician at the University of Albany and Cindy Sage, an EMF researcher, note that there is "strong scientific evidence that exposure to magnetic fields from power lines greater than 4 mG is associated with an elevated risk of childhood leukemia"(Reference 21).

They conclude that the evidence for effects on human health from ELF-EMF is strong enough to merit immediate regulatory action to reduce EMF exposure levels. They suggest that "such a reduction could best be achieved by setting exposure goals that are lower than levels known to be associated with disease, even while understanding that these exposure goals are significantly lower than many current exposures." Dr. Carpenter and Ms. Sage, in collaboration with other public health researchers, have also authored the BioInitiative Report, which argues for a more proactive application of a precautionary approach to radio frequency and ELF EMF (Reference 22).

For the Brookings County to Hampton 345 kV transmission line project (Commission docket number TL-08-1474), Dr. Carpenter testified before the Commission on behalf of a party which argued that magnetic field levels for that project would exceed safe exposure levels. **Testimony was provided in opposition to Dr. Carpenter's opinion by Dr. Peter Valberg. After examining and weighing the competing testimony of Drs. Carpenter and Valberg, the administrative law judge and, ultimately, the Commission,** determined that the state's current exposure standard for ELF-EMF (an electric field standard of 8 kV/m) is "adequately protective of human health and safety."

Predicted EMF Levels for the Project

No adverse health impacts from electric or magnetic fields are expected for persons living or working near the project. ITCM has modeled and calculated electric and magnetic fields for the project, reflecting structure configurations that may be used for the project and several electrical loading scenarios (Appendix H2).

Predicted Electric Fields

The project's maximum predicted electric field, modeled at one meter above ground, is calculated to be 5.29 kV/m. This electric field was modeled where two 345 kV lines would be built on parallel rights of way. Also, ITCM modeled a 5.25 kV/m electric field a distance of 50 feet from the center line for a 345 kV/161 kV H-frame lake crossing structure, which are shorter than the single tower structures proposed for the rest of the project. Electric fields for all other structure configurations are less than 5.0 kV/m. Thus, electric field levels along all

Table 5-3 State Electric and Magnetic Field Standards

State	Electric Field (kV/m)		Magnetic Field (mG)
	Within ROW	Edge of ROW	Edge of ROW
Florida	8[(1)]	2	150[(1)] (max load)
	10[(2)]	---	200[(2)] (max load)
	---	---	250[(3)] (max load)
Massachusetts	---	---	85[(7)]
Minnesota	8	---	---
Montana	7[(4)]	1[(5)]	---
New Jersey	---	3	---
New York	11.8	1.6	200 (max load)
	11[(6)]	---	---
	7[(4)]	---	---
Oregon	9	---	---

Source: Reference (19)

(1) 69 kilovolt (kV) to 230 kV transmission lines
(2) 500 kV transmission lines
(3) 500 kV transmission lines on certain existing ROW
(4) Maximum for highway crossing
(5) May be waived by the landowner
(6) Maximum for private road crossings
(7) A level above 85 mG is not prohibited, but may trigger a more extensive review of alternatives.

Table 5-4 International Electric and Magnetic Field Guidelines

Organization	Electric Field (kV/m)		Magnetic Field (mG)	
	General Public	Occupational	General Public	Occupational
IEEE	5	20	9,040	27,100
ICNIRP	4.2	8.3	2,000	4,200
ACGIH	---	25	---	10,000/1,000[(1)]
NRPB	4.2	---	830	4,200

Source: Reference (20)

(1) for persons with cardiac pacemakers or other medical electronic devices.

Table 5-5 Predicted Magnetic Fields for Primary Structure Types

Magnetic fields levels are predicted to increase over time, from 2017 until some future date at which the line reaches its maximum loading. Magnetic field levels are predicted to be greatest underneath the line and to decrease exponentially with distance from the line. **'Future Maximum' magnetic field calculations assume that 2,000 megawatts (MW) of new generation are added in southwest Minnesota over the next several years.**

Structure Type	Timeframe (System Condition)	Distance to Proposed Centerline in Feet (Magnetic field in mG)								
		-200	-100	-50	-25	0	25	50	100	200
Single-Pole, Davit Arm, 345/161 kV Double-Circuit	2017 (peak)	1.8	6.0	15.2	23.3	21.7	12.9	7.5	3.3	1.2
	2017 (average)	1.2	4.0	10.2	15.6	14.5	8.6	5.0	2.2	0.8
	2023 (peak)	2.6	8.7	22.2	33.8	31.5	18.9	11.2	5.0	1.8
	2023 (average)	1.7	5.9	14.9	22.7	21.1	12.7	7.5	3.3	1.2
	Future Maximum (peak)	7.7	26.4	67.7	104.1	97.2	56.8	32.1	14.0	5.1
	Future Maximum (average)	5.2	17.7	45.4	69.7	65.1	38.0	21.5	9.4	3.4
Single-Pole, Davit Arm, 345kV Single Circuit	2017 (peak)	1.9	6.3	15.8	23.9	22.2	13.8	8.4	3.8	1.3
	2017 (average)	1.3	4.2	10.6	16.0	14.9	9.2	5.6	2.5	0.9
	2023 (peak)	2.7	9.0	22.7	34.5	32.1	19.9	12.1	5.4	1.9
	2023 (average)	1.8	6.1	15.3	23.1	21.5	13.3	8.1	3.6	1.3
	Future Maximum (peak)	8.4	28.4	71.5	108.4	100.8	62.5	38.1	17.1	5.9
	Future Maximum (average)	5.7	19.0	47.9	72.6	67.5	41.9	25.5	11.4	4.0

Source: Appendix H2, ITCM Modeling Data

sections of the project are anticipated to be less than the Commission's 8 kV/m standard.

Predicted Magnetic Fields

Predicted magnetic field levels depend on anticipated currents (amps) on the transmission line, which in turn depend on the electric load served by the line now and into the future. The larger the expected current flow, the higher the predicted magnetic field. ITCM has predicted magnetic field levels for the project in 2017 and 2023, and maximum magnetic field levels that could be reached at an unknown future date. This maximum magnetic field modeled assumes that 2,000 megawatts (MW) of new generation are added in southwest Minnesota over the next several years. This loading is considered maximum because it would create a scenario in which a single fault in the system would cause other electrical system components to fail. Additionally, ITCM has modeled magnetic field levels for all scenarios at average and peak current levels. Average levels are those current levels experienced for most hours of the year; peak levels are current levels for limited hours of the year when current levels are projected to be higher due to system loading and electrical generation in the project area, among other factors. Peak current levels are approximately 1.5 times higher than average current levels (Appendix H2).

ITCM's modeled magnetic fields for the project's primary structure types are shown in Table 5-5. The predicted magnetic fields for a 345 kV only configuration are slightly higher than those for a 345/161 kV double-circuit configuration due to phase canceling effects of the two circuits on the same structures that occur with a double-circuit configuration. Detailed modeling results for all the various structure types and timeframes are provided in Appendix H2.

For the project's primary structure types, the maximum predicted magnetic field, modeled at one meter above ground, is calculated to be 108.4 mG, at a distance of 25 feet from the transmission line centerline (Table 5-5). Because magnetic field strength drops off exponentially with distance, predicted levels fall below 30 mG at the edge of the transmission line ROW, and below 10 mG by 200 feet from centerline. As shown in the detailed data in Appendix H2, predicted magnetic fields are slightly higher than these for 345/161 configurations that use specialty two-pole H-frame structures, structures that would likely be used at lake crossings. Predicted levels are lower along 161 kV only sections of the project.

In all cases, predicted magnetic fields for the project, in 2017, 2023, and at some future date when the line is at a maximum loading, are below regulatory guidelines for magnetic fields used in other states and internationally. Predicted average magnetic field levels at the edge of the 345 kV ROW for all **timeframe** scenarios, are less than 20 mG.

Mitigation - EMF

No adverse health effects from EMF are anticipated for the project. However, consistent with the Commission's precautionary approach to EMF impacts, basic mitigation measures to minimize EMF exposure levels are prudent. Such strategies are discussed below. These strategies are discussed individually, but in some instances or for specific sections of a route, they could be combined.

Distance

EMF levels decrease with distance from a conductor. Thus, EMF exposure levels could be reduced by selecting a route away from residences and from other places where people congregate. To a great extent, ITCM's proposed routes A and B avoid residences; however, there may be route alternatives and route variations examined in this EIS that improve on ITCM's routes in this respect. Distances and numbers of residences along the various alternatives and variations for the project are discussed in Section 6.0.

A second means of increasing distance is to use taller poles, which, by placing conductors at a greater height, reduce EMF levels at or near ground level. The 130- to 190-foot tall, single pole structures proposed for this project help reduce ground level electric and magnetic field strength.

Phase Cancellation

EMF levels could be reduced by a phenomenon known as phase cancellation. Electrical power is generally transmitted along three parallel conductors, each carrying a single phase of the power being transmitted. The closer these phases/ conductors are to each other, the lower the magnetic fields produced. In other words, when the magnetic fields of the individual conductors are close together, they tend to cancel each other out.

There are limits, however, on how close together conductors could be placed. The distance between conductors must meet National Electrical Safety Code (NESC) clearances, and there must be sufficient clearance to ensure the safety of utility workers. Placing conductors closer together would also require more transmission line structures per mile to better control conductor blowout and sag.

Undergrounding

Placing a transmission line underground could reduce EMF exposure levels. Electric fields are reduced by the underground facilities and covering earth. Magnetic fields are not reduced by covering materials, but could be attenuated by phase cancellation, because underground conductors are placed closer together than are overhead conductors.

Undergrounding high-voltage transmission lines is generally not feasible for cost and reliability reasons. The feasibility of undergrounding a section of the project is discussed in Section 3.7.2.

Double-Circuiting

Instead of placing one circuit (three conductors) on a transmission line pole, two circuits (six conductors) could be placed on each pole. The benefit of double-circuiting is that the phases of the two circuits could be arranged such that their magnetic fields cancel each other out, thereby reducing the net magnetic field.

Modeling results shown in Appendix H2 illustrate how the double-circuit sections of the project have reduced magnetic field strength compared to single circuit options.

Higher Voltage

Increasing the voltage of a transmission line would increase the electric field associated with the line, but for a given amount of power, it would reduce the current required and would thus result in lower magnetic fields. Based on ITCM's modeling and that of the Midcontinent Independent System Operator (MISO), 345 kV is the highest voltage that would operate effectively in this part of southern Minnesota and Iowa. Therefore, it is not feasible to increase project voltage higher than the proposed 345 kV as a means of reducing magnetic field strength. See Section 4.5.1 for further discussion of the potential use of higher voltages.

5.3.2 Implantable Medical Devices

Electromechanical implantable medical devices, such as cardiac pacemakers, implantable cardioverter defibrillators (ICDs), neurostimulators and insulin pumps may be subject to interference from electric and magnetic fields, which could mistakenly trigger a device or inhibit it from responding appropriately (Reference 23).

ICD manufacturers' recommended threshold for modulated magnetic fields is 1 Gauss (G). Since 1 G is five to ten times greater than the magnetic field likely to be produced by a HVTL (Reference 23), research has focused on electric field impacts. A 2004 EPRI report (Reference 24) states that sensitivity to electric fields was reported at levels ranging upwards from 1.5 kV/m, particularly for older (unipolar) pacemakers; some modern (bipolar) units are immune at 20 kV/m. Medtronic and Guidant, manufacturers of various implantable medical devices, have indicated that electric fields below 6.0 kV/m are unlikely to affect most of their devices (Reference 24).

The maximum predicted electric field strength for the project is 5.25 kV/m (Appendix H2). This field strength is below the 6.0 kV/m interaction level for modern, bipolar pacemakers, but above the range of interaction levels for older, unipolar pacemakers. Electric field levels decrease with distance, however, and maximum levels at the edge of the ROW are anticipated to be less than 2.5 kV/m, and, in most instances, less than 1 kV/m. Accordingly, impacts to implantable medical devices and their users are anticipated to be minimal.

In the event that a cardiac device is affected, the effect is typically a temporary asynchronous pacing (i.e., fixed rate pacing), and the device returns to its normal operation when the person moves away from the source of EMFs (Reference 23). Therefore, no adverse health impacts or permanent impacts on implantable medical devices are anticipated as a result of the project, and no mitigation measures are proposed.

5.3.3 Stray Voltage

Electrical systems that deliver power to end-users, and electrical systems within the end-user's business, home, farm or other buildings are grounded to the earth for safety and reliability reasons. The grounding of these electrical systems results in a small amount of current flow through the earth.

Stray voltage could arise from neutral currents flowing through the earth via ground rods, pipes or other conducting objects, or from faulty wiring or faulty grounding of conducting objects in a facility. Thus, stray voltage could exist at any business, house or farm which uses electricity, independent of whether there is a transmission line nearby.

Stray voltage is typically experienced when livestock come into contact with two metal objects, such as feeders, water troughs or stalls, between which a voltage exists, thereby causing a small current to flow through the livestock (Reference 25). The fact that both objects are grounded to the same place (earth) would seem to prevent any voltage from existing between the objects. However, this is not the case – a number of factors determine whether an object is, in fact, grounded. Factors that could influence the intensity of stray voltage include wire size and length, the quality of connections, the number and resistance of ground rods and the current being grounded. **Stray voltage can also occur when there is contact between livestock and one metal object in the barnyard area that is not properly grounded.**

Stray voltage is by and large an issue associated with electrical distribution lines and electrical service at a residence or on a farm. Transmission lines do not create stray voltage as they do not directly connect to businesses, residences or farms. Accordingly, no impacts due to stray voltage are anticipated from the project. The project is a 345 kV transmission line that would not directly connect to businesses or residences in the area, and does not change local electrical service.

However, transmission lines may not be, for purposes of stray voltage, completely independent of locally distributed electrical service. Where transmission lines parallel distribution lines, they can, in the immediate area of the paralleling, cause current to flow on these lines (additional current, as the distribution lines already carry current). For distribution lines and electrical service that are properly wired and grounded, these additional currents are of no matter. However, for distribution lines and electrical service that are not properly wired and grounded, these additional currents could create stray voltage impacts.

Depending on the route selected for the project, the 345 kV line could parallel existing distribution line**s**. If a distribution line is paralleled, this arrangement could create additional currents on the distribution line in the immediate area of the paralleling. These currents are not anticipated to cause any stray voltage issues in the project area. If, however, there is not proper grounding or wiring on the distribution system or at a nearby residence, business or farm, these currents could point up this insufficiency.

Mitigation - Stray Voltage

In those instances where transmission lines could induce **currents** on **inadequately grounded** distribution circuits, mitigation measures **for stray voltage may** be **required**. These mitigation measures tend to be site specific but could include phase cancellation, **transmission-to-distribution** separation **, isolation of the end-user neutral** and improved grounding.

5.3.4 Induced Voltage

The electric field from a transmission line could couple with any conductive object in close proximity to the transmission line, such as a vehicle or a metal fence. This conductive coupling could induce a voltage on the object, with the magnitude of this voltage depending on factors which include the weather, object shape, size, orientation and location along the ROW. **The** alternating magnetic fields created by transmission lines could also induce currents on conductive objects.

If **the** objects **upon which a voltage is induced** are insulated or semi-insulated from the ground and a person touches them, a small current would pass through the person's body to the ground. This might be accompanied by a spark discharge and mild shock, similar to what could occur when a person walks across a carpet and touches a grounded object or another person.

The main concern with induced voltage is the current flow (amps) through a person to the ground. Most shocks from induced current are considered more of a nuisance than a danger, but to ensure the safety of persons in proximity to a transmission line, the NESC requires that any discharge be less than 5 milliamps (mA). In addition, the Commission's electric field limit of 8 kV/m is designed to prevent serious hazard from shocks due to induced voltage under transmission lines. Route permits issued by the Commission require that transmission lines be constructed and operated to meet NESC standards and the Commission's electric field limit (Appendix B).

Mitigation - Induced Voltage

Grounding of metal objects under a transmission line is the best method of meeting the NESC's and Commission's standards and avoiding electrical shocks. Route permits issued by the Commission require permittees to ground all stationary metallic objects in or near the transmission line ROW (Appendix B).

Thus, for objects that the permittee can ensure are effectively grounded (i.e., stationary objects), no impacts due to inducted voltage are anticipated from the project. However, for metallic objects where effective grounding is more difficult to achieve (e.g., machinery that is movable and operated directly under a transmission line) impacts could occur, such as a mild shock. Such impacts could occur only if a person was standing on the ground and touching the machinery while directly under a transmission line. The primary means of mitigating this potential impact is to avoid exiting and entering machinery directly under a line (i.e., to avoid stopping under a line).

5.3.5 Air Quality

The air quality in Minnesota is generally good and, for most pollutants, it has been improving. Minnesota has been in compliance with all national ambient air quality standards since 2002 (Reference 26). Data from the MPCA air quality monitoring station closest to the project indicates that air quality in the vicinity of the project is generally good to moderate. Air quality trends in the project area mirror those in the state overall, with air quality generally improving over the last several years (Reference 27).

Potential air-quality impacts associated with the project come from two primary sources: 1) ozone and nitrogen oxide (NO_X) emissions from operating the facility; and 2) short-term emissions from construction activities.

Ionization of air molecules surrounding the conductor ("corona effect") produces a small amount of ozone and NO_X, both of which are reactive compounds that contribute to smog and could adversely affect human respiratory systems, animals, crops, vegetation and buildings (Reference 28), Reference 29). Because of their detrimental effects, air concentrations of these compounds are regulated by both the USEPA and the MPCA. The State of Minnesota has an ozone limit of 0.08 parts per million (ppm) (Minnesota Rules, part 7009.0800), and the federal ozone limit is 0.075 ppm (eight hour limit) (Reference 30). Because the total emissions of ozone and NO_X from operating a HVTL are very small, the project is not expected to create any potential for concentrations of ozone that might exceed these standards.

Air emissions during construction would primarily consist of emissions from construction equipment and would include carbon dioxide, NO_X and particulate matter (PM); dust generated from earth-disturbing activities would also give rise to PM. Emissions would be dependent upon weather conditions, the amount of equipment at any specific location and the period of operation required for construction at that location. Any emissions from construction would be similar to those from agricultural activities common in the project area and would only occur for short periods of time in localized areas.

Emissions from operating the proposed line would have negligible impacts on air quality, so no mitigation is proposed. Minor short-term air quality impacts from construction could be mitigated by equipping construction equipment with appropriate mufflers, using a water truck to reduce dust and promptly reseeding areas of disturbed vegetation.

5.3.6 Environmental Contamination

Construction of the project would involve soil disturbance. If existing soil or groundwater contamination is encountered during construction, it could create a safety and health concern. Exposing existing contaminated soils could create a health and safety risk to construction workers and the nearby public.

A review of MPCA's "What's in My Neighborhood" database (Reference 31) indicates that there are four hazardous waste sites located within 100 feet and 10 hazardous waste sites within 500 feet of the anticipated alignments of the routes, route alternatives and route variations analyzed for this project. Because there are no records of violations or enforcement actions for these sites, it is unlikely that these sites have had any inadvertent releases to the environment which could be encountered during construction activities. There are no registered tanks located within 100 feet and five tanks located within 500 feet of the routes, route alternatives and route variations. One of these tanks is associated with a reported leak. In addition, there are four other reported leak sites located within 500 feet of the routes, route alternatives and route variations. The locations of these potentially contaminated sites are shown on the resource maps in Section 6.0 and the sites are labeled as "hazardous wastes", "tanks and leaks" or "multiple activities" (meaning that these sites are listed in more than one environmental contamination database).

Health and safety risks could be minimized by avoiding any known or suspected contaminated sites. During detailed design, structure locations could be adjusted to span contaminated sites and efforts could be made during construction to avoid disturbance in contaminated areas. If any contaminated soils or groundwater are encountered during construction of the project, the contaminated material would need to be managed in accordance with state regulations.

5.4 Land-Based Economies

Constructing and operating the project could potentially affect land-based economies in the project area. Transmission lines and associated structures are a physical, long-term presence on the landscape which could prevent or otherwise limit use of the land for other purposes. When placed in an agricultural field, transmission line structures have a relatively small footprint, yet they could potentially interfere with farming operations. In addition, structures and tall growing trees are not allowed in transmission line ROWs, a restriction that could affect commercial businesses and forestry operations along the ROW.

Impacts to agricultural operations due to the project are anticipated to be minimal to moderate, with most impacts capable of being mitigated. No impacts to forestry or mining operations are anticipated. Impacts to recreation and tourism are anticipated to be minimal and limited to the aesthetic impacts of the project. Impacts to land-based economies could be mitigated by prudent routing (i.e., by choosing routes and alignments that avoid such economies). Impacts could also be mitigated by the use of designs and structures which are, to the extent possible, compatible with land-based economies. This section discusses the project's potential impacts on agriculture, forestry, mining and tourism.

5.4.1 Agriculture

Agriculture is the primary land-based economic resource in the project area. Jackson, Martin and Faribault counties are among Minnesota's top 10 counties for crop production (Reference 32). Principal crops in the project area include corn, soybeans, vegetables, sweet corn and wheat (Reference 33). Farmers in the area also raise livestock, including hogs and pigs, broiler or other meat-type chickens, cattle, sheep and turkeys (Reference 33).

Potential impacts to agriculture associated with projects of this nature could be either temporary or permanent. Temporary impacts are caused by construction activities and are limited to the duration of construction. These activities could limit the use of fields or could affect crops and soil by compacting soil, generating dust, damaging crops or drain tile or causing erosion. Project construction activities would typically be limited to the transmission line ROW. Temporary impacts in agricultural lands are estimated to cover 0.5 acre per pole, five acres every 25 miles for equipment staging areas and 1,600 square feet every two miles for spooling locations.

Permanent agricultural impacts are caused by the physical presence of transmission line poles and associated facilities in crop, pasture or other agricultural lands. ITCM indicates that approximately three acres of additional land would be required to expand the existing Lakefield Junction substation, and approximately 32 acres would be required for the new Huntley substation. For the transmission line itself, the footprint of a pole could be relatively small, with the footprint of the structures proposed for the project varying between 20 and 115 square feet, depending on structure type (Reference 1). The impact of such structures, however, could be greater than their footprint since they could impede the use of farm equipment and irrigation systems and interfere with aerial spraying. These physical impacts could result in lost farming income or decreased property values (Section 5.1.4). In addition, stray voltage could affect livestock if not properly mitigated (Section 5.3.3).

Mitigation - Agriculture

Impacts to agricultural operations could mitigated by prudent routing (i.e., by selecting routes that avoid agricultural fields by following existing infrastructure ROWs, field lines and property lines). Where structures are placed in fields, impacts could be mitigated by not placing structures diagonally across fields, but rather parallel to existing field lines **or spanning fields if diagonal crossings are necessary**.

Impacts could also be mitigated by the use of single pole structures. Route alternatives that use the existing 161 kV transmission line ROW would replace existing H-frame (two pole) structures with single pole structures. Although the single pole structures would be larger in diameter than single H-frame poles, the single pole structure would occupy less total space, which would increase land available for farming and would reduce pole-related obstacles. The existing H-frame structures are approximately 700 feet apart. The single pole structures proposed for this project would be placed an average of 900 feet apart, reducing the overall number of structures in the fields and providing additional land for agricultural uses.

Impacts to agricultural lands could also be minimized by limiting the removal of crops to only that necessary for construction and on-going safe operation of the line. Additionally, ITCM, in collaboration with the Minnesota Department of Agriculture (MDA) **has prepared** an Agricultural Impact Mitigation Plan (AIMP) for the project **(Appendix E)**. The AIMP identif**ies** measures that ITCM would take to avoid, mitigate or provide compensation for agricultural impacts that could result from constructing and operating the project. The AIMP specifies procedures for repairing damaged drain tile, **alleviating compaction and** removing construction debris. Compliance with the AIMP is not a permit condition in the Commission's generic route permit template, but has been included as a permit condition for other HVTL projects (Appendix B).

Prime Farmland

Much of the agricultural land in the project area is of superior productivity, and has been designated as prime farmland or farmland of statewide importance. The Farmland Protection Policy Act defines prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides and labor" (*Code of Federal Regulations*, title 7, section 657.5 (a) (1)).

Farmland of statewide importance includes other land that is of statewide or local importance for the production of food, feed, fiber, forage or oilseed crops. Route-specific impacts to prime farmland and farmland of statewide importance are included in Section 6.0. Mitigation strategies for potential impacts to prime farmland and farmland of statewide importance are similar to those described above for all agricultural lands.

Organic Farms

MDA's 2012-13 Directory of Minnesota Organic Farms (Reference 34) lists eight organic farms in the project area that could be affected by the project. However, because organic farmers are not required to register with the MDA, there could be additional, un-registered organic farms within the project area. In addition, organic farm registration does not give the precise location of organic fields, only the registrant's mailing address.

While the presence of an HVTL on or near an organic farm would not directly affect a farm's organic certification, special construction and maintenance procedures would need to be followed to avoid impacts to these farms. Herbicides, pesticides or other substances prohibited by the U.S. Department of Agriculture (USDA) National Organic Program could not be used on organic farms, and construction vehicles would need to be cleaned prior to entering organic farms to prevent tracking offsite soil or plant material onto the farm.

Livestock

Hog, poultry, cattle and sheep farms are located in the project area. Livestock operations could be temporarily affected during construction. Construction activities could temporarily disrupt livestock access to pasture lands and disturb livestock with construction noise. In addition, poultry could be sensitive to disease caused by pathogens introduced by offsite soils. Measures to minimize impacts to livestock during construction could include erecting temporary fences, temporarily relocating livestock from construction areas, restoring vegetative cover using landowner-approved seed mixes suitable for livestock grazing, and washing equipment prior to entering poultry farms.

Though no stray voltage impacts are anticipated as a result of the project, stray voltage could be of concern to livestock farmers, particularly on dairy farms, due to its potential impacts to milk production and quality. Stray voltage is discussed further in Section 5.3.3. Induced voltage also may be of concern to livestock farmers, for those with buildings near a transmission line that would require grounding of the metal components of the building. No impacts due to induced voltage are anticipated from the project if effective grounding is implemented. Induced voltage is discussed further in Section 5.3.4.

Aerial Spraying

Transmission line structures could potentially affect the coverage and effectiveness of aerial spraying. Poles could limit the ability of aerial applicators to reach specific areas of fields, by limiting those areas where applicators could safely fly. Adverse effects on aerial spraying and to crops could be mitigated by aligning the project in a configuration that is consistent with current aerial spraying patterns or by using land-based herbicides or pesticides in the areas near the transmission line.

Irrigation Systems

Transmission line structures in agricultural fields could potentially impede the use of irrigation systems, either by necessitating reconfiguration of an irrigation system to accommodate poles or by reducing crop revenue because all or a portion of a field could not be irrigated. No known center-pivot or other irrigation systems have been identified in the project area; therefore, impacts to irrigation systems are not anticipated and mitigation would not be required. If an irrigation system is encountered during construction of the project, procedures specified in the AIMP would be implemented to minimize disruption of the system.

Precision Farming Systems

Precision farming involves the use of GPS and, more recently, real-time kinematic (RTK) GPS in farm machinery, allowing the machinery to be directed more accurately and maximize a farm's efficiency. Precision farming minimizes the potential for waste from, for example, duplicate row seeding or overlap in fertilizer or pesticide application. Transmission lines have the potential to interfere with RTK and standard GPS used for precision farming in two ways: (1) electromagnetic noise from a transmission line could potentially interfere with the frequencies used for RTK and standard GPS signals; and (2) transmission line structures could cause line-of-site **obstructions or create multipath reflections** such that sending and receiving of signals would be compromised.

Interference could occur where the spectrum of HVTL electromagnetic noise overlaps the frequency spectrum used by RTK or standard GPS systems. As noted in Section 5.1.6, HVTL electromagnetic noise occurs from about 0.1 to 50 MHz. RTK GPS and standard GPS utilize much higher frequency ranges, from 300 to 3,000 MHz and 1,225 to 1,575 MHz, respectively (Reference 35). There is no overlap between HVTL electromagnetic noise and frequencies used by RTK and standard GPS systems; therefore, HVTL electromagnetic noise from the project is not anticipated to affect precision farming systems.

Interference due to line-of-sight obstruction **or multipath reflection** could occur in two ways: (1) obstruction of**, or other reflection interference with,** a GPS satellite signal; and (2) obstruction of radio transmissions from an RTK base station to a mobile receiving unit. GPS uses information from multiple satellite signals to determine specific locations. Interference with one signal would not cause inaccurate navigation; however, simultaneous interference with two signals could lead to inaccurate navigation. Because simultaneous interference with two signals is relatively unlikely, and any line-of-sight obstruction would be resolved with movement of the GPS receiver (e.g., tractor) such that proper GPS reception would be quickly restored, line-of-sight obstruction impacts to precision farming systems are anticipated to be minimal and temporary.

A transmission line pole located very near an RTK base station could cause a line-of-sight obstruction in the signal from **a** base station. **A transmission line pole near an RTK base station (within 100 feet) could also cause multipath reflections that interfere in the signal from a base station. Multipath reflections can also be caused by other structures and landscape features including homes, trees, sheds, and sudden changes in ground elevation.** Prudent placement of poles and prudent location (or relocation) of the base station **likely** would mitigate this potential impact.

If interference with electronic devices, including precision farming systems, does occur and is caused by the presence or operation of the transmission line, route permits issued by the Commission require permittees to take those actions which are feasible to restore electronic reception to pre-project quality (Appendix B).

5.4.2 Forestry

The project area is predominantly agricultural land with minimal forested areas, so construction of the project would result in minimal clearing of trees. A few small woodlots and shelterbelts are located adjacent to farmsteads, and some forested areas are located adjacent to waterways and on lands managed by the Minnesota Department of Natural Resources (DNR). There are, however, no known tree farms, timber plots or other commercial forestry operations in the project area. Therefore, the project is not anticipated to adversely affect forestry resources,

5.4.3 Mining

Several small active or abandoned aggregate mining sites are found in the project area. Sand, gravel and other aggregate materials are primarily mined for local use in highway, road, bridge and other construction projects. None of the known mining sites are located in the project area.

The project would need to use sand and aggregate for tower backfill, for concrete and to maintain reliable access routes. Some of the aggregate material could come from local sources. Although demand would temporarily increase during construction, it's anticipated that no new aggregate source facilities would be constructed, nor would any existing facilities be expanded.

Transmission lines could also affect future mining operations if the structures interfere with access to mineable resources or the ability to remove them. If there are potentially recoverable aggregate reserves in the project area, construction of the project could limit the ability to successfully mine these reserves, depending on the selected route alternative and the location of any mineable reserves. Impacts to aggregate reserves in the project area are anticipated to be minimal. Impacts can be mitigated by prudent routing and by prudent pole placement and placement of the alignment within the route to avoid aggregate mining sites.

5.4.4 Recreation and Tourism

Tourism in the project area consists primarily of outdoor recreational opportunities, such as hunting and fishing. Several lakes, rivers, wildlife management areas, waterfowl production areas and other hunting lands in the area support these activities. Both resident and non-resident sportsmen visit areas across Minnesota every year to take advantage of the state's hunting and fishing opportunities. Communities in the vicinity of the project likely receive some economic benefit from these sportsmen.

There are several recreational areas located in the vicinity of the project. The Des Moines River State Water Trail and Blue Earth River State Water Trail extend through the project area, attracting outdoors enthusiasts interested in canoeing, kayaking, boating, camping and bird watching. Several snowmobile trails traverse the project area. There are several lakes located in the project area, including Fox Lake and Lake Charlotte, which are used for recreational boating and fishing. And finally, several wildlife management areas and waterfowl production areas are scattered throughout the project area that are used for hunting and wildlife viewing. Recreational users of these trails, lakes and wildlife areas likely spend money in nearby communities and help support the local economies.

Effects on recreation and tourism due to construction of the project are anticipated to be minor and temporary in nature, lasting only for the duration of construction. The short-term disturbance, which includes increased noise and dust, could detract from nearby recreational activities and could affect hunting by temporarily displacing wildlife. Wildlife, however, is expected to return to the area once construction has been completed.

Constructing the transmission line across the rivers and lakes or across snowmobile trails could temporarily disrupt recreational users of these amenities. Mitigation measures could include conducting the construction activities during seasons when recreational users are not present or providing alternative routes around the construction zone. Once construction has been completed, these areas would again be available for outdoor recreational uses. Therefore, construction of the project is not expected to result in ongoing or long-term impacts to recreation and tourism.

The project itself, once constructed, could impact aesthetics in the project area or at a specific recreational feature, such that recreation in the project area would, for the average citizen, be less enjoyable. Potential aesthetic impacts of the project are discussed in Section 5.1.1. Additionally, aesthetic impacts relative to specific natural features are discussed in Section 6.0.

5.5 Archaeological and Historic Resources

Cultural resources, including archaeological and historic artifacts and features, contribute to the record of human occupation and alteration of the landscape. Archaeological resources include historic and prehistoric artifacts, structural ruins or earthworks and are often partially or completely below ground. Historic resources include extant structures, such as building and bridges, as well as districts and landscapes. Traditional Cultural Properties (TCPs) are also considered historic or cultural resources that reflect a cultural or religious importance. No known TCPs have been identified within the project area; therefore, TCPs are not discussed further in this EIS.

Transmission lines have the potential to impact archaeological and historic resources. Archaeological resources could be impacted by the disruption or removal of such resources during the construction of a line. Historic resources could be impacted by the placement of a line in a manner that impairs or decreases the historic value of the resource.

To determine potential impacts on cultural resources, known archaeological and historic sites in the project area were identified through a review of agency records. The Minnesota State Historic Preservation Office (SHPO) maintains records of known archaeological and historic resources in the state. These resources are typically identified through surveys conducted for projects that require compliance with Section 106 of the National Historic Preservation Act (NHPA), or through state sponsored research initiatives.

A search of SHPO records was conducted for the project. The search indicated that there are 40 archaeological resources and 19 historic resources located within a half mile of the routes, route alternatives and route variations analyzed for this project. These resources are listed in Appendix I. Additional analysis regarding the proximity of these archaeological and historic resources to each route alternative is provided in Section 6.0.

The archaeological resources are generally near waterbodies, with the largest concentration of resources (26) near the Blue Earth River. Historic resources include historic structures within municipalities, as well as rural homes, churches and bridges. Most of the cultural resources are located at a distance from the route alternatives; however, three archaeological resources are within or adjacent to a route alternative.

Compliance with Section 106 of the NHPA is required for all projects under federal jurisdiction. The purpose of Section 106 is to compel federal agencies to consider the effects of a project on archaeological and historic resources and applies to resources that are listed on, or eligible for listing on the National Register of Historic Places (NRHP). Of the resources identified within one half mile of the route alternatives, eight have been evaluated and listed on the NRHP. All eight sites are archaeological resources near the Blue Earth River and one is located within a proposed route (route A-LH).

In Minnesota, the primary laws regarding the protection of archaeological and historic resources are the Minnesota Historic Sites Act, the Minnesota Field Archaeology Act, and the Minnesota Private Cemeteries Act. A summary of these laws is as follows:

- **Minnesota Historic Sites Act.** This act establishes the State Historic Sites Network and the State Register of Historic Places, and requires that state agencies consult with the Minnesota Historical Society before undertaking or licensing projects that may affect properties on the network or on the State or National Registers of Historic Places (Minnesota Statutes, section 138.661-138.669).

- **Minnesota Field Archaeology Act.** This act establishes the office of the State Archaeologist; requires licenses to engage in archaeology on nonfederal public land; establishes ownership, custody and use of objects and data recovered during survey; and requires state agencies to submit development plans to the State Archaeologist, the Minnesota Historical Society and the Minnesota Indian Affairs Council for review when there are known or suspected archaeological sites in the area (Minnesota Statutes, section 138.31-138.42).

- **Minnesota Private Cemeteries Act.** A portion of this legislation protects all human burials or skeletal remains on public or private land (Minnesota Statutes, section 307.08).

At this time, no National Environmental Policy Act (NEPA) or federal Section 106 nexus has been identified for this project; therefore, no field surveys have been conducted and the impact analyses presented here are based on known archaeological or historic resources identified in SHPO records. Limited archaeological surveys may be initiated along portions of Route A to more clearly define the boundaries of an NRHP-listed archaeological district that is crossed by the existing Lakefield to Border 161 kV transmission line. See Section 6.0 for additional discussion on this resource. If it is determined that federal permits are required for this project, ITCM would need to consult with federal agencies to ensure that the project complies with Section 106 of the NHPA. ITCM would also need to consult with the appropriate state agencies to address potential project impacts to archaeological and historic resources located within the project area on state land.

Mitigation - Cultural Resources

The primary means of mitigating impacts to cultural resources is prudent routing, i.e., avoiding known archaeological and history resources. Avoidance of resources may include minor adjustments to the project design and the designation of environmentally sensitive areas that would be left undisturbed by the project. Impacts can also be avoided by prudent pole placement within a route such that resources are spanned or avoided.

If unanticipated archaeological or historic resources are discovered during construction, construction activities would cease at that location and the SHPO would be contacted to assist in the development of appropriate measures to protect the resource (Appendix B). In addition, if human remains or suspected burial sites are discovered during construction, the State Archaeologist would be contacted and construction would cease at the location until ITCM and the State Archaeologist have developed adequate mitigation measures as per Minnesota Statutes, section 307.08.

If archaeological resources are anticipated or known to exist within a specific part of a route, impacts to these resources could be mitigated by measures developed in consultation with SHPO prior to construction, and by training of construction workers in the recognition and managing of archaeological resources.

5.6 Natural Environment

Transmission lines have the potential to impact natural resources through temporary, construction-related impacts and long-term impacts to resources, habitats, flora and fauna. Construction of the project would temporarily disturb vegetative cover and soils, which could affect water quality in adjacent water resources and could affect habitat for flora and fauna. Avian species could also be impacted by collisions with transmission line conductors.

Potential impacts to natural resources as a result of the project are anticipated to be minimal. Impacts to natural resources, to a great extent, could be avoided and mitigated.

5.6.1 Water Resources

The project area is located in the Minnesota River Watershed, which is part of the Upper Mississippi Region hydrologic unit (Reference 36). All of the route alternatives pass through the following three sub-watersheds: the Des Moines Headwaters watershed (HUC 07100001), the East Fork Des Moines watershed (HUC 07100003) and the Blue Earth watershed (HUC 07020009) (Reference 37). Annual precipitation across the project area averages around 30 inches (Reference 38).

The main surface water features present within the project area include the Des Moines River, the Blue Earth River, the Chain of Lakes area (which includes Lake Charlotte) and Fox Lake. In addition, several smaller lakes, watercourses (i.e., streams, rivers and ditches), floodplains and wetlands are present across the project area.

The project could require crossing lakes, watercourses, floodplains and wetlands. All lakes and watercourses would be spanned and transmission line structures would not be placed within them. Wetlands and floodplains would be spanned to the extent feasible. In some situations, however, transmission line structures might have to be placed within these resources.

The potential impacts of the routes, route alternatives, route variations and associated facilities on surface and ground water resources are detailed in Section 6.0.

State and Federal Regulations

Some watercourses, lakes and wetlands within the project area are designated as public waters and are listed in the public waters inventory (PWI) by the State of Minnesota. The statutory definition of a public water is found in Minnesota Statute, section 103G.005, subdivision 15 and 15a. These water resources are under the jurisdiction of the DNR, and a DNR License to Cross Public Waters would be required when an activity would cross or change or diminish the course, current or cross section of public waters by any means, including filling, excavating or placing of materials in or on the beds of public waters.

The federal Clean Water Act (CWA) could potentially regulate several types of activities or impacts associated with the project. Section 303(d) of the CWA requires states to publish a list of streams and lakes that are not meeting their designated uses because they are excessively polluted. In Minnesota, the MPCA has jurisdiction over determining 303(d) waters, which are described as "impaired." Several of the water bodies in the project area are listed as 303(d) waters. The only pollutant on the MPCA impairment list that could be generated by the project – through increased sedimentation from construction activities – is turbidity.

Also regulated by the federal CWA are any activities that may result in a discharge to navigable waters. These activities must first obtain a state Section 401 water quality certification to ensure that the project would comply with state water quality standards. Section 401 of the federal CWA is administered by the U.S. Environmental Protection Agency (USEPA). The CWA, however, gives the USEPA the authority to delegate 401 certification to the states. In Minnesota, the USEPA has delegated Section 401 certification to MPCA.

Wetlands are present throughout the project area. Pursuant to Section 404 of the CWA, the U.S. Army Corps of Engineers (USACE) defines wetlands in *Code of Federal Regulations*, title 10, sec. 328.3b as those areas that are "inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands must possess three essential characteristics: (1) a dominance by hydrophytic vegetation; (2) hydric soils; and (3) wetland hydrology (Reference 39). For an area to be classified as a jurisdictional wetland under the federal guidelines, all of the above criteria must be met, and the wetland must have a surface hydrologic connection to a water of the U.S. Disturbances to jurisdictional wetlands or waters of the U.S. could require a Section 404 Permit from the USACE.

In Minnesota, both jurisdictional and non-jurisdictional wetlands (i.e., wetlands with no surface hydrologic connection to waters of the U.S.) are protected under Minnesota Rules, chapter 8420, the Wetland Conservation Act (WCA). Although the Minnesota Board of Water and Soil Resources (BWSR) administers the WCA on a statewide basis, counties, cities and townships implement the WCA locally. Local governments may also have their own wetland ordinances, and they could require a WCA permit for any disturbances to wetlands.

Construction activities may have the potential to indirectly affect lakes, watercourses, floodplains and wetlands by increasing the turbidity from sedimentation. Best management practices (BMPs) could be used to minimize these impacts during construction. Construction BMPs could be required in a National Pollutant Discharge Elimination System (NPDES) construction permit for the project and/or as a condition of the Commission's route permit (Appendix B).

The general construction stormwater permit (permit number MN R100001) was re-issued by the MPCA on August 1, 2013. Under the re-issued permit an NPDES/State Disposal System (SDS) permit is required for any construction activity disturbing:

- One or more acre of soil
- Less than one acre of soil, if that activity is part of a larger common plan of development or of a sale that is greater than one acre
- Less than one acre of soil, but the MPCA determines that the activity poses a risk to water resources

Transmission line projects that meet these criteria would be required to comply with the requirements specified in this general construction stormwater permit. The types of activities that trigger the need for a stormwater construction permit include ROW clearing, constructing staging areas, access roads, landings for storage of equipment and timber and other types of activities which disturb soil.

The construction stormwater permit requires the preparation of a project specific stormwater pollution prevention plan (SWPPP) that identifies controls and practices (i.e., BMPs) that would be implemented during construction to prevent erosion and sediment from affecting surface waters. In addition, when construction projects are located within one mile of certain protected waters, such as trout streams or waters that have been designated as impaired, additional precautions, erosion controls and sediment removal practices would be required.

Surface Waters

The Chain of Lakes area extends north-south through the project area in the center of Martin County. Most of the lakes in the Chain of Lakes area, including Lake Charlotte, are listed as PWI basins. Lake Charlotte is crossed by an existing 161 kV HVTL. Fox Lake, which is west of the Chain of Lakes area, is also crossed by an existing 161 kV HVTL and is the site of a power generation facility that uses lake water for cooling. In addition to being listed as PWI basin, Fox Lake is on the MPCA impaired waters list for excess nutrients/eutrophication (Reference 40).

In addition to Lake Charlotte and Fox Lake, the route alternatives could need to cross smaller lakes, some of which are PWI basins and designated impaired waters. All lakes would be spanned and transmission line structures would not be placed within them.

Both the Des Moines and the Blue Earth Rivers are PWI watercourses (Reference 41) and waters of the U.S. The Des Moines River runs north-south through the western portion of the project area (Map 6-5), and all of the route alternatives would require crossing the Des Moines River. This section of the Des Moines River is listed on the MPCA impaired waters list for ammonia, fecal coliform, dissolved oxygen and turbidity (Reference 40). The Blue Earth River runs north-south through the easternmost portion of the project area (Map 6-6), and route A and route alternative I90-4 would require crossing the Blue Earth River (Map 6-35). In the vicinity of these crossings, the reach of the Blue Earth River is listed on the MPCA impaired waters list for fish bioassessments, mercury in fish tissue and turbidity (Reference 40).

In addition to the Des Moines and the Blue Earth Rivers, route alternatives and route variations may require crossing several smaller watercourses, some of which are PWI watercourses and designated impaired waters. All watercourses would be spanned and transmission line structures would not be placed within them.

It is anticipated that lakes and watercourses would be spanned by the project. Thus, no structures would be placed within these features, and no direct effects on lakes and watercourses are anticipated. ITCM has indicated that it will work with the DNR to ensure all proper licenses and approvals are obtained for PWI crossings.

Although waterbodies and watercourses would be spanned, indirect impacts associated with crossing these resources could occur. Construction-related impacts could result in short-term water quality impacts due to increased turbidity. However, mitigation measures could be implemented to prevent or minimize surface water impacts. For construction of the project, ITCM would need to obtain an NPDES permit from the MPCA and develop a SWPPP that would identify BMPs to be used during construction in order to minimize erosion and sedimentation.

Indirect impacts to birds and other wildlife species that utilize riparian habitats could result from crossing waterbodies and watercourses. See Section 5.6.3 and Section 6.0 for further discussion of these impacts.

Floodplains

The Federal Emergency Management Agency (FEMA) designates areas that are likely to experience flooding in a 100-year rainfall event. Permanent impacts to floodplains could reduce flood storage and may increase the flood elevation during a flood event. FEMA-designated floodplain is present within the project area. Mapped floodplains would be spanned to the extent feasible; however, the small cross-section of transmission line structures is not expected to affect flood elevations over a large river floodplain. The proposed substation locations are not mapped as 100-year floodplain and would not affect floodplains (Reference 42, Reference 43 and Reference 44).

Placement of structures within 100-year floodplain zones would be avoided to the extent possible. Some counties and municipalities along rivers have floodplain ordinances, which require that floodplain impacts be avoided when feasible, and permitted (usually through a floodplain permit) if unavoidable.

Mitigation may be required as part of a floodplain permit. Because each structure placed within a floodplain would displace less than 100 cubic feet of flood storage volume, the total floodwater displacement from the project structures is not anticipated to affect flooding. The number of structures in floodplains could be minimized by using taller (greater than 150 feet) or stronger (reinforced H-frame) structures that could span longer-than-standard distances. Increased engineering and construction costs may be necessary in order to design and construct structures within the floodplain.

Wetlands

Several wetlands are present within the project area, some of which are listed as PWI basins (Reference 45), and others are classified as jurisdictional wetlands. The U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps (Reference 46) were used to identify wetlands along routes, route alternatives and route variations. Starting in the 1970s, the USFWS produced maps of wetlands (NWI) based on aerial photographs and Natural Resources Conservation Service (NRCS) soil survey maps. Because land use has changed since the 1970s, wetlands shown on the NWI maps are sometimes inconsistent with current wetland conditions. The NWI, however, is the best available database of wetland resources within the project area. Forested NWI wetlands throughout the project area were compared to current aerial photographs in order to confirm that these wetlands are still forested.

ITCM indicates that it would span wetlands to the extent feasible. Some transmission line structures, however, may need to be placed in wetlands in cases where the wetland is too large (over 1,000 feet wide) to span. Wetlands within specific routes, route alternatives and route variations are discussed in Section 6.0.

Mitigation - Wetlands

Temporary impacts to wetlands may occur if they need to be crossed during construction of the HVTL. To minimize impacts to wetlands, the Commission's generic route permit template requires that construction in wetlands be conducted when the ground is frozen. When construction during winter is not possible the permit template requires the use of wooden or composite mats (i.e., swamp mats) (Appendix B1).

The most effective means of avoiding or minimizing impacts to wetlands is to span them. Where that is not possible, however, structures would have to be placed within wetland boundaries, causing permanent impacts. Permanent wetland impacts due to structure placement would range between 20 and 115 square feet, depending upon the type of structure used. Temporary impacts would affect approximately 0.5 acre per structure. If wetlands are affected during construction, the necessary state and federal permits would have to be obtained, and the wetlands would be restored in accordance with these permit requirements.

Forested wetlands within the ROW may undergo a permanent change of vegetation type because HVTLs cannot be safely or reliably operated with trees growing under and up into them. Therefore, existing trees must be removed throughout the ROW, including forested wetlands. The USACE may require wetland mitigation for conversion of forested wetlands to non-forested wetlands.

Groundwater

Wells are abundant throughout the project area due to the rural nature of the landscape. The County Well Index, which is managed by the Minnesota Department of Health (MDH), was reviewed to determine whether there are known locations of public and private water supply wells near routes, route alternatives and route variations of this project. According to the County Well Index, wells are scattered throughout the project area, with four private wells located within 100 feet of the anticipated alignment of a route, route alternative or route variation (Reference 47).

Locations of groundwater wells would be considered during detailed transmission line design and structure placement. Structure foundations are typically between 25 feet and 30 feet deep, with well depths typically at least 75 feet deep. All foundation materials would be non-hazardous materials, and impacts to groundwater resources are not anticipated. If shallow depths to groundwater resources are identified during site-specific geotechnical investigations, specialty foundations may be used.

5.6.2 Flora

The project is located in southern Minnesota, near the eastern edge of the North American central prairie. Most of the project area consists of a fairly homogenous mixture of gently rolling moraine flats and ridges. Vegetation community types in Minnesota are described following the Ecological Classification System (ECS), which places the project entirely within the Prairie Parkland Province, one of four ecological provinces in the state. Within this ecological province, the entire project lies within the North Central Glaciated Plains Section (Minnesota River Plains Subsection and Coteau Moraines Subsection) (Reference 48). ECS subsection designations are used by the DNR and USFWS as the basis for management planning for certain wildlife species.

The North Central Glaciated Plains Section is characterized by level to rolling till plains, moraines, lake plains and outwash plains with dry to mesic soils. Pre-settlement, these features supported frequent fires that typically occurred every few years. The combination of landform, soils and fire regime primarily supported treeless, fire-dependent native grassland communities. Dominant among those pre-settlement native plant communities was upland prairie, which covered more than 80 percent of the North Central Glaciated Plains section. Wet and wet-mesic prairie, marshes and wet meadow native plant communities dotted the remaining portions of the section (Reference 48)

The pre-settlement upland prairie communities were dominated by prairie grasses. Dominant species in drier communities were mainly little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), dropseed (*Sporobolus heterolepis*) and porcupine grass (*Hesperostipa spartea*). Mesic to wet areas were dominated by big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*) and switchgrass (*Panicum virgatum*).

Pre-settlement vegetation of all but approximately the western one-quarter of the project area was typical of the Minnesota River Plains subsection. Pre-settlement vegetation in the remainder of the project area was typical of the Coteau Moraines subsection. Pre-settlement vegetation in both subsections was dominated by prairie grasslands. The Coteau Moraines subsection, however, consisted primarily of dry upland prairie, with fewer wet-mesic prairie communities.

Current upland vegetation communities in both subsections are now predominantly agricultural types, primarily used for corn and soybean production. Native vegetation communities remain, but they are primarily confined to riparian communities along waterbodies, wetlands and state-managed conservation areas. Native prairie species are still present in both subsections, but distinct remnant prairie communities are rare (Reference 49, Reference 50) and are now typically found along railroad ROWs, and within state-managed conservation areas. In addition, routes, route alternatives and route variations, cross conservation easement lands, including Conservation Reserve Enhancement Program (CREP) and Reinvest in Minnesota (RIM) lands, which could contain native vegetation communities.

Wetland habitats in the project area consist primarily of wet meadows and marshes. Wet meadows are characterized by grasses, including prairie cordgrass (*Spartina pectinata*) and narrow reedgrass (*Calamagrostis stricta*), as well as a variety of sedge species and rushes. Marshes are emergent herbaceous communities that are typically heavily dominated by cattails (T*ypha* sp.), bulrushes (*Scirpus sp.* and *Schoenoplectus* sp.) and sedges (*Carex* sp.). Also present in the project area farmed wetlands, which are wetlands that have been manipulated for agricultural production, but which retain certain wetland characteristics. General wetland issues are discussed in Section 5.6.1.

Impacts to existing vegetation communities caused by construction and operation of the project include temporary and permanent impacts. Except for the final footprint of the installed structure, the majority of the disturbed area at each structure in non-agricultural cover types would be reseeded with certified weed free seed selected for site-specific conditions (Appendix B1). The potential impacts of routes, route alternatives, route variations, associated facilities and substations on vegetative communities are detailed in Section 6.0.

Temporary impacts to existing vegetation communities include localized physical disturbance caused by the use of construction equipment during site preparation including grading, excavation and soil stockpiling. Preparing the site and installing support poles may temporarily affect about half an acre of habitat at each structure location. Establishing and using staging and stringing areas would also temporarily affect flora by concentrating surface disturbance and equipment use. The Commission requires that these temporary work spaces be selected to limit the clearing of vegetation (Appendix B1)

Vegetation could be permanently removed at each pole footprint (between 20 and 115 square feet) and within portions of the ROW that are currently dominated by woody vegetation. While wooded areas are uncommon along the ROW, trees and shrubs that have the potential to interfere with the operation and maintenance of the HVTL would be permanently controlled using mechanical or herbicide treatments. Vegetation that does not interfere with the safe operation of the transmission line would be allowed to establish within the ROW.

Mitigation - Flora

Effects on native vegetation could primarily be mitigated by avoiding or spanning vegetation communities. Some of the routes, route alternatives and route variations being considered for the project use existing ROWs, including transmission lines, roads and agricultural field lines, most often adjacent to cultivated row crops. Accordingly, impacts to native vegetation are not anticipated to substantially disrupt vegetative community quality or function in these areas. When native vegetation communities cannot feasibly be spanned, impacts could be minimized by using as few structures as possible within these communities.

Flora – Noxious Weeds and Invasive Vegetation

Noxious weeds, which could rapidly overtake native vegetation, degrade habitat quality and reduce the productivity of cropland, are regulated under Minnesota Statutes, section 18.78. Noxious weeds could be introduced to new areas through transportation on contaminated construction equipment. Disturbed soil surfaces allow noxious weeds to establish and out-compete existing vegetation, so clearing and other construction activities could potentially contribute to the spread of noxious weeds. Developing and implementing an integrated weed management program could mitigate the potential spread of noxious weeds. In addition, using seed free of noxious weeds in restoration efforts would further reduce the spread of noxious weeds.

Eleven species of primary noxious weeds are recognized by Minnesota Rules, part 1505.0730.

- Oriental bittersweet (*Celastrus orbiculatus*)
- Japanese hops (*Humulus japonicas*)
- Giant hogweed (*Heracleum mantegazzianum*)
- Common teasel (*Dipsacus fullonum*)
- Cut-leaved teasel (*Dipsacus laciniatus*)
- Dalmatian toadflax (*Linaria dalmatica*)
- Grecian foxglove (*Digitalis lanata*)
- Black swallow-wort (*Cynanchum louiseae*)
- Yellow starthistle (*Centaurea solstitialis*)
- Meadow knapweed (*Centaurea x moncktonii*)
- Brown knapweed (*Centaurea jacea*)

The Minnesota Noxious Weed Law also defines and lists two restricted weed species and 52 secondary noxious weeds. A county may place a weed or weeds from the secondary list on its noxious weeds list, thereby requiring that the weed must be controlled in that county.

Jackson, Martin and Faribault counties all regulate three noxious weeds from the state's secondary weed list. These are cocklebur (*Xanthium pennsylvanicum*), velvetleaf (*Abutilon theophrasti*) and common sunflower (*Helianthus anuus*). Jackson County also regulates yellow nutsedge (*Cyperus esculentus*) and Faribault County also regulates black nightshade (*Solanum nigrum*), both of which are also on the state's secondary weed list.

5.6.3 Fauna

Topography, soils and vegetation community types are relatively homogenous within the project area, resulting in a somewhat narrow range of wildlife habitat types. Moreover, row-crop agriculture is the dominant land cover, which further limits the availability and diversity of good quality wildlife habitat. Forage, shelter, nesting and stopover habitat for both resident and migratory wildlife are all available in the project area, but are mainly limited to the river crossings and other special wildlife management areas, as discussed below. Portions of the project with less disturbed, unique or diverse vegetation communities tend to support more wildlife species and could act as refuges or corridors of movement for wildlife.

Wildlife populations that occur within the project area include both game and non-game species. Game populations are managed and regulated by the DNR for hunting and fishing and are an important part of Minnesota's recreation and rural economy. Non-game species contribute to Minnesota's biological diversity and are afforded protection or support at the state and federal levels under a variety of programs and laws. Lands managed and maintained for wildlife habitat, as well as habitat occurring naturally on the landscape, are also designated under several different state and federal organizations and programs.

Resident and migratory wildlife species that typically habituate agricultural landscapes, prairie remnants, wetlands and riverine habitats are commonly found in the project area. These include large and small mammals, songbirds, waterfowl, raptors, fish, reptiles, mussels and insects. Habitat functions provided in the project area include forage, shelter and breeding, as well as stopover habitat during migration. Dominant wildlife in the project area are those species habituated to landscapes that are highly modified by human activities, with scattered remnant vegetation communities. These species include small- and medium-sized mammals, perching birds, waterfowl, upland game birds, raptors and common amphibians and reptiles.

Route A crosses four Grassland Bird Conservation Areas (GBCA) - priority areas for grassland protection and enhancement that are thought to provide suitable habitat for many or all priority grassland bird species in tall grass prairie. Two GBCAs are crossed by, and five are adjacent to, route B. These priority areas for grassland protection and enhancement provide suitable habitat for many grassland bird species in tall grass prairie. The GBCAs in the project area are all categorized as Type 3, which means that they have at least 55 acres of grassland and are at least 0.25 mile wide.

The route alternatives and route variations for the project cross or are adjacent to several areas of natural or managed wildlife habitat. Route A crosses Pilot Grove Waterfowl Production Area (WPA), and passes within one mile of the Fox Lake, Four Corners, Krahmer and Rooney Run Wildlife Management Areas (WMAs). Route B crosses the Caron and Four Corners WMAs, and is within one mile of the Seymour Lake, Krahmer and Lane WMAs and the Pilot Grove Lake WPA. The I90 route alternatives cross the largest unit of the Krahmer WMA and are within one mile of the Fox Lake and Guckeen WMAs, as well as other units of the Krahmer WMA.

Fauna – Species of Greatest Conservation Need

The U.S. Congress established the State Wildlife Grants (SWG) program in 2002 to help states identify and manage wildlife habitat needs. States participating in the SWG program were required to develop a comprehensive wildlife plan. Minnesota's plan, *Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife* (Reference 51), was completed in 2005 and was approved by the USFWS. It is also referred to as the Comprehensive Wildlife Conservation Strategy (CWCS). Approval of the CWCS allows Minnesota to participate in the SWG program, which has provided approximately $1 million annually to implement the plan.

The CWCS is organized following the DNR ECS of native plant communities at the province and subsection levels. The project crosses two ECS subsections – Minnesota River Plains and Coteau

Moraines. All routes, route alternatives and route variations pass through at least some portion of each of these subsections. Identified within each ECS subsection are species of greatest conservation need (SGCN), which are those species whose populations are rare, declining or vulnerable in Minnesota. Of the approximately 1,200 wildlife species evaluated by the CWCS, 292 (~25 percent) met the SGCN definition. Approximately half of the SGCN are also state-listed species (Reference 51).

Overall, the project area provides key habitat for 121 SGCN. Key habitats are defined as those habitats most important to the greatest number of SGCN in a subsection.

The two subsections have roughly the same number of SGCN, with slightly more in the Minnesota River Plains. Most of the 121 SGCN species are common to both subsections. This is not unexpected, since the two subsections are similar in landform and available wildlife habitats. Overall, the project area provides key habitats for SGCN species in the following taxa – 67 birds, 9 fish, 11 insects, 10 mammals, 12 mollusks, 8 reptiles, 3 spiders and 1 amphibian.

The CWCS identified habitat loss or degradation as the primary type of impact to SGCN (Reference 51). Many SGCN have specific habitat needs, or require larger, unfragmented habitat areas to sustain viable populations. SGCN may also be affected by the temporary and permanent project impacts described below for non-avian and avian species. Most of the project area is in row-crop agricultural cover, which typically does not provide key SGCN habitat. Because of this, the key SGCN habitats are generally restricted to river crossings, woodlots, the GBCAs, Pilot Grove Lake WPA and the Fox Lake Game Refuge.

Fauna – General Wildlife Impacts

The project would affect wildlife and wildlife habitat, and the impacts may be either temporary or permanent and would affect SGCN, non-avian species and avian species. Potential effects of the project on non-avian wildlife are not anticipated to be significant at a population level. The potential for impacts to avian wildlife is relatively higher, due to the potential for collisions in some areas. However, these impacts could be mitigated and are not anticipated to be significant at a population level.

Non-avian Species

Construction activities like clearing, grading, building structures and stringing lines could, in the short term, displace or alter habitats. These impacts could result from actual physical disturbance of wildlife or their habitat, or from noise associated with construction activities. At each structure location, construction would temporarily affect approximately 0.5 acre. Staging and stringing areas could also temporarily affect fauna within the project construction area. Grading previously undisturbed sites for staging areas and clearing for access roads could temporarily affect wildlife by altering habitat. The potential impacts of the routes, route alternatives, route variations, associated facilities and substations on wildlife and wildlife habitat are detailed in Section 6.0.

Clearing and grading activities could also affect birds' eggs or nestlings and small mammals that may be unable to avoid equipment. Many wildlife species would likely avoid the immediate area during construction, and the distance that animals would be displaced depends on the species and the tolerance level of each individual. Because other suitable habitat is available in and near the project area, the potential temporary impacts to wildlife are not expected to cause a change in listing status or a detectable permanent change in local populations.

Permanent impacts from construction could include habitat loss and fragmentation. Fragmentation occurs when a transmission line bisects large forested or grassland tracts that provide habitat for species adapted to those community types. Fragmentation could affect the survival of some species that depend on large areas of undisturbed habitat, and it could create barriers to daily movement. In addition, predators may pose a threat to animals that are forced out of cover to search for food, especially as the distance predators need to travel to penetrate large habitat areas decreases.

Mitigation - Non-Avian Species

Routes, route alternatives, and route variations that follow existing ROWs and division lines, such as roads, existing transmission lines and field lines, reduce the potential for substantial habitat loss and fragmentation. Limiting the clearing in forested and grassland areas to only the area necessary to permit the passage of equipment and maintain the appropriate cleared ROW width would also reduce the effects on wildlife.

Effects on wildlife could best be reduced by avoiding wildlife habitat and by limiting impacts on habitat. Impacts could be mitigated by spanning designated habitat, conservation areas or other sensitive habitats wherever practical. In areas where complete spanning is not possible, the number of structures placed in high quality wildlife habitat could be minimized by using specialty structures.

Routes, route alternatives, and route variations that follow existing transmission lines or roads would require less clearing of potential wildlife habitat than those that proceed cross country without following existing lines or roads. Field and property lines could provide habitat to some wildlife species, though these habitats tend to be narrow and of marginal quality. Therefore, routing options that follow field and property lines would also affect habitats less than alternatives on new, cross-country routes. Routing options that require new transmission line ROWs would introduce new collision hazards for birds.

Using BMPs during construction would reduce potential sediment runoff into aquatic habitats. Non-agricultural areas cleared for construction would be reseeded using a weed free seed mix appropriate to the site (Appendix B1), and existing native herbaceous and shrub vegetation communities would be allowed to re-vegetate cleared areas. Most native communities dominated by trees would not be allowed to re-establish under the completed transmission line, although, in native plant communities, maintenance of the transmission line ROW could be limited to the minimum required for access to structures and passage beneath the conductors.

Avian Species

Effects on birds include those described for non-avian species, but birds could also be affected by collision with lines and structures, electrocution and loss or disturbance of nests during construction.

The structure designs proposed for this project are consistent with avian protection standards, as documented in the Avian Power Line Interaction Committee's (APLIC) Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 (Reference 52). These designs minimize electrocution risk by providing adequate clearance from energized conductors to grounded surfaces and to other conductors.

The APLIC suggests that the effects of transmission lines on avian species are negligible beyond one mile (Reference 52). Therefore, all land areas designated for wildlife conservation and management within one mile of all route alternatives were identified. These included areas such as WMAs, WPAs, wildlife refuges and Minnesota Biological Survey (MBS) areas.

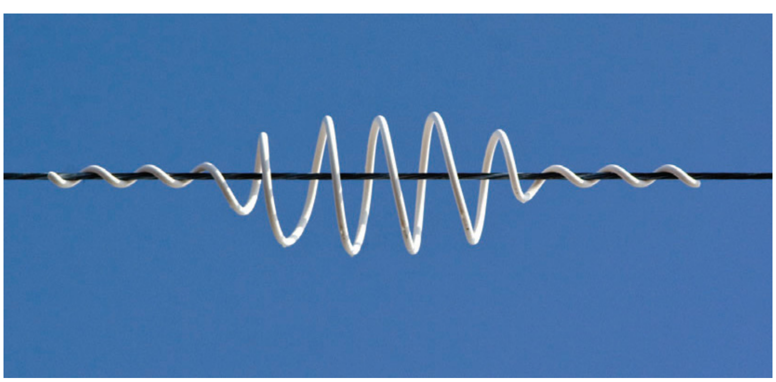
Independent of the risk of electrocution, birds may be injured by colliding with transmission lines. The risk of collision is influenced by factors such as surrounding habitat, bird concentration and movement patterns, foraging areas, roost sites and structure design. Potential collision risk is highest at spans or structures located in rural areas with native vegetation where the line crosses habitats typically used by area birds, such as rivers and wetlands, and where human influence in the immediate vicinity is limited.

Waterfowl, especially larger waterfowl such as trumpeter swans, Canada geese, pelicans, cranes and herons, are typically most likely to collide with transmission lines. The frequency of collisions increases when a transmission line is placed between agricultural fields that serve as feeding areas, or in wetlands or open water, which serve as resting areas. In these areas, it is likely that waterfowl and other birds would be traveling between different habitats, potentially increasing the likelihood of avian conflicts.

Mitigation - Avian Species

The incidence of birds colliding with transmission lines is also influenced by the number of horizontal

Figure 5-2 Bird Flight Diverter



planes in which the conductors are strung. Stringing the conductors in a single horizontal plane presents less of a barrier to birds crossing the transmission line ROW. A single horizontal plane, however, generally requires a wider configuration of structures. Conversely, stringing the conductor wires in two or more planes creates a greater barrier to birds attempting to fly, not only across the lines, but over and potentially between them. Stringing conductors in multiple planes, however, generally requires less ROW.

Beyond conductor configuration, bird collisions with transmission lines could also be mitigated by the use of bird flight diverters. Diverters enable birds to better see conductors during flight and avoid collisions with them. A picture of a typical diverter installation is shown in Figure 5-2.

ITCM has coordinated with the DNR and USFWS to identify waterfowl and other bird migration pathways, and to identify areas where the transmission line should be marked with birds diverters. ITCM intends to mark the transmission line shield wires and to install bird diverters in several areas, including the Des Moines and Blue Earth river crossings, south of Lake Charlotte, over the Pilot Grove Lake WPA (including

Table 5-6 Rare Species Documented Within One Mile of the Project Area

Type	Number of Records	Scientific Name	Common Name	State Status	Federal Status
Bird	1	*Ammodramus henslowii*	Henslow's Sparrow	Endangered	None
Bird	1	*Athene cunicularia*	Burrowing Owl	Endangered	None
Bird	1	*Lanius ludovicianus*	Loggerhead Shrike	Endangered	None
Bird	1	*Rallus elegans*	King Rail	Endangered	None
Bird	1	*Haliaeetus leucocephalus*	Bald Eagle	**Tracked**	None
Bird	3	*Bartramia longicauda*	Upland Sandpiper	Tracked	None
Insect	1	*Atrytone arogos iowa*	Iowa Skipper	Special concern	None
Insect	1	*Speyeria idalia*	Regal Fritillary	Special concern	None
Mussel	2	*Actinonaias ligamentina*	Mucket	Threatened	None
Mussel	1	*Elliptio dilatata*	Spike	Threatened	None
Mussel	1	*Lasmigona costata*	Fluted-shell	Threatened	None
Mussel	1	*Lasmigona compressa*	Creek Heelsplitter	Special concern	None
Mussel	1	*Ligumia recta*	Black Sandshell	Special concern	None
Mussel	2	*Pleurobema sintoxia*	Round Pigtoe	Special concern	None
Vascular plant	2	*Agalinis auriculata*	Eared False Foxglove	Endangered	None
Vascular plant	1	*Arnoglossum plantagineum*	Tuberous Indian-plantain	Threatened	None
Vascular plant	7	*Asclepias sullivantii*	Sullivant's Milkweed	Threatened	None
Vascular plant	2	*Lespedeza leptostachya*	Prairie Bush Clover	Threatened	Threatened
Vascular plant	1	*Arisaema dracontium*	Green Dragon	Special concern	None
Vascular plant	2	*Cypripedium coulddidum*	Small White Lady's-slipper	Special concern	None
Vascular plant	4	*Eryngium yuccifolium*	Rattlesnake-master	Special concern	None
Vascular plant	1	*Juncus gerardii*	Black Grass	Tracked	None
Tree	1	*Gymnocladus dioica*	Kentucky Coffee-tree	Special concern	None

Source: Reference 54)

500 feet outside the WPA boundary), across other open water crossings, and through wildlife refuges. ITCM indicates that it will continue to consult with agencies to identify any wildlife migration pathways, particularly those of waterfowl, crossed by the permitted route and to identify areas where the line should be marked to avoid avian interactions.

5.7 Rare and Unique Natural Resources / Threatened and Endangered Species

A variety of rare and unique natural resources have been documented within the project area. Without careful planning, the project could impact rare plants, animals and habitats. Because mitigation strategies are available, these impacts are anticipated to be minimal. Section 6.0 summarizes rare resources identified within the project area and compares the potential impacts presented by the routes, route alternatives and route variations.

5.7.1 State and Federally Listed Threatened and Endangered Species

The USFWS technical assistance website (Reference 53) was reviewed to determine if any federally listed species were known to be present within the three counties where the project is located. The USFWS lists the federally threatened prairie bush clover (*Lespedeza leptostachya*) in Jackson and Martin counties and the federally proposed-endangered northern long-eared bat (*Myotis septentrionalis*) in Jackson, Martin and Faribault counties (Reference 53).

The DNR Natural Heritage Information System (NHIS) database was queried in December 2013 to obtain the locations of rare and unique natural resources within one mile of the project area (Reference 54). The NHIS database includes records of rare and unique natural resources that are state or federally protected. It also includes species that are either special concern or tracked. Although these special concern and tracked species may be important ecologically, they are not protected under the Minnesota Endangered and Threatened Species statute (Minnesota Statutes, section 84.0895), unlike species listed as endangered or threatened under Minnesota Rules, chapter 6134.

The rare species documented within one mile of the project area are summarized Table 5-6 and consist of six bird species, two insect species, six mussel species, eight vascular plant species and one tree species. The only federally listed species documented within one mile of the project is the prairie bush clover.

Bald eagles (*Haliaeetus leucocephalus*) have been documented nesting along the Blue Earth River near Winnebago, in the northeastern portion of the project area (Reference 54). Although bald eagles are no longer federally or state-listed, they are still protected under the Bald and Golden Eagle Protection Act (16 USC 668-668C) and the Migratory Bird Treaty Act (*Code of Federal Regulations*, title 50, sec. 21.11).

In addition to the rare species mentioned above, the NHIS database also documents locations where assemblages of rare species have been observed. It documents a colonial waterbird nesting site adjacent to the Blue Earth River in the southeastern part of the project area. The NHIS database also documents rare and unique plant communities, and those present within the project area are discussed in Section 5.7.2.

The primary means of mitigating impacts to rare and unique natural resources is to avoid them and their habitat through prudent routing. Indirect impacts to habitat for rare and unique species could be mitigated through appropriate BMPs which minimize soil erosion and sedimentation, and protect water quality in adjacent waterbodies and wetlands. In general, rivers and streams would be spanned by transmission lines, and structures would not be placed within them, so direct impacts to rare aquatic species (e.g., mussels) are not anticipated. Most wetlands could also be spanned, which would minimize impacts to any rare species within wetland habitats.

5.7.2 Rare Communities

The MBS native plant community database (Reference 55) **was** used to identify rare habitats, such as upland and wetland native plant communities, within one mile of the project area. The following native plant community types were identified within one mile of the project area:

- Dry Hill Prairie (Southern) Type
- Mesic Prairie (Southern) Type
- Cattail – Sedge Marsh (Prairie)
- **Prairie – Mixed Cattail Marsh**
- **Southern Wet Prairie**

- Prairie Wet Meadow/Carr
- Prairie Wetland Complex
- Spikerush – Bur Reed Marsh (Prairie)
- Basswood – Bur Oak – (Green Ash) Forest
- Elm – Ash – Basswood Terrace Forest
- Red Oak – Sugar Maple – Basswood – (Bitternut Hickory) Forest
- Silver Maple – (Virginia Creeper) Floodplain Forest
- Southern Mesic Maple-Basswood Forest
- Southern Mesic Oak-Basswood Forest
- Southern Terrace Forest
- Southern Wet-Mesic Hardwood Forest
- Southwestern Rich Mesic Hardwood Forest Complex

The DNR state-designated railroad prairie data (Reference 56) were evaluated to determine whether there were recorded locations of remnant native prairie along railroads within one mile of the project area. Prairies, once abundant in this part of Minnesota, are often found on railroad ROWs because these areas were typically not disturbed by cultivation and other human activities. Remnant native prairie associated with railroad ROWs appear in 16 locations within one mile of the project area. These prairies are generally associated with the Mesic Prairie (Southern) Type native plant communities mentioned above.

The MBS identifies particular areas of land for their biodiversity significance, and these are generally associated with locations of native plant communities. Depending on the presence of rare species and the location, size and condition of the native plant community, Sites of Biological Significance (SBS) sites are ranked outstanding, high, moderate or below with regard to their biodiversity significance. According to the SBS data (Reference 57) there are several SBS within one mile of the project area. Although SBS are present across the project area, sites tend to be concentrated near the Des Moines and Blue Earth Rivers.

Impacts to rare natural communities could be mitigated by prudent routing – i.e., by avoiding these communities, and by spanning these communities if possible. Where structures must be placed within areas of documented rare resources, a biological survey, conducted in coordination with appropriate agencies, would likely be needed to determine the presence of rare species. If the resource is unavoidable, a takings permit from the DNR may be required, and other conditions may be set. Mitigation methods for potential impacts to rare avian species are similar to those for all avian species, which are discussed in Section 5.6.3.

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