



MANITOBA – MINNESOTA TRANSMISSION PROJECT
Environmental Impact Statement

ACCIDENTS, MALFUNCTIONS AND UNPLANNED EVENTS

CHAPTER 21
SEPTEMBER 2015

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ABBREVIATIONS AND ACRONYMS

AC	alternating current
CEAA 2012	<i>Canadian Environmental Assessment Act, 2012</i>
CEMP	Manitoba Hydro's Corporate Emergency Management Program
CEnvPP	Construction Environmental Protection Plan
CF ₄	tetrafluoromethane
CSA	Canadian Standards Association
D604I	Dorsey to Iron Range 500 kV AC transmission line
GIE	gas insulated equipment
HVDC	high voltage direct current
kV	kilovolt
L	litre
MH	Manitoba Hydro
MMTP	Manitoba–Minnesota Transmission Project
MRO	Midwest Reliability Organization
N ₂	nitrogen
NERC	North American Electric Reliability Corporation
PCB	polychlorinated biphenyl
RBD	reliability based design
ROW	right-of-way
SCC	system control centre
SF ₆	sulfur hexafluoride
S ₂ F ₁₀	disulfur decafluoride
SRPP	Spill Response and Prevention Plan
VC	valued component

GLOSSARY OF TECHNICAL TERMS

Deleterious substance	<p>Any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or the use of fish by man of fish that frequent that water OR any water that contains a substance in such quantity or concentration, or that has been so treated, processed or changed, by heat or other means, from a natural state that it would, if added to any other water, degrade or alter or form part of a process of degradation or alteration of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water (<i>Fisheries Act</i>, R.S.C., 1985, c. F-14).</p>
Dielectric medium	<p>A substance that is a poor conductor of electricity, but an efficient supporter of electrostatic fields. An important property of such substance is its ability to support an electrostatic field while dissipating minimal energy in the form of heat. Most substances are solid (ceramic, glass). Some liquids and gases also can serve as good substances.</p>
Release to the environment	<p>Release to the environment is defined as:</p> <ul style="list-style-type: none">• the deposit of a deleterious substance in water frequented by fish (<i>Fisheries Act</i>) or a fish habitat; and/or• a hazardous material that is in contact with air, land or water beyond a containment or mitigation system. <p>Release includes to spill, discharge, dispose of, spray, inject, inoculate, abandon, deposit, pour, empty, throw, dump, place and exhaust, and to cause or allow to leak, seep or emit (<i>Manitoba: The Environment Act</i>)</p>

21 Accidents and Malfunctions and Unplanned Events

In accordance with Section 9.1.1 of the Scoping Document, and section 19.1 (a) of the Canadian Environmental Assessment Act, 2012 (CEAA 2012), the environmental assessment for the Manitoba–Minnesota Transmission Project (MMTP, or the Project) includes the assessment of environmental effects of malfunctions and accidents that might occur in connection with the designated Project. Using section 6.6.1(2) of the National Energy Board Electricity Filing Manual (2015) as guidance, the effects of accidents and malfunctions on workers, the public and bio-physical and socio-economic elements were identified and assessed. This chapter of the environmental Impact statement identifies potential accidents, malfunctions and unplanned events that may occur during Project construction and operation, and assesses their potential effects on each of the identified valued components (VCs).

Based on discussions with the study team and Project engineers, and with experience on transmission projects and environmental assessment, the following accidents, malfunctions and unplanned events were identified for the Project:

- power outages
- tower collapse due to extreme weather, sabotage or force majeure
- electrocution
- failure of erosion protection and sediment control measures
- spill of hazardous materials
- release of insulating gas
- interconnection of aquifers
- fire
- collisions

Table 21-1 presents the potential interactions between VCs and the potential accidents, malfunctions and unplanned events. Project and cumulative effects of the accident, malfunction or unplanned event on each VC are described, and the significance of the effect is determined using the same thresholds as those for the Project environmental effects. Any event that results in human mortality is considered significant. The potential for, and consequence of, accidents and malfunctions were assessed considering historical risk information from Manitoba Hydro's experience and for other similar projects.

Table 21-1 Potential Interactions between Accidents, Malfunctions and Unplanned Events and VCs

Potential Accidents, Malfunctions and Unplanned Events	VCs											
	Fish and Fish Habitat	Wildlife and Wildlife Habitat	Vegetation and Wetlands	Traditional Land and Resource Use	Heritage Resources	Infrastructure and Services	Employment and Economy	Agriculture	Land and Resource Use	Visual Quality	Human Health Risk	Community Health and Well-being
Power Outage	-	-	-	-	-	✓	✓	✓	-	-	-	✓
Tower Collapse	-	✓	✓	✓	✓	✓	-	✓	✓	-	✓	✓
Electrocution	-	✓	-	-	-	-	-	-	-	-	✓	-
Failure of Erosion Protection/Sediment Control Measures	✓	✓	✓	✓	✓	-	-	-	✓	-	-	-
Spill of Hazardous Materials	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	-
Release of Insulating Gas	-	✓	-	-	-	-	-	-	-	-	-	✓
Interconnection of Aquifers	✓	-	✓	✓	-	-	-	-	✓	-	-	-
Fire	-	✓	✓	✓	✓	✓	-	✓	✓	✓	✓	✓
Collisions	-	✓	-	-	-	-	-	✓	-	-	✓	✓

NOTES:

“✓” = Potential interactions that might cause an effect.

“-” = Interactions are not expected.



21.1 Power Outage

21.1.1 Causes

Manitoba Hydro's system consists of both transmission and distribution lines spanning more than 100,000 km from the U.S. border to the shores of Hudson Bay. Both types of lines have experienced outages. Between March 2008 and June 2014, Manitoba Hydro reported 16 power outages on 500kV transmission lines. Outage durations lasted from a day or less ($n = 4$), two to five days ($n = 4$), five to 10 days ($n = 3$), with the remaining five outages ($n = 5$) lasting from between eight to 17 days.

A number of factors can cause power outages. These include equipment failure, wildlife or equipment contact with live wires; environmental events such as fires, tornado-like winds, and ice storms; automatic safety equipment deactivating the line; and staff temporarily taking the transmission line out of service either intentionally or accidentally.

21.1.2 Incident Prevention

Power outages will be reduced through the application of sound engineering practice and regular maintenance of the transmission lines. Manitoba Hydro adheres to the Reliability Standards Regulation of the *Manitoba Hydro Act* (Government of Manitoba 2012) and NERC/MRO/MH reliability criteria. The design, construction and maintenance of the transmission line will follow industry standards and reflect Manitoba Hydro's experiences. To limit the effect of failure events on the line that could result in power outages, transmission line components are designed as part of a system, where failure of one component will not necessarily result in the failure of another.

21.1.3 Lessons Learned

The experience, skills and insights gained through dealing with past accidents and malfunctions are reflected in the transmission and distribution emergency response plan in Manitoba Hydro's Corporate Emergency Management Plan (CEMP) (Manitoba Hydro 2014). This plan outlines the company's emergency preparedness plan, emergency response plans and hazard risk assessment; the Incidence Command System; roles accountabilities and duties; the Emergency Operations Centre; and documentation and communication protocols. It is the result of a recent review of past practices and procedures, and is subject to continuous review and improvement.

Manitoba Hydro's extensive annual patrols of transmission infrastructure combined with improved data collection and asset management strategies have led to no major failures due to conditional deficiencies. Through previous outages from weather events, Manitoba Hydro has developed and refined its response procedures to areas that are accessible only by air, developed mutual aid agreements with neighbouring utilities for assistance during major outage events, and developed the standardization of equipment to reduce the different types of emergency spare components required to have in storage. Recent technology advances in LIDAR mapping of vegetation within

and adjacent to the right-of-way (ROW) have greatly improved the identification of trees that could cause outages and fire if contact is made with the conductor. This allows maintenance crews to target specific trees for removal as a preventative measure.

21.1.4 Effects Pathways

A power outage could affect VCs such as infrastructure and services, employment and economy, agriculture and community health and well-being. Effects on infrastructure and services would consist of changes in community road traffic and transportation utility due of failure of traffic lights, and interference with communication and radio signals due to the loss of power to signal sources. Effects on employment and economy would result if the power outage resulted in a loss of productivity for businesses. Effects on agriculture would occur if power were lost to agriculture operations such as hog barns. Effects on community health and well-being could involve changes in levels of stress and annoyance and change in capacity of health care services. The lack of power could also affect the operation of health care facilities.

21.1.5 Mitigation Measures

Responding to unplanned outages is among Manitoba Hydro's highest priorities. Unplanned outages are dealt with immediately.

Manitoba Hydro's System Control Centre (SCC) constantly monitors the entire transmission system to detect faults on the line or in a station that result in tripping (or opening) of a circuit breaker. As a result of integrated system planning, a line or station fault may not necessarily result in a power outage experienced by customers. Manitoba Hydro maintains an emergency contact number 24 hours per day, seven days a week, which can be used to report power outages. The company website also provides public information on what to do in the event of a power outage.

Manitoba Hydro subscribes to a weather monitoring service that monitors weather conditions that could affect system reliability. The system allows operators to monitor a variety of weather conditions, including precipitation, icing, wind speed and direction, as well as real-time lightning strikes. The SCC receives severe weather forecasts from professional meteorologists who monitor and provide detailed updates for the area covered by Manitoba Hydro's transmission system. This allows operators to prepare contingency plans for rerouting power to limit the effect of power outages, should they occur (Manitoba Hydro 2007).

In the event of an outage, Manitoba Hydro's first priority is to ensure public safety. The restoration of service will be based on policies and procedures outlined in the CEMP for transmission and distribution systems (Manitoba Hydro 2003). Manitoba Hydro will assess the total damage and work required to restore power.

Manitoba Hydro's Customer Service Operations department operates the distribution and subtransmission systems, and the Transmission Line Maintenance departments maintain the transmission system; both departments have emergency stocks of rapid response materials.

District and Line Maintenance staff are on standby outside regular work hours and are called out to respond to emergencies related to outages and damage to the electrical system. Electrical Apparatus Maintenance staff are on standby to respond to emergencies related to stations or associated electrical equipment failure. The standby staff are contacted by the customer contact centre or System Control department to respond to emergencies outside regular office hours.

Transmission lines and substations will be restored first. Priority will then be given to restoring service to essential facilities, including hospitals, police, fire and rescue, communication facilities and water pumping stations. The next priority will be to restore power to the largest number of customers with the highest return on effort. The focus will be on neighbourhoods, businesses, industrial and agricultural facilities. Service will then be restored to small groups of customers and single residences.

21.1.6 Summary of Residual Effects

Depending on the nature and timing of the outage, service to individual customers could be interrupted for a period. Outages occurring due to severe weather events (*e.g.*, winter storms, floods, extreme wind events) could have more pronounced effects on customers. In certain situations, such as during major storms, some areas may be inaccessible to repair crews due to ice, floods, fallen trees or other safety issues. This would mean some customers would have to wait longer for power to be restored while these areas are cleared. However, only 16 outages have occurred throughout the system over the six year period of record, with only half lasting longer than five days. The use of Manitoba Hydro's standard incident prevention measures, constant monitoring, and implementation of mitigation measures and response plans for power outages is expected to result in the restoration of power in a short time in all but the most extreme cases.

While the magnitude of effects of a power outage on infrastructure and services, employment and economy, agriculture, and community health and well-being during a power outage could be moderate to high, the likelihood is low, given the natural frequency of occurrence and robust monitoring and mitigation measures. As a result, residual effects are assessed as being not significant.

21.2 Tower Collapse

21.2.1 Causes

While considered unlikely given the applied design standards, it is possible for a transmission tower to collapse during construction and operation as a result of extreme weather, mechanical failure, or intentional or unintentional human interaction.

Manitoba Hydro has had one instance of multiple tower collapse on a 500 kv transmission line. On September 5, 1996, extreme high winds associated with a severe thunderstorm event caused the collapse of 19 steel lattice towers 2 km north of the Dorsey Converter Station on the

Radisson-Dorsey HVDC line (Bipole I and II). Following this event, it took more than four days to restore one HVDC line.

21.2.2 Incident Prevention

The risk of tower failure will be reduced through the application of sound engineering practice in the design of the towers and transmission lines for extreme loadings, the use of qualified construction contractors, and regular maintenance.

Engineering design will adhere to industry standards and reflect Manitoba Hydro's experience with similar projects. Design of the D604I 500 kV AC transmission line will be subject to two general design standards. The Canadian Standards Association (CSA) C22.3 No. 1-10 "Overhead Systems" standard will be applied to determine all electrical and safety clearances. The Reliability Based Design Method will be used for designing the structural components following the CAN/CSA-C22.3 No. 60826-10 "Design Criteria of Overhead Transmission Lines" standard. Climatic design loads will be determined using a 200-year return period and statistical historical weather data.

These standards document the engineering design for site-specific normal and extreme physical environmental conditions based on historical climate records, and provide design criteria that the regulatory agencies consider satisfactory for withstanding the potential physical environmental conditions. These standards consider physical environmental criteria, such as temperature, wind, snow and ice loading, and drainage for historical climate conditions.

Three of the four specific types of tower structures used for the new tower construction of the D604I and portions of the M602F transmission line are designed to prevent or resist failure due to extreme weather events:

- anti-cascading towers – installed at regular intervals to prevent cascading failures
- angle towers – located where there is a change in route direction and are subject to additional longitudinal loads arising from the tension of the conductors
- dead-end tower – towers at the terminations of the line subject to loads arising from the unbalanced effect of conductor tension on one side of the structure

These tower types are designed for more complex loading conditions that typically require greater structural strength and larger footprints than required for tangent towers, which are installed in straight sections of the line. These stronger towers are a design consideration to mitigate the effects of extreme weather events that are capable of causing multiple tower failures. If deemed more efficient, anti-cascade towers maybe replaced by adding additional longitudinal load capacity into the tangent towers

During the route selection process (Chapter 5), values for system reliability included consideration of the influence of extreme weather (wind events, tornadoes, icing) and the amount of paralleling of other transmission lines. Probabilities of each proposed route and existing routes

both being affected by severe weather were determined, and scores were given based on the relative probabilities. These scores were entered into the selection of the preferred route.

The influences of extreme weather conditions on the Project are discussed in Chapter 20, Section 20.2.

Manitoba Hydro's weather monitoring system contains models that provide forecasts of weather movement, which provides operators with information on predicted storm paths. This "storm tracker" also provides predications of storm severity and possibilities of the severity of line outages, or the potential for tower failures, based on current and predicted conditions. External meteorologists are available to participate as part of an emergency response team, if needed.

21.2.3 Effects Pathways

Tower collapse could affect wildlife habitat availability, community infrastructure and services, and agricultural activities. While unlikely, there is also the potential for mortality to humans and wildlife if people or wildlife are present where a tower collapses. Line breaks due to the collapsed tower could cause fires, which could affect habitat, vegetation cover and agricultural land. Cultural sites or rare plant locations could be damaged or destroyed by a collapsed tower, and access to lands used by First Nations and Metis and other land users could be restricted. During repairs to collapsed towers, there is the potential for disturbance to wildlife along the access trails, roads and ROW, and a risk to public safety.

21.2.4 Mitigation Measures

Tower failures are rare and tend to result from severe weather conditions. The Transmission Line Maintenance department conducts annual patrols to visually inspect tower structures and foundations for deficiencies. As a result, there has been no major failure of a transmission tower as a result of condition deficiency. ROW width determination considers tower height so that if a tower failure occurs, the structure is likely to stay within the ROW.

Manitoba Hydro responds to tower failures in accordance with policies and procedures outlined in the CEMP. The SCC will be aware of unexplained multiple line trips or lockout (a line that could not be re-energized) and will notify the Line Maintenance department, which will initiate a special (emergency) patrol. The priorities will be to ensure the safety of the public and Manitoba Hydro staff, and to maintain system reliability. Once the cause of the line trip or lockout is determined, Line Maintenance will communicate the finding to SCC, along with the estimated time it will take to mitigate the outage and re-establish system reliability. If the event is expected to be an extended outage, the Emergency Operation Centre will be notified as per the Corporate Emergency Response Program. If injuries occur, emergency personnel will be contacted immediately. If fires are started due to downed lines, the local fire department will be contacted.

A determination of the most feasible option for dealing with the collapsed tower will be made. If there is potential for a tower collapse to affect public safety, this will be communicated to the public by the Emergency Operation Centre Incident Commander or the Line Maintenance

Manager. In the unlikely event that damage is extensive or widespread, Manitoba Hydro has mutual assistance agreements in place to obtain help from other utilities. In the case of a major emergency, the Line Maintenance Manager will activate the Transmission and Distribution Emergency Operation Centre and will act as the response manager.

21.2.5 Summary of Residual Effects

As indicated, tower failure could occur as a result of extreme weather, mechanical failure, or intentional or unintentional human interaction. The residual effects of tower failure would depend on the nature and the timing of the specific event. For example, a tower failure during the growing season could result in the need for construction equipment to remove or repair a damaged tower on agricultural fields, which could lead to crop damage and soil degradation (e.g., compaction). A collapsed tower could result in a power outage, and the effects discussed in Section 21.1 could occur on infrastructure and services, agriculture, and community health and well-being. The potential exists for human and wildlife injury or mortality, damage to vegetation or soils, or fires resulting from downed lines. However, the likelihood of occurrence of tower failure is substantially reduced by adherence to strict design and installation requirements, the frequency of extreme weather events, and ongoing surveillance. In addition, the consequences are managed through a number of mitigation measures. Line maintenance crews will address damage to personal property, vegetation or soils. Soil contamination issues will be addressed following Manitoba Hydro's Spill Response and Prevention Plan. If the collapsed tower destroyed wildlife habitat or land used for hunting, trapping or plant harvesting by First Nations or Metis or other land and resource users, a residual effect would occur; however, the extent of duration of the effect would be limited.

In summary, the effects of a tower collapse would be localized and short term. The viability of wildlife populations or the capacity of critical habitat for wildlife species of conservation concern would not be jeopardized. The long-term persistence of vegetation communities in the regional assessment area and viability of vegetation species at risk will not be contrary to federal or provincial management objectives. Disruption of infrastructure and services and agriculture is expected to be short term and minimal. Given the localized extent of the effects on wildlife habitat used for traditional purposes by First Nations and Metis and other resource users, effects on land use activities are not expected to extend beyond the actual collapsed structures. The likelihood of injury to or death of, humans or wildlife is low given the limited area affected by a tower collapse and the rarity of such an occurrence. As a result, while the magnitude of the effect of tower collapse on the affected VCs could be moderate to high, given the low likelihood and array of mitigation measures the effect is assessed as being not significant.

21.3 Electrocutation

21.3.1 Causes

Human or animal contact with a live wire or electrical equipment could lead to electrocution. While unlikely, electrocution could also occur if an aircraft were to collide with live wires or if collision of farm equipment with towers resulted in contact with live wires. From a public safety perspective, the threat of electrocution would be of greatest concern during the operation and maintenance phase if flooding or storm conditions damaged infrastructure and resulted in live wires coming in contact with the ground.

21.3.2 Incident Prevention

Electrocution during Project construction is not likely because the conductors will be grounded as per grounding safe work procedures and will not be energized until the commissioning phase of construction. Any testing of electrical equipment required during commissioning will be conducted by qualified personnel under controlled conditions following Manitoba Hydro safe work procedures.

Stations and other ground level equipment will be fenced and secured. Manitoba Hydro has public information campaigns (company website and media commercials) regarding contact with power lines or downed power lines, and safe vehicle exit. Maintenance and repair activities will be conducted by qualified personnel following corporate safe work procedures.

21.3.3 Effects Pathways

Human or wildlife contact with high-voltage electricity can result in human or wildlife injury or death. Electrocution of humans and most wildlife (*i.e.*, other than birds) from regular operation of the transmission line is not likely due to the height and grounding of the towers and transmission lines. Birds could be at risk of electrocution during normal operational conditions if they perch and connect two electrified line phases (*i.e.*, two lines). Bird electrocutions are not anticipated due to the large spans between two electrified transmission line phases (even a very large bird could not stretch wide enough to touch two electrified parts simultaneously). Application of design standards and the fact that 230kv and larger electrical components have large separation distances between phases will also reduce the risk of bird electrocutions at stations. This potential is assessed as a routine Project effect in Chapter 9, Section 9.5, and therefore is not assessed further here.

21.3.4 Mitigation Measures

Manitoba Hydro monitors the transmission system using real-time monitoring, which allows situations that could lead to electrocution to be identified and responded to quickly. Protection measures incorporated into Project design detect an abnormal event or disturbance within the

power system (e.g., a short circuit in a transformer) and disconnect the faulted piece of equipment within a fraction of a second. Protection equipment monitors for abnormal voltages and currents, and if it determines that there is an abnormality, de-energizes the faulty equipment at the station by tripping power circuit breakers. In the event that protection equipment identifies a problem with the transmission line, instead of tripping all three phases, only one phase (*i.e.*, the faulted phase) will be tripped and re-energized to allow the two other phases to continue to distribute electricity.

Where conditions create the potential for electrocution, the likelihood of electrocution will be reduced through public notification and communication. Manitoba Hydro maintains an emergency contact number that is available 24 hours per day, seven days per week and can be used to report downed lines. Public education information on what to do if downed wires are encountered is available on Manitoba Hydro's website.

Once the site of any downed lines has been secured and the power turned off, the risk of electrocution is eliminated.

21.3.5 Summary of Residual Effects

Since the consequences of electrocution could result in substantial injury or even death to wildlife and human health, considerable effort is placed into reducing the likelihood of this occurring, through grounding, fencing and security, regular testing, and real-time monitoring and protection systems. As a result, while the magnitude of the effect is high, the likelihood is low and the effect is assessed as being not significant.

21.4 Erosion/Sediment Control Failure

21.4.1 Causes

Erosion protection and sediment control measures will be implemented on stream crossings and other erosion-prone slopes, as required, along the transmission line route. A possibility exists for failure of erosion and sediment control measures during construction due to extreme precipitation events. Such failures could result in the release of sediment-laden runoff to receiving watercourses and the surrounding area.

21.4.2 Incident Prevention

During Project construction, an Erosion Protection and Sediment Control Framework will be provided to guide each contractor (where applicable) in preparing an Erosion Protection and Sediment Control Plan. The plan will be in accordance with Canadian professional erosion and sediment control standards and guidelines to manage construction activities that have the potential to cause soil erosion and result in sediment releases to the aquatic environment. These include Manitoba Government Infrastructure and Transportation's Standard Construction

Specifications (Government of Manitoba 2015) and Field Guide for Erosion and Sediment Control (Government of Alberta 2011). An overview of the sediment control plan includes the following:

- The objective of the plan will be to reduce environmental effects of sediment releases on the aquatic environment in accordance with provincial and federal legislation and guidelines, and corporate environment policies and guidelines.
- Environmental protection measures will be prescribed for erosion protection and sediment control, including winter construction, establishment of buffer zones, avoidance of sensitive areas and use of bioengineering techniques.
- Environmental inspectors will conduct regular inspections of construction activities, including erosion protection and sediment control measures.
- The plan will be reviewed after each construction season. Results from the reviews will be used to adjust plan provisions to ensure continued effectiveness.
- The Erosion Protection and Sediment Control Plan will be completed and implemented prior to the commencement of construction for each applicable component of the Project.

21.4.3 Effects Pathways

The failure of an erosion and sediment control structure would most likely be restricted to the stretch of the watercourse immediately adjacent to the failure, and the effect would be the covering of fish habitat and degradation of water quality. This is the expected scenario for the Project.

Depending on the size of the structure, failure could also result in sediment covering adjacent vegetation, wildlife habitat and heritage resources. The covering of heritage resources would be a positive effect, since it would preserve the resource.

Traditional land and resource use by First Nations and Metis could be disrupted through the restriction of access to streams. Other land users, including recreational boaters, could experience restricted access to sites.

21.4.4 Mitigation Measures

Manitoba Hydro's typical erosion protection measures include the use of geotextile fabric on sensitive slopes, and the use of silt fences and settling ponds as required. In the event of a failure of an erosion protection and sediment control structure during construction, the contractor's plan for such an occurrence will be implemented. Their plan, which will have been approved by Manitoba Hydro, will require the immediate notification of Manitoba Hydro, who will be involved in the incident response. The response to an erosion/sediment control failure will include responder safety, assessment of the extent of damage, repair of the structure, and cleanup of the disturbed area, while taking into consideration the reduction of further environmental effects.

21.4.5 Summary of Residual Effects

Erosion protection and sediment control structures will be primarily associated with stream crossings along the Final Preferred Route. The extent of a failure would be small and the effects on fish and fish habitat, vegetation, wildlife habitat, heritage resources, traditional land and resource use and other land uses are expected to be of a low magnitude. While failure of an erosion and sediment control measure could occur over the course of Project construction, routine monitoring and inspection will aid in the rapid identification of such failure. Implementation of remedial action as required will limit environmental effects. Failure of erosion and sediment control measures are not a concern during long-term operation because erosion and sediment will be controlled by vegetative cover and other permanent measures such as riprap, gabions and other treatments.

In summary, the magnitude of the effects is low and there are monitoring and follow-up procedures to prevent extensive damage. The likelihood of the occurrence is low to moderate and the environmental effects on the affected VCs are assessed as being not significant.

21.5 Spills of Hazardous Materials

21.5.1 Sources

Manitoba Hydro considers a “spill “ to be the escape of a product from its vessel that occurs outside of normal work procedures or the practice of due diligence. Further, for the purposes of this assessment, a “release to the environment” is defined as:

- the deposit of a deleterious substance in water frequented by fish (*Fisheries Act*) or a fish habitat; and/or
- a hazardous material that is in contact with air, land or water beyond a containment or mitigation system.

Release includes “to spill, discharge, dispose of, spray, inject, inoculate, abandon, deposit, pour, empty, throw, dump, place and exhaust, and to cause or allow to leak, seep or emit” (Manitoba: *The Environment Act*).

The potential for emissions, discharges and releases may be a result of:

- abnormal operating conditions (weather-related circumstances)
- equipment failure
- physical location of equipment (in a sensitive area)
- new type or model of equipment with different characteristics
- work procedure changes
- the human element

Hazardous material spills are discussed in terms of spills during Project construction, spills of insulating oil at converter stations and substations, and spills of herbicides during vegetation management. Minor leaks from equipment and vehicles are addressed under Manitoba Hydro's *Spill Response and Prevention Plan (2014)*, and are not discussed further in this section.

21.5.1.1 Spills during Construction

The operation and maintenance of construction equipment requires the presence of various hazardous materials onsite, including fuels (gasoline, diesel and propane), lubricants (engine oil, transmission or drive train oil, hydraulic oil, gear oil and lubricating grease), coolants (ethylene glycol and propylene glycol), methanol, paints and solvents. Hazardous liquids pose the greatest threat to the environment because of their ability, if not properly contained, to flow in an uncontrolled manner and seep into porous material. Some liquids (*e.g.*, lubricating oil, methanol and antifreeze) contain components that are toxic to plants and wildlife. In addition, many of these materials are readily flammable or explosive. Antifreeze (ethylene glycol) is toxic and has a sweet smell that may attract wildlife. Inadvertent spills could result in contamination or alteration of soil, plants and ecological communities, surface or underground water quality, riparian habitat, wetland function, wildlife and wildlife habitat, and human health. Further damage to soils, vegetation and habitat could occur during spill clean-up and reclamation efforts following a spill.

While spills are most likely to occur during Project construction because there will be considerably more equipment and workers engaged in Project activities, these spills will generally be small and localized and easily cleaned up. The likelihood of a large spill is low because large quantities of hazardous materials will not be stored or used.

21.5.1.2 Spills of Insulating Oil from Stations

Insulating oil is a highly refined petroleum-based mineral oil used in power transformers and other high voltage electrical apparatus as an electrical insulator and heat transfer medium. In the case of power transformers, the insulating oil is circulated through a radiator in order to transfer heat generated from the transformer to the atmosphere. Insulating oil generally has low levels of toxicity and is insoluble and biodegradable; it generally breaks down over time with exposure and weathering.

Volumes of insulating oil at each station vary by equipment and range from a predicted total of 11,378 L at the Dorsey Converter Station to 301,770 L at the Glenboro South Station and 340,039 L at the Riel Converter Station. The volume of insulating oil required for individual pieces of equipment ranges from 50 L to 150,000 L.

21.5.1.3 Spills of Herbicides during Vegetation Management

Herbicide treatments will be formulated to target only broad-leafed plants (trees and weeds). Foliar applications of herbicides are made only during the summer; dormant stem applications are made when the plants are dormant, usually in the fall and winter. Spraying equipment includes

backpack sprayers, truck and track-mounted power sprayers equipped with a broadcast applicator system, hose and handgun, and all-terrain vehicle mounted power sprayers.

Herbicide applications are completed and supervised by licensed applicators and in accordance with conditions specified in the Pesticide Use Permit, which is obtained annually.

Manitoba Hydro maintains a typical list of herbicide foliage treatments and has developed application guidelines, such as the Pesticide Application requirements for Manitoba Hydro Employees and Contractors. This guideline is designed to provide regulatory and applicator licensing information, technical guidance, safety requirements and check lists for line managers responsible for pesticide application to ensure compliance with legal requirements and Manitoba Hydro policies.

With respect to a spill of herbicide, a worst-case scenario would be a spill of concentrated herbicide during transport and handling that finds its way into a watercourse.

21.5.2 Incident Prevention

Manitoba Hydro's Spill Response and Prevention Plan (2014) (SRPP) covers the transportation, use, storage and transfer of hydraulic fluid, other mechanical lubricants, petroleum fuels, antifreeze and herbicides. All personnel, including contractor personnel, receive training in spill prevention.

Manitoba Hydro's code of practice for storage and handling of petroleum products and storage tank systems includes the following:

- Transfer of fuel must be attended at all times.
- Only welded tanks with an Underwriters Laboratories of Canada tag are acceptable.
- Tanks greater than 5000 L capacity must be registered with MB Conservation Environment Services and reviewed bi-annually; changes to these systems must be pre-approved by MB Conservation ES, except in emergency.
- Fixed tanks greater than 230 L capacity require secondary containment, a weekly inventory of quantity of fuel and water, and a weekly inspection for rust, dents and leaks; if a tank is out of service for 18 months, then products are to be removed and purged before relocation.
- Any sign of leak/spill on an existing site must be sampled and cleaned up.
- All spills and leaks must be reported in a Hazardous Materials Incident Report.
- Tanker trucks may not be used for onsite storage except in remote locations according to MB Conservation Environment Services approval.
- Secondary containment must be 110% of largest vessel.
- Storage location must be more than 100 m from open water.

Insulating oil will be brought to site in quantities as required, so long-term storage is not anticipated.

21.5.3 Effects Pathways

Spills could result in:

- surface water contamination and subsequent effects on fish and fish habitat
- groundwater contamination and subsequent effects on human health if the material reaches an aquifer used for human consumption
- wildlife mortality, and loss or alteration of wildlife habitat
- loss or alteration of vegetation
- soil contamination
- destruction of, or access restrictions to lands used by First Nations and Metis or other land users

21.5.4 Mitigation Measures

In the event of a release during Project construction, contractors will follow their own spill response plans, which will have been reviewed as part of their contracts with Manitoba Hydro. During maintenance activities, the Local Operating Authority (the site owner) has the ultimate responsibility for dangerous goods, hazardous wastes and controlled product releases in their areas of jurisdiction. Contractors who provide maintenance services have the same responsibilities for their work. Manitoba Hydro is responsible for any spills from their equipment.

Manitoba Hydro employees will follow the procedures for spill response outlined in the company's SRPP. The general steps are as follows:

- Identify the hazard (identify the product, product hazard and site hazards).
- Use personal protective equipment.
- Stop the source.
- Contain the release.
- Secure the site.
- Notify the activity supervisor and Area Spill Response Coordinator.
- Plan the cleanup.
- Clean up the release.
- Sample the site to assure adequate clean up.

- Dispose of waste.
- Restore the site.

Stations have spill kits and spill containment plans, including a combination of non-point and point containment for oil-filled equipment. Non-point containment for small equipment is managed by surface grading. Point containment is required for large equipment containing more than 5,000 L of oil, and consists of containment pits around the equipment. Both point and non-point containment will direct contaminants through oil/water separators, and at the converter stations, will direct contaminants to containment ponds.

21.5.5 Summary of Residual Effects

There are a variety of potential sources of hazardous materials spills during all phases of the Project, influenced by aspects such as weather conditions, equipment failure, and human error. Spills could range from small localized fuel spills during construction, to more substantial events such as regional flooding or a fire or explosion that damages containment structures. These spills have the potential to contaminate land or enter surface and groundwater and affect VCs such as fish and fish habitat, wildlife and wildlife habitat, agriculture, community health and well-being, traditional land and resource use and other resource use. Given the potentially high consequences, Manitoba Hydro has developed, through several decades of experience, a robust Spill Response and Prevention Plan and codes of practice that addresses all aspects of transportation, use and storage of hazardous materials. With both point and non-point containment in place, the potential for a spill to reach the receiving environment is low and limited to extreme/unlikely events. As a result, the effects of spills on the VCs are assessed as being not significant.

21.6 Release of Insulating Gas

21.6.1 Causes

Manitoba Hydro has used insulating gas since the 1980s to replace the use of oils and air as interrupting and insulating mediums in high voltage equipment. Insulating gases are handled in their pure state or mixed for use in gas-insulated equipment (GIE). Sulphur hexafluoride (SF₆) is the primary insulating gas, and due to the low operating temperature requirements, GIE is designed to be mixed with carbon tetrafluoride (CF₄) or nitrogen (N₂) gas. Insulating gas is not used directly on a conventional air-insulated transmission line but is used in electrical equipment outdoors in the terminal switchyard at each end of the line; for example, in circuit breakers, gas insulated switchgear and circuit switchers.

SF₆ and CF₄ are potent greenhouse gases, and Manitoba Hydro makes every effort to minimize or eliminate their release to the atmosphere. Environment Canada has required mandatory reporting of SF₆ and CF₄ releases to the atmosphere since 2004.

SF₆ and CF₄ are heavier than air, and if released, will collect in low areas and displace oxygen. Insulating gas that is subject to high heat, primarily from normal arcing inside a circuit breaker interrupter, or due to a flashover, will develop SF₆ arc by-products that are toxic. Flashover events are very rare. One flashover event occurred on a 66 kV circuit breaker in 2014; it was the only such event within Manitoba Hydro's transmission line business unit over the last 25 years.

Under normal circumstances, minor releases of insulating gas may occur during testing and handling processes or from leaking GIE. Most GIE manufacturers have a documented leak rate of 0.05% per year, and not all equipment is expected to leak.

21.6.2 Incident Prevention

Outdoor GIE have low pressure alarms, and if there is a leak, the gas releases directly to the atmosphere. For terminal stations, GIE located inside buildings are equipped with low pressure alarms monitored by System Control Centre (SCC), and the buildings have ventilation systems that would exhaust any leaking gas to the outside environment, where it would dissipate rapidly into the atmosphere. All such buildings and GIE are located within secured facilities with restricted access, so the public would not be at risk.

21.6.3 Effects Pathways

Infrastructure and services could be affected by the release of insulating gas, because a leak would result in GIE being taken out of service to make repairs. A flashover event that affects GIE could lead to a line outage. Human health could be affected by a line outage that results from GIE leaks or failure. Members of the public could be exposed to insulating gas, which would be a health risk, if a motor vehicle accident occurs during transport of the insulating gas to facilities.

21.6.4 Mitigation Measures

As part of safety design, most GIE have a rupture disk that will release all gas in the event of an over pressure due to an internal flashover. The gas is compartmentalized with a rupture disk for each compartment so that if a flashover event does occur, the total amount of gas released is minimized. Released gas would dissipate quickly into the atmosphere. SF₆ arc by-products produced from arcing due to a flashover can be deposited as a powdery substance on equipment and must be decontaminated with a neutralizing solution by Manitoba Hydro staff using suitable personal protective equipment and following established safe work procedures.

In the event that a leak of insulating gas is detected, the following procedures will be followed:

- The System Control Centre will notify the work area responsible and arrange an outage of the equipment.
- The work area will clear the equipment and prepare to refill the insulating gas.
- The work area will test the gas quality in the equipment, refill the equipment and attempt to locate the leak.

- The quantity of insulating gas used to refill the equipment will be documented and reported as a release.
- The equipment will returned to service.

Insulating gas is stored and transported in pressurized cylinders following federal transportation of dangerous goods regulations. Manitoba Hydro's Apparatus Maintenance Shop supplies insulating gas, as required, for facilities within a 2-hour driving radius of Winnipeg. For more remote facilities, insulating gas is stored onsite in secured facilities. Cylinders are inspected and weighed on annually to detect leaks. Manitoba Hydro staff who enter a building containing GIE will be aware of the potential hazards, and only qualified personnel will conduct testing and handling of insulating gas.

21.6.5 Summary of Residual Effects

Insulating gases are potent greenhouse gases and can be toxic. As indicated, under normal circumstances minor releases may occur during testing and handling procedures or from leaking equipment. A flashover event could result in a release of insulating gas to the environment and deposition of SF₆ arc by-products, which would require decontamination and may result in a line outage. Line outages related to releases of insulating gas could affect infrastructure and services and community health and well-being, as discussed in Section 21.1. The release of insulating gas to the environment could result in a localized pocket of SF₆ arc by-products, which could result in wildlife mortality or contamination of wildlife habitat. However, as with the potential for power outages, this effect would be local and short term. The rapid dissipation of GIE into the atmosphere, should there be a release, minimizes the likelihood of effects on human health. In addition, there are measures in place to reduce consequences, including design measures in equipment, response protocols and low pressure alarm systems that will alert the SCC, which will notify the work area responsible and arrange an outage of the GIE so that repairs could be made. Given the magnitude and likelihood of effects, and the mitigation measures in place, effects from the release of insulating gases are determined to be not significant.

21.7 Interconnection of Aquifers

21.7.1 Causes

Normal foundation installation procedures may intercept an aquifer but are not expected to negatively affect groundwater resources in terms of flow or quality. In areas with artesian (free flowing) wells or springs; however, there is a potential risk of interconnection through pre-construction (specifically geotechnical drilling) or construction (foundation installations) boreholes if they are not sealed properly or quickly enough. In this situation, groundwater from a more pressurized aquifer will intrude into a less pressurized one, resulting in groundwater chemistry changes. Intrusion of saline water into a freshwater aquifer may result in the local loss of groundwater resources.

Saline aquifers in the Project development area are at depths of greater than 10 mgs (metres below ground surface), and because tower foundations are normally drilled to depths of 9 m, no saline aquifers are expected to be intercepted. No free-flowing saline wells are located in the Project development area. There are artesian freshwater aquifers underlying the Project development area, and tower foundations drilled in these aquifers could result in a release of fresh groundwater to surface.

Aquifers southwest of Winnipeg have a moderate vulnerability to contamination, while those southeast of the city have a high vulnerability. The sensitivity in these locations relates to the connection between the potable carbonate aquifer and the overlying shallow sand and gravel aquifers that act as a recharge zone for the deeper aquifer. Spills of hazardous substances to these shallow aquifers have the potential to affect groundwater quality in the potable carbonate aquifer.

21.7.2 Incident Prevention

The following activities will be conducted to reduce or preclude aquifer interconnection (or surface discharge) during drilling and foundation installations in areas of documented springs and artesian groundwater conditions:

- A qualified driller with appropriate experience will be contracted to work in areas affected by artesian conditions.
- Emergency response plans for sealing/grouting and pumping will be implemented as required.
- Follow-up inspections of installed foundations will be undertaken to monitor for excess moisture.

21.7.3 Effects Pathways

Fish and fish habitat could be affected by the release of fresh water from a flowing groundwater well due to habitat destruction or alteration. Vegetation and wetlands could be affected, depending on the timing and volume of a groundwater release, as a result of erosion or habitat alteration or destruction. Agriculture could be affected by erosion or submergence of crops. Traditional land and resource use could be affected by the loss of fish and vegetation components. These VCs could also be affected by spills of hazardous materials that affect groundwater quality. Similarly, the land and resource use could be affected by spills of hazardous materials that affect groundwater users.

21.7.4 Mitigation Measures

Water levels will be monitored during drilling and foundation installation, and an emergency grouting kit will be kept onsite. If a freshwater groundwater release occurs, emergency response plans for sealing/grouting and pumping will be implemented. Any hazardous materials spills will

be addressed as outlined in the spill response plan. An emergency spill response kit will be kept onsite.

21.7.5 Summary of Residual Effects

Interconnection of aquifers may occur during construction activities and introduce the risk of groundwater contamination. Surficial discharge may have high ecological and social importance, depending on the quality and quantity of the discharging groundwater; particularly if used for domestic water supply. Freshwater groundwater discharges could directly or indirectly affect other local environments (e.g., wildlife habitat, vegetation and wetlands), and these effects could persist beyond the effects on groundwater or surface water. While the magnitude of effects could be high, the likelihood is low. This low likelihood is primarily through the identification of environmentally sensitive sites, the avoidance of areas where there is a risk of occurrence, and the use of precautions such as adherence to drilling protocols and groundwater monitoring. In addition, there are well-developed hazardous spill response procedures and remediation measures. As a result, the residual effect is anticipated to be not significant.

21.8 Fire

21.8.1 Causes

Due to the operation of internal combustion engines (e.g., vehicles, heavy equipment) and the presence of workers during Project construction, brush and wild fires could be ignited. Storage of combustible material or waste, equipment malfunction at a station, lightning strike during Project operation and maintenance, or a tree falling on a conductor could also result in fire. The carbon in smoke from forest or fires can cause flashovers on steel structure lines, which can result in power outages.

21.8.2 Incident Prevention

The primary objective of Manitoba Hydro's Fire Prevention and Protection Program is to prevent the loss of life and property due to fires. The Manitoba Hydro Fire Manual provides general rules, guidelines and standards for fire prevention and protection. A hazard analysis is conducted as part of the job plan for any work carried out by Manitoba Hydro. Risk of fire is covered in the job plan that is completed before every job. Manitoba Hydro personnel will take precautions to prevent fire hazards at the work site and will keep the site free of flammable waste. Manitoba Hydro will also provide training to personnel in the use of fire-extinguishing equipment. Stations have fire alarms that notify SCC and emergency responders, and fire response equipment is present.

Under *The Wildfires Act*, there is no requirement for a burning permit between November 16 and March 31. If burning is required outside of those dates, a burning permit application will be made to the local Manitoba Conservation and Water Stewardship office.

21.8.3 Effects Pathways

A fire at a Project location could interact with the wildlife, vegetation and agriculture as a result of habitat loss, crop destruction, loss of livestock or contamination with sediment-laden water used to extinguish the fire. Heritage resources could be damaged if the fire burns through the sod layer or destroys surface artifacts. Infrastructure and services could be affected by stress on public services, such as emergency fire response. Traditional land and resource use could be affected through the risk of loss or damage to property or resources, or loss of access to resources that are destroyed or damaged by fire. Fire could also result in a change in visual quality of the landscape. Community health and well-being and human health could be affected by risk of injury and mortality, emissions from smoke, and soil contamination from water used to extinguish the fire.

21.8.4 Mitigation Measures

In the unlikely event of a fire, the SCC will be notified and will follow policies and procedures outlined in Manitoba Hydro's CEMP and Fire Manual. Local emergency response teams will also be contacted, and their assistance will help to reduce the severity and extent of damage.

21.8.5 Summary of Residual Effects

The magnitude of the effects of a fire will depend on its location, timing and severity. A small-scale fire that is brought under control and extinguished in a timely manner is not expected to have a significant effect on the environmental or socio-economic VCs. A larger fire has the potential to result in significant effects if it diminishes the capacity of critical habitat to provide for the recovery or survival of species at risk or threatens the long-term viability of wildlife populations or plant species, results in the loss of agricultural land and loss of operations such that existing levels cannot continue, and/or land use and traditional land and resource use cannot continue as they have been. Since the magnitude of effect could be large, efforts focus on reducing the likelihood of occurrence. This includes monitoring fire risk conditions and providing training in terms of use of flammable materials and fire prevention methods. As a result, the residual effects on wildlife and wildlife habitat, vegetation and wetlands, agriculture, land use, traditional land and resource use, and visual quality are assessed as not significant.

21.9 Collisions

21.9.1 Causes

There is a potential for vehicles, heavy equipment, farm equipment or aviation equipment to collide with transmission line towers, conductors, other vehicles, people or wildlife. The operation of vehicles and heavy equipment on highways, access roads and the ROW could result in human or wildlife mortality or injury. The potential for these types of collisions is influenced by traffic volumes and weather conditions. Wildlife incidents may affect both large and small animals,

including mammals, birds and amphibians. Other wildlife-related incidents could occur as a result of vehicle travel over natural terrain (e.g., crushing nests or dens with young, or slow-moving animals). The potential for vehicle-wildlife interactions is influenced by the time of year, the surrounding habitat type, and the time of day.

Frequency of vehicle traffic will be higher during Project construction, when there is more vehicle activity and more transportation of workers during hours of low visibility or higher wildlife activity; however, the likelihood of motor vehicle collisions is expected to be low throughout Project operation and maintenance. Table 21-2 presents Manitoba Hydro’s vehicle collision statistics for 2005 to 2015, and contractor vehicle collision statistics for construction of the Bipole III Transmission Project for the first three months of 2015.

Table 21-2 Manitoba Hydro Vehicle Collision Statistics

		Wildlife (e.g., hit deer)	At worksite (e.g., excavator backed into truck)	Not at worksite (e.g., collision in a parking lot)
Manitoba Hydro Vehicles (April 1, 2005 – March 31, 2015)	Transmission line and civil construction	8	8	36
	Operation and maintenance	7	7	11
	Total	15	15	47
Contractors on Bipole III (January 1 – March 31, 2015)	Construction	3	7	4

During the operation and maintenance phase, there is a potential for farm equipment, such as tractors and combines, to collide with transmission towers in agricultural fields during cropping activities. There is also a potential for aviation equipment, such as airplanes, helicopters and aerial crop spraying equipment to make contact with conductors (*i.e.*, transmission lines). The likelihood of aviation-related collisions is higher for activities that involve low-level flying, such as aerial crop spraying and airplane take-off or landing at strips located near transmission lines. There are three airports and three airstrips in the Project area. Of these, two airports (Piney-Pine creek Border Airport and Winnipeg/Lyncrest Airport) and three unnamed airstrips are located within 4 km of the Project.

21.9.2 Incident Prevention

The focus of incident prevention will be on prevention of collisions through compliance with traffic laws and regulations, and compliance with Manitoba Hydro’s corporate policy on use of corporate vehicles. Preventative measures to reduce the risk of collisions include reducing traffic to the

communities and the Project site during construction. This will include the use of group transportation where possible. Project vehicles will follow posted speed limits and exercise caution in areas frequented by wildlife. During Project operation and maintenance, vehicle travel and access onto the line will be at a reduced speed regardless of the time of year due to terrain, equipment used and the nature of work.

21.9.3 Effects Pathways

A vehicle collision as a result of Project-related activities could interact with wildlife by causing injury to, or mortality of, wildlife species. Human health could be affected through collisions that cause injury or death. Community health and well-being could be affected through the involvement of emergency response services. Agriculture could be affected by farm equipment and aerial spraying collisions.

21.9.4 Mitigation Measures

The routing, tower type, spacing and placement of transmission lines and towers on annual crop lands is planned to reduce footprint areas, nuisance and impediments to equipment maneuverability. This includes reducing diagonal crossing of annual crop land, use of self-supporting towers in agricultural areas, and routing the transmission line down half-mile lines in agricultural areas, where possible. In addition, aeronautical assessments will be conducted, in accordance with Transport Canada/NAV Canada regulations, to identify potential interferences with airports or airstrips located within 4 km of Project transmission lines.

21.9.5 Summary of Residual Effects

Collisions can occur during the operation of any moving equipment and the consequences can be large, in terms of injury and loss of life. As a result, efforts focus on reducing the likelihood of occurrence. This includes a requirement for Manitoba Hydro staff and contractors to comply with applicable traffic laws and regulations and corporate policies on vehicle use, and the implementation of safety measures such as access management and posted speed limits. Due to the measures in place to mitigate effects, residual effects of collisions are assessed as being not significant. Summary of Accidents, Malfunctions and Unplanned Events

The assessment of accidents, malfunctions and unplanned events for the Project addressed the following:

- power outages
- tower collapse
- electrocution
- failure of erosion protection and sediment control measures
- spill of hazardous materials

- release of insulating gas
- interconnection of aquifers
- fire
- collisions

Manitoba Hydro has been successfully constructing and operating transmission lines in the province since 1961. One of the company's highest values is to be proactive in protecting the environment. To this end, Manitoba Hydro has developed an environmental protection program that includes specific environmental protection, management and monitoring plans for each project. These plans reduce the likelihood of environmental effects of the Project and include measures to prevent accidents and malfunctions. In the event of an accident, malfunction or unplanned event, Manitoba Hydro's CEMP provides protocols for addressing such events.

The assessment of accidents, malfunctions and unplanned events concluded that Manitoba Hydro's mitigation measures for such occurrences will result in effects that are not significant, with the following exceptions:

- any event that results in a human fatality
- a power outage that extends for a period that affects the provision of health care services
- spills that destroy critical habitat for vegetation, wildlife or fish species of conservation concern
- fires that destroy critical habitat, or affect agriculture land so that current operations cannot continue, or land use and traditional land and resource use cannot continue as presently carried out, or the visual quality of the landscape changes from undisturbed to disturbed in areas where this an important planning objective.

With Manitoba Hydro's environmental protection plans, mitigation measures and emergency response plans in place, the likelihood of significant environment or socio-economic effects occurring is low.

21.10 References

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