MANITOBA-MINNESOTA TRANSMISSION PROJECT

Environmental Monitoring Plan

Manitoba Hydro

Manitoba-Minnesota Transmission Project Environmental Monitoring Plan

Draft

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ACRONYMS

AC	Alternating Current
ATK	Aboriginal Traditional Knowledge
ATKS	Aboriginal Traditional Knowledge Studies
EMP	Environmental Monitoring Plan
CEC	Clean Environment Commission
CEAA	Canadian Environmental Assessment Agency
CEAA 2012	Canadian Environmental Assessment Act 2012
CEnvPP	Construction Environmental Protection Plan
CHRPP	Cultural and Heritage Resources Protection Plan
DFO	Department of Fisheries and Oceans
EA	Environmental Assessment
EIS	Environmental Impact Statement
EnvPP	Environmental Protection Plan
EPIMS	Environmental Protection Information Management System
EPP	Environmental Protection Program
ESS	Environmentally Sensitive Site
FNMEP	First Nation and Metis Engagement Process
FRI	Forest Resource Inventory
GPS	Global Positioning System Unit
km	Kilometre
kV	Kilovolt
LAA	Local Assessment Area
MBCA	Migratory Birds Convention Act
MBCDC	Manitoba Conservation Data Centre
SD	Manitoba Sustainable Development
MESEA	Manitoba Endangered Species and Ecosystems Act
MMF	Manitoba Metis Federation

MMTP	Manitoba-Minnesota Transmission Project
NEB	National Energy Board
PDA	Project Development Area
PEP	Public Engagement Process
RoW	Right-of-way
SARA	Species at Risk Act
SOCC	Species of Conservation Concern
TSS	Total Suspended Solids
VC	Valued Component
VES	Visual Encounter Surveys

1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

Manitoba Hydro is proposing to construct and operate a 500 kilovolt (kV) alternating current (AC) international transmission line in southeastern Manitoba that includes additions and upgrades to three associated transmission stations at Dorsey, Riel and Glenboro South. (Map 1-1) The proposed project is called the Manitoba-Minnesota Transmission Project (the Project) and consists of approximately 213 km of single circuit, 500 kV AC transmission line (D604I) that will start at the existing Dorsey Converter Station northwest of Winnipeg, in the RM of Rosser, and will connect at the Manitoba-Minnesota border to a new transmission line proposed by Minnesota Power, called the Great Northern Transmission Line. The proposed project is required for the following reasons:

- Export power to the United States based on current sales agreements
- Improve reliability and import capacity in emergency and drought situation; and
- Increase access to markets in the Unites States

Clearing and construction of the Project is expected to take approximately 2 ¾ years to complete with activities starting in the Q3 of 2017 and ending in Q1 2020. Subject to regulatory approvals, the in-service date of the project is 2020.

1.1.1 Regulatory Requirement

The Project is subject to environmental regulatory review and approval. The project is defined as a Class 3 Development (under the Classes of Development Regulation) that will be reviewed by Manitoba Sustainable Development (SD) and require an Environment Act License under *The Environment Act* (Manitoba).

Authorization for the construction and operation of the transmission line is also required under the *National Energy Board Act* and the project is subject to an environmental assessment by the National Energy Board (NEB) under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012).

This Environmental Monitoring Plan (EMP) has also been included in the Manitoba-Minnesota Transmission Project Environmental Impact Statement (EIS) submission to be reviewed and approved by regulatory authorities.

Map 1-1 Project Components Map

1.2 ENVIRONMENTAL PROTECTION PROGRAM

Part of Manitoba Hydro's commitment to environmental protection includes the development of a comprehensive Environmental Protection Program (EPP), this is further described in chapter 22 of the EIS. The purpose of the EPP is to provide the framework for implementing, managing, monitoring and evaluating environmental protection measures that are consistent with regulatory requirements and environmental guidelines. This EMP is a component of the EPP as illustrated in Figure 1-1.

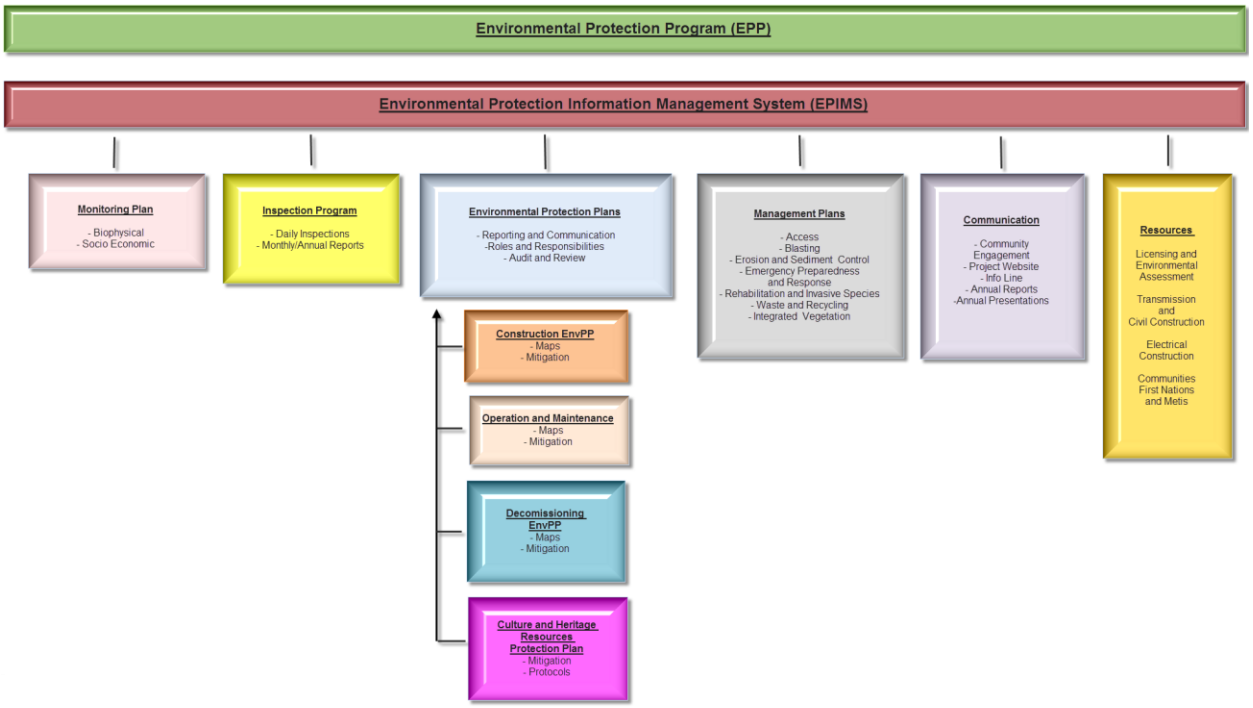

Figure 1-1 Transmission Environmental Protection Program

2.0 ENVIRONMENTAL MONITORING

This document describes the Environmental Monitoring Plan, which outlines the various monitoring activities that will occur to address follow-up requirements identified for the valued components included in the environmental assessment. Monitoring activities will be considered during all phases of Project development (i.e. pre-construction, construction and post construction). Follow-up requirements include actions implemented to assess the effectiveness of the environmental assessment and to confirm compliance with regulatory requirements.

This EMP is intended to describe how and provide assurance to regulators, environmental organizations, First Nations, the MMF and Indigenous organizations and the general public that potential environmental effects caused by the Project will be monitored, evaluated and reported on in a responsible and accountable manner.

An internal Environmental Protection Information Management System (EPIMS) was developed that will manage, store and facilitate the transfer of Environmental Protection Program data and information amongst the Project team. EPIMS will facilitate the transferring of knowledge and experiences encountered on a daily basis during construction activities from Environmental Inspectors to the Specialists that are responsible for monitoring project effects. EPIMS is an essential tool that manages vast amounts of data and information that will be generated through the implementation of this plan, allowing for Manitoba Hydro to employ an adaptive management approach during this project and apply that experience and knowledge to future developments.

2.1 PURPOSE

The purpose of this EMP is to outline the potential effects identified in the EIS and the key activities that will be conducted as part of the monitoring and follow-up component of the EPP. The intended goal of this plan is to provide details on monitoring activities and how monitoring results will be used within an adaptive management cycle to make decisions and trigger actions to further minimize the effects of the Project on the environment.

2.2 OBJECTIVES

The objectives of this monitoring plan are to:

- Confirm the nature and magnitude of predicted environmental effects as stated in the EIS;
- Assess effectiveness of mitigation measures implemented;
- Establish decision-triggers for action;

- Identify unexpected environmental effects of the project, if they occur;
- Identify additional mitigation measures to address unanticipated environmental effects, if required;
- Confirm compliance with regulatory requirements including approval terms and conditions; and
- Provide additional baseline information to evaluate long-term changes or trends.

2.3 SCOPE OF WORK

The scope of this EMP will include the biological and socio economic components of the environment. A Cultural and Heritage Resources Protection Plan (CHRPP) will also be developed that outlines Manitoba Hydro's commitment to safeguard cultural and heritage resources and provide information on how to appropriately handle human remains or cultural and heritage resources discovered or disturbed during construction of the Project.

2.4 MANAGEMENT AND COORDINATION

As part of the EPP, Manitoba Hydro will have staff comprised of senior Manitoba Hydro management, as well as implementation teams committed to the implementation of the EMP for the Project. The Environmental Protection Management Team will be responsible for the management of the environmental protection plans including compliance with regulatory and other requirements, quality assurance and control, consultation with regulators and activities related to the Public Engagement Process (PEP) and First Nation and Metis Engagement Process (FNMEP). The Environmental Protection and Implementation Team, which is comprised of Manitoba Hydro operational and office staff, will be responsible for the day to day implementation of environmental protection plans developed for the project which include monitoring, inspecting and reporting.

Manitoba Hydro will ensure that resources are allocated to the environmental aspects of project planning, development, implementation and operation for the successful implementation of environmental protection measures and follow-up including monitoring. Manitoba Hydro will commit resources early in the planning cycle to ensure effective environmental assessment, mitigation and monitoring including an environmental staff member from the Licensing and Environmental Assessment Department that will lead the field monitoring program during the construction of the Project and provide field level support to the ongoing FNMEP.

2.5 PUBLIC COMMUNICATIONS AND ENGAGEMENT

In addition to extensive public engagement efforts that have occurred to date throughout the development of the Project, Manitoba Hydro welcomes all members of the public to contact the

corporation with questions or comments throughout the construction process. Manitoba Hydro's Manitoba-Minnesota Transmission Project website site, https://www.hydro.mb.ca/projects/mb_mn_transmission, will be maintained and updated regularly throughout the project with the summary of results of this EMP. As noted on the Project website, additional information is always available to the public upon request via a toll-free phone number, dedicated project e-mail address or by mail.

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Manitoba–Minnesota Transmission Project
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Winnipeg MB R3M 3T1

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2.6 FIRST NATION AND METIS ENGAGEMENT & TRADITIONAL KNOWLEDGE

2.6.1 Traditional Knowledge

The ATKS Management Team (Black River First Nation, Swan Lake First Nation, Long Plain First Nation), Peguis First Nation, Dakota Plains Wahpeton Oyate, Roseau River Anishinabe First Nation, Sagkeeng First Nation and the Manitoba Metis Federation (MMF) submitted ATK reports for the proposed Project. First Nations and the MMF that conducted ATK studies in the later stages of the engagement process for the Project were informed that their information would be used to inform the Environmental Protection Program.

More detailed information regarding Aboriginal Traditional Knowledge Studies completed can be found in Chapter 4.0 of the project EIS.

2.6.2 Ongoing First Nations and Metis Engagement Process

Manitoba Hydro has developed different approaches to its ongoing post-EIS First Nation and Metis Engagement Process. These approaches for transmission project follow-up and monitoring programs began in 2008-2010 with the Wuskwatim Transmission Project, followed by the Bipole III and Keeyask Transmission Projects in 2013, both projects are planned to continue until 2018/19. Each of these projects had a different approach tailored to the geographic region, scope/scale of project and the number of communities involved. Through these past and current projects, accompanied by the desire to use active adaptive management

in its community involvement programs for the construction of transmission projects, Manitoba Hydro has developed a new approach for this Project.

Manitoba Hydro's proposed approach to the ongoing FNMEP is based on experiences by other industries where the project is located within a traditional or current resource use area but not necessarily in close proximity to the community itself. The approach is also based on ATK field trips, self-directed reports received to date, and the desire within those reports for further investigation and mapping of sensitive sites, transfer of knowledge from Elders to youth to prevent loss of knowledge, updates on project progress and involvement in follow-up and monitoring.

The ongoing FNMEP would include inviting interested First Nations, MMF and Indigenous organizations representatives to attend regular field trips to the construction areas with the focus being the highly valued undisturbed land or land with little disturbance (Black River First Nation, Long Plain First Nation, Swan Lake First Nation. 2015) as well as areas identified as sensitive sites (Peguis, 2015 and Roseau River, 2015). Field trips with representatives would take place throughout both the construction and monitoring and would be guided by various staff depending on topic, including Construction Supervisors, Environmental Inspectors and Specialists such as experts in botany, wildlife, and traditional medicinal plants. These field trips would be supported by a translator as required. During the construction field trips, representatives would learn and witness activities associated with various topics including:

- Mitigation measures;
- Project schedule;
- Clearing and construction practices;
- Inspection results; and
- Monitoring results.

During follow-up and monitoring field trips, representatives could participate with the Environmental Monitor in monitoring activities such as vegetation, traditional plant, stream crossing, mammal track, bird and camera trap surveys. Both construction and follow-up and monitoring trips would allocate time for representatives to share concerns and ask questions of the Project staff along with receiving a materials package and copy of photos/video taken that day to share with their First Nation, the MMF or Indigenous organization.

To enhance traditional knowledge transfer amongst generations, educate youth about Manitoba Hydro's EPP, and explain environmental career opportunities for youth, separate field trips involving youth and Elders and a Manitoba Hydro representative could occur during school summer break. These Youth/Elder trips would be similar in nature to the construction and follow-up and monitoring trips described above but would focus opportunities for traditional knowledge sharing.

While specific details about the field trips are yet to be determined, Manitoba Hydro is looking forward to working with First Nations, the MMF and Indigenous organizations to develop the approach for this Project, which will be guided by the following objectives;

- Awareness of the Project and EPP;
- Manitoba Hydro awareness of community concerns and communication back on how they are being addressed;
- “Boots on the ground” field experiences;
- Multiple First Nations, MMF and Indigenous organizations working together; and
- A Youth and Elder component.

Manitoba Hydro is committed to an ongoing engagement process to incorporate traditional knowledge within components of its Environmental Protection Program.

3.0 PAST, PRESENT AND FUTURE MONITORING PROGRAMS

Monitoring programs allow us to see how predicted effects from environmental assessments compare to the actual outcome from construction activities.

Good project planning in combination with effective monitoring is a major component for enhancing the effectiveness of development programs and projects. Monitoring and evaluation of projects help in the understanding and learning from past project successes and challenges which in turn helps to inform decision-making so that current and future monitoring programs for projects can be improved.

In order to ensure continual improvement of monitoring programs for future projects, information and results from past monitoring programs were reviewed to better understand the effects of transmission line construction on the biophysical and socio-economic components of the environment. This results in a reduction of project specific residual effects through project-based mitigation which demonstrates a commitment to continual improvement and sustainable development.

Past and current Manitoba Hydro projects that have implemented extensive monitoring programs include the Wuskwatim Transmission Project (2008 to 2012) and the Bipole III Transmission Project (currently two years of monitoring completed). Recently, the Environmental Monitoring Plan was initiated for the Keeyask Transmission project and Lake Winnipeg East System Improvement transmission project (one year each).

Appropriate methods accepted by Manitoba Hydro and Sustainable Development were used to monitor environmental components, such as access, aquatics, mammals, birds, and vegetation, identified for the Wuskwatim, Bipole II, Keeyask and Lake Winnipeg East System Transmission projects and are also outlined in the MMTP EMP.

Manitoba Hydro manages all its projects monitoring programs in a coordinated fashion so that knowledge gained from one program is combined with other programs for a more informed understanding of transmission line environmental effects.

4.0 MONITORING PROGRAM

4.1 REQUIREMENTS

As defined under the *Canadian Environmental Assessment Act* (CEAA) *2012*, monitoring and follow up is required to verify the accuracy of the environmental assessment of a project and determine the effectiveness of measures taken to mitigate potential adverse environmental effects (CEAA, 2012). The National Energy Board (NEB) through their Regulatory Framework also requires "Lifecycle Compliance Monitoring" in which the NEB monitors and enforces compliance with requirements concerning the safety and protection of employees, the public and the environment as they may be affected throughout the life of the project (NEB, 2015). In addition the NEB may monitor and verify compliance with requirements during construction, operation and decommissioning through the use of audits, inspections, compliance meetings, investigations and response to concerns and complaints.

Through monitoring and follow up, EIS outcomes are realized, communicated and managed through refinement and improvement of mitigation strategies.

The EPP includes two main types of monitoring:

- Environmental monitoring – periodic or continuous surveillance or testing, according to a predetermined schedule, of one or more environmental indicators to establish/enhance knowledge of baseline conditions or to verify the accuracy of an environmental assessment and the effectiveness of mitigation measures. Pre and post disturbance and control-impact monitoring are the preferred approaches to monitoring environmental effects.
- Compliance monitoring – observation or testing conducted to verify whether a practice or procedure meets the applicable requirements prescribed by legislation, licence conditions, and/or Environmental Protection Plans.

Environmental monitoring is addressed through this EMP. Compliance monitoring is accomplished through the Environmental Protection Program which will involve the use of dedicated environmental inspectors to observe and verify the implementation of the environmental protection plans. Information generated from this program will be utilized by an adaptive management approach to improve both mitigation measure effectiveness and monitoring program design. A summary of compliance monitoring results will be presented in an annual report.

4.2 VALUED COMPONENTS

This section identifies the Valued Components that were selected for the environmental assessment that will be monitored including rationale for their selection. Additional information in this section includes key monitoring activities, task descriptions, duration, frequency and timing of activities, Environmental Monitor input, Manitoba Hydro commitments and specialist and SD roles. Manitoba Hydro has developed the plan to address concerns expressed by stakeholders, local communities, First Nations and Metis, and regulators.

Where applicable, Decision Trigger(s)/Threshold(s) for Action have been identified for each valued component. These decision triggers or thresholds for action are mechanisms to promote adaptive management that cause Manitoba Hydro and its Specialists to stop and further evaluate the monitoring results and, if required, adapt mitigation measures or monitoring activities. Decisions triggers/thresholds cannot be identified for all situations, there are too many parameters and variables and lack of scientific data. It is for this reason why many government agencies, including Manitoba, have not yet published definitive thresholds for action for different wildlife management scenarios. Manitoba Hydro will continue to fund applicable research and contribute monitoring information from projects to the regulators.

4.2.1 Valued Component Selection

An initial step of the environmental assessment for the proposed project was the identification of Valued Components (VCs) that may be adversely affected by the Project this is fully discussed in Chapter 7 of the EIS).

VCs are environmental elements that have the potential to interact with the Project and that met one or more of the following criteria:

- represent a broad environmental, ecological or human environment component that might be affected by the Project;
- are a part of the heritage of First Nations and Metis or a part of their current use of lands for traditional purposes;
- are of scientific, historical, archaeological importance;
- have been identified as important issues or concerns by stakeholders or by other effects assessments in the region.

Valued Components that require monitoring and follow-up were identified in each applicable chapter within the EIS. For each VC, one or more environmental indicators were selected to focus monitoring and follow up efforts.

Environmental indicators were selected to represent the valued components in the table below if the component had one or more of the following attributes:

- Scientific/regulatory importance (rare/endangered or protected status);
- Environmental importance;
- Socio-economic importance;
- Cultural importance (important to communities or society as a whole); and
- Vulnerable and sensitive to change.

Table 4-1 below provides a list of valued components and their environmental indicators that will require monitoring as well as the parameters being measured and rationale for their selection.

Table 4-1 Valued Components and Environmental Indicators

Valued Component	Environmental Indicator	Parameter	Rationale[1]
Fish and Fish Habitat	Stream Crossings	Riparian buffers, ground cover, erosion;	Environmental importance; protection of aquatic life; Regulatory importance
Vegetation and Wetlands	Wetlands	Vegetation cover and area of wetland affected by the project	Environmental importance; protection of aquatic life, no net loss
	Plant Species of Conservation Concern	Species occurrence	Regulatory importance – MESEA and SARA
	Invasive Plant Species	Species occurrence	Environmental importance
	Traditional Use Plant Species	Species occurrence	Cultural and environmental importance
Wildlife and Wildlife Habitat	Amphibians	Presence of northern leopard frogs, eastern tiger salamanders and habitat	Regulatory importance –SARA *The Wildlife Act*
	Common Garter Snakes	Presence of garter snake hibernacula	Regulatory importance –*The Wildlife Act*

Table 4-1 Valued Components and Environmental Indicators

Valued Component	Environmental Indicator	Parameter	Rationale[1]
	Bird-Wire Collision	Abundance and Mortality	Environmental and cultural importance; Regulatory importance
	Sharp-tailed Grouse Lekking Sites	Lek abundance, number of males, mortality changes	Vulnerable and sensitive to change; Regulatory importance
	Bird Species of Conservation Concern	Presence /Absence habitat suitability	Regulatory importance - MESEA; SARA; MB CDC, designated Golden-winged Warbler critical habitat
	Golden-winged Warbler Habitat	Vegetation cover	Regulatory importance – MESEA and SARA
	Birds of Prey	Nest site locations	Environmental importance; Regulatory importance
	Ungulates and Predators	Occurrence and/or seasonal distribution, vehicle collision related mortality	Environmental and cultural importance; Regulatory importance
	Black Bear	Occurrence, annual prevalence	Environmental and cultural importance; Regulatory importance
Employment and Economy	Project Employment	Total person years of employment, total number of hires, total number of employees.	Socio-economic and cultural importance

Table 4-1 Valued Components and Environmental Indicators

Valued Component	Environmental Indicator	Parameter	Rationale[1]
		Type (job classifications) of work available.	
	Direct/Indirect Business Effects	Direct project expenditures Indirect business opportunities	Socio-economic importance and cultural importance
	Direct Labour Income and Taxes	Direct labour income. Project taxes generated (non-labour).	Socio-economic and cultural importance
Infrastructure and Services	Transportation	Traffic volumes and accidents on key roadways.	Socio-economic importance and cultural importance
Outfitters and Falconry	Outfitter Resource Use	Change in occurrence of black bears frequenting bear bait sites	Socio-economic importance
	Peregrine Falcon Conservation Centre	Location of peregrine perch sites and total distance moved	Socio-economic/ environmental importance

4.2.2 Valued Component Monitoring Tables and Schedule

Figure 4-1 illustrates the proposed schedule of monitoring activities. The following tables 4-2 thru 4-17 summarize the key monitoring activities that will be conducted for each of the Valued Components and Environmental Indicators identified in Section 4.2.1 above. Detailed methodologies for each key monitoring activity are outlined in Section 7.0 of this report.

Figure 4-1 Proposed Monitoring Activities Schedule

Valued Component	Key Monitoring Activity	Pre-Construction Surveys	Clearing and Construction of the Transmission Lines and station modifications			Post Construction	
		Fiscal Year(s) (April-March)					
		2017/18 (1st-3rd Quarters)	2017/2018 (4th Quarter)	2018/2019	2019/2020	2020/2021	2021/2022
Fish and Fish Habitat	Stream Crossing Assessment			■	■	■	
Vegetation and Wetlands	Wetland Surveys	■		■	■	■	■
	Rare Plant Surveys	■		■	■	■	
	Invasive Species Survey	■		■	■	■	
	Traditional Use Plant Species Survey	■		■	■	■	■
Wildlife and Wildlife Habitat	Wetland Amphibian Survey	■				■	■
	Snake Hibernacula Survey	■				■	■
	Bird-Wire Collision Survey					■	■
	Sharp-tailed Grouse Lek Survey	■		■	■	■	■
	Bird Species of Conservation Concern Survey	■	■	■	■	■	
	Golden-winged Warbler Habitat Survey	■	■	■	■	■	■
	Raptor Nest Survey	■					
	Distribution / Occurrence Mapping Survey	■	■	■	■	■	■
	Camera Trap Survey	■	■	■	■	■	■
	Vehicle Collision Statistic Gathering		■	■	■	■	
	Mineral Lick Survey	■					
Employment and Economy	Project Employment Reporting			■	■	■	
	Direct/Indirect Business Opportunities Reporting			■	■	■	
	Direct Labor Income and Taxes Reporting			■	■	■	
Infrastructure and Services	Traffic Monitoring Survey			■	■	■	
Outfitting and Falconry	Black Bear Bait Site Camera Trap Survey	■		■	■	■	
	Peregrine Falcon Conservation Centre Survey	■		■	■	■	

Valued Component Monitoring Table Description Key

Environmental Indicator

Brief description of the environmental indicator in the context of the Project, and the potential effects of the Project on the environmental indicator.

Objectives

- *List of objectives the monitoring program is designed to fulfill.*

Applicable Project Component(s): *List of Project components that are being monitored due to the potential interactions between the project component and environmental indicators*

Monitoring Activities

Table x-x Name of Environmental Indicator

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Name of key monitoring activities (i.e. Bird Point Count Survey)	*The phase of the project the activities will take place (i.e., baseline information, pre-construction construction, post construction)*	*Description of the task being conducted (i.e. upstream/downstream water quality monitoring).*	*Identification of the parameters being measured by the task (i.e. species counts)*	*Locations in which the measurements of the parameters will be conducted (i.e. Assiniboine River)*	*How many years the activities will take place (i.e. three years)*	*How many times per year will the activity take place (i.e. annual – once a year)*	*The time of year the activity will take place (i.e. Spring and fall)*	*Units by which the parameters are being measured (total number of bird species observed) Or qualitative observations of effects (bird behaviours)*

Manitoba Hydro Commitment:

- *This section will describe the activities the Manitoba Hydro is committed to conducting and resources it will provide to execute the monitoring plan.*

Responsibilities of Environmental Monitor include:

- *This section will describe the activities the Environmental Monitor will conduct and resources they will provide to execute the monitoring plan. The Environmental Monitor Role may be fulfilled by either a Manitoba Hydro staff, a Manitoba Hydro retained consultant, an Indigenous Community Member selected through the Indigenous Community Monitoring Working Group, or a University student pursuing bachelors or master's degree.*

Specialist will:

- *This section describes the activities the Specialist will conduct and resources it will provide to execute the monitoring plan, the specialist may be Manitoba Hydro staff or external consultants.*

Decision Trigger(s)/Threshold(s) for Action:

- *Describes the scenarios which will trigger the requirement for adaptive management to be implemented. This section does not provide how Manitoba Hydro will respond to a particular action as there are an indefinite amount of possible scenarios and responses, Manitoba Hydro is committed to an adaptive management process as described in Section 5 to fully evaluate the options and develop an appropriate response.*

Approach to Adaptive Management:

- *This is a summary of how adaptive management will be applied for this valued component.*

4.3 FISH AND FISH HABITAT

4.3.1 Water Course Crossings

As outlined in Chapter 8 of the EIS, the Project will require overhead line crossings of 75 water courses of which 29 are fish bearing. There are no water courses in close proximity to the station upgrades. The Project crosses two major watersheds, the Assiniboine River Basin and the Red River Basin, and seven sub-watersheds, including the Lower Assiniboine, La Salle River, Red River, Seine River, Cooks Creek/Devils Creek, Rat River and Roseau River.

A potential effect of the Project to fish habitat is the loss of riparian vegetation (vegetation along the water's edge) during construction. Riparian vegetation functions as fish habitat by providing bank stability, food and nutrient inputs (e.g., leaf litter and insect drop), and shading. The loss of riparian vegetation can result in increased sediment in water due to decreased bank stability, increased water temperature and decreased cover for fish. Increased suspended sediments can decrease light penetration resulting in decreased photosynthesis. Sedimentation of streams can bury or create unsuitable habitats for aquatic invertebrates, infill spawning habitats and reduce the spawning and feeding success of fish. To validate EIS predictions environmental monitoring will verify effectiveness of prescribed mitigation and to allow for adaptive management.

Objectives:

- *To verify the implementation and effectiveness of mitigation prescribed for areas adjacent to watercourses including: riparian buffers, erosion control, and temporary stream crossings.*

Applicable Project Component(s): *D604I Transmission Line*

Monitoring Activities:

Table 4-2 Fish and Fish Habitat

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Stream Crossing Assessment	*Baseline Information*	*Fish Habitat Assessments*	*Water course characterization and sensitivity*	*23 sites in LAA*	*1 field season*	*Once*	*2014*	*Fish Habitat (Channel size), Habitat Sensitivity (High, Medium, Low)*
	Construction	*Stream Crossing Survey*	*Riparian buffers, ground cover and erosion*	*ESS*	*During construction*	*Annual*	*Spring*	*Riparian buffer width (m), Vegetative cover (% cover : % bare ground), Bank stability and erosion (%), Re-vegetation where soil was disturbed (% ground cover: % bare ground.)*
	Post-construction	*Stream Crossing Survey*	*Riparian buffers, ground cover and erosion*	*ESS*	*1 yr.*	*Annual*	*Spring*	*Riparian buffer width (m), Vegetative cover (% cover : % bare ground), Bank stability and erosion (%), Re-vegetation where soil was disturbed (% ground cover: % bare ground.)*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Report immediately to SD any unanticipated project effects on stream crossing and encroachment areas discovered through monitoring activities and consult on any remediation plans; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, Metis and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of mitigation performance at ESS sites within project footprint or access routes.*
- *Record observations with photo and waypoint and store in EPIMS*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase.*

Specialist will:

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of stream crossing requiring site survey and assessment of ROW effects;*
- *Review Environmental Inspector and Monitor daily reports for the performance and implementation of prescribed mitigation measures at each stream crossing site;*
- *Design and conduct specific survey methods that sample aquatics ESS sites and at sites where documentation by Environmental Inspectors is insufficient or site conditions warrant follow-up to verify accuracy of EIS predictions and effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on stream crossings discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Thresholds for Action/Decision Triggers:

- *Bank stability and erosion not equal to pre-construction stability.*
  - *Action: Implement site specific rehabilitation measures as required.*
- *Insufficient riparian buffer retained.*
  - *Action: Implement site specific rehabilitation measures as required.*

Approach to Adaptive Management:

- *Passive - Implement environmental protection plan measures and apply experience from previous transmission development projects (i.e. implement site-specific buffers and setbacks near watercourses).*

4.4 VEGETATION AND WETLANDS

4.4.1 Wetlands

Wetlands perform many important functions which include water storage, flood control, ground water recharge, sediment trapping, shoreline protection, nutrient cycling and carbon sequestration. Wetlands also provide valuable habitat for wildlife and plant species, and may support species of conservation concern. Wetland conservation is a priority under The Federal Policy on Wetland Conservation (Government of Canada 1991).

Wetland function includes three major components: habitat, hydrological and biogeochemical function (Halsey et al. 1997, Hanson et al. 2008). Wetland alteration can result in a loss of wetland function. Threats to wetlands include drainage, erosion and degradation, lowered water tables, increased run-off, and reduced plant productivity of adjacent areas.

Large intact wetlands are present in the Local Assessment Area (LAA) in addition to smaller degraded wetlands in cultivated areas. As described in Chapter 10 of the EIS, the Project LAA intersects approximately 1884 ha of wetlands, of which 56 ha are within the Project Development Area (PDA). Wetland classes occurring along the PDA include bog, fen, swamp, marsh, shallow open water and dugout. Main effects to wetlands as a result of the project include site disturbance or loss of plants from construction, maintenance and decommissioning activities. To validate EIS predictions, verify implementation of mitigation measures, and to allow for adaptive management, pre-construction, construction and post-construction monitoring will identify any changes to wetland area affected (ha), and species composition and abundance.

Objectives:

- *Pre-construction wetland surveys to confirm location and collect baseline vegetation information;*
- *Monitoring to document disturbance, and species composition and abundance of wetland vegetation at selected sites; and*
- *Verify the implementation and effectiveness of wetland protection measures.*

Applicable Project Component(s): *New ROW for the D604I Transmission Line*

Monitoring Activities:

Table 4-3 Wetlands

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Wetland Surveys	*Baseline Information*	*Wetland desktop and field surveys*	*Wetland classification*	*74 sites surveyed in PDA, LAA*	*1 field season*	*Once*	*2014*	*Wetland class (bog, marsh, swamp, shallow open water)*
	Pre-construction	*Ground surveys to confirm location and record wetland characteristics*	*Area of wetland intersected by the project, vegetation cover*	*PDA*	*Pre-construction*	*Once*	*Summer*	*Wetland class; species composition and abundance*
	Construction	*Ground surveys to identify wetland changes not discernible from habitat mapping and to monitor wetland protection measures*	*Area of wetland affected by the project, vegetation cover*	*PDA*	*During construction*	*Annual*	*Summer*	*Wetland class; species composition and abundance*

	Post-construction	*Ground surveys to identify wetland changes not discernible from habitat mapping*	*Area of wetland affected by the project, vegetation cover*	*PDA*	*2 yrs.*	*Annual*	*Summer*	*Area affected (ha); species composition and abundance*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Map cleared project footprint;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, Metis and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of mitigation performance at Environmentally Sensitive Sites (ESS) within project footprint or access routes.*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase.*

Specialist will:

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of potential wetland sampling sites and assessment of ROW effects;*
- *Conduct pre-clearing surveys in wetlands to classify wetlands;*
- *Review Environmental Inspector and Monitor daily reports for identification of potential wetland sampling sites;*
- *Design and conduct specific survey methods that sample vegetation composition and abundance to verify accuracy of EIS predictions and effectiveness of mitigation measures implemented;*
- *Adhere to Manitoba's Hydro's Biosecurity procedures;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on wetlands discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Thresholds for Action/Decision Triggers:

- *Partially frozen wetlands are encountered during construction season.*
  - *Action: Report to SD Conservation Officer mitigation options to reduce impacts (i.e. matting, ice roads, snow roads, hand clearing).*

- *Actual disturbance footprint exceeds the expected disturbance footprint.*
  - *Action: Implement site specific rehabilitation measures as required.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*

Approach to Adaptive Management:

- *Passive - Implement environmental protection plan measures and apply experience from previous transmission development projects (i.e. implement restrictions on vehicle use in wetland areas).*

4.4.2 Plant Species of Conservation Concern

Species of conservation concern include species of plants that are protected under *The Endangered Species and Ecosystems Act* (MESEA) in Manitoba, the federal *Species at Risk Act* (SARA), The Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or are listed by the Manitoba Conservation Data Centre (MBCDC) as plants that are very rare to uncommon. These species generally exist in low numbers, play a role in helping to preserve species diversity, and/or have limited distributions.

As described in Chapter 10 of the EIS, two historical locations for plant species of conservation concern were previously known to occur along the Project Development Area (PDA); seven were known to occur along the LAA and 62 along the Regional Assessment Area (RAA) (MBCDC records). No historical occurrences of protected plants are known to occur within the Project PDA or LAA. Protected species have historical occurrences within the RAA.

Field assessments in 2014 identified three species of conservation concern in the PDA at eight locations. None of these species are listed under MESEA, SARA or COSEWIC. Pre-construction field assessments will help identify any other locations where species of conservation concern may exist and prescribe appropriate mitigation measures. Construction activities can potentially negatively affect plant species of conservation concern through the use of heavy equipment (crushing plants) and from clearing and grubbing (removal of roots) of vegetation. Herbicide use during maintenance activities can also negatively affect desirable species. To validate EIS predictions, verify implementation of mitigation measures, and to allow for adaptive management, pre-construction, construction and post-construction monitoring will identify any impact to vegetation species of conservation concern.

Objectives:

- *Pre-construction surveys to identify species of conservation concern;*
- *Monitoring to document presence/absence of species post construction; and*
- *Verify the implementation and effectiveness of protection measures.*

Applicable Project Component(s): *New ROW for D604I Transmission Line*

Monitoring Activities:

Table 4-4 Plant Species of Conservation Concern

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Rare Plant Surveys	*Baseline Information*	*Desktop, key person interviews, and field surveys*	*Species names and locations*	*95 sites surveyed in PDA, LAA*	*1 field season*	*Once*	*2014*	*Species presence/absence*
	Pre-construction	*Ground surveys to record species of concern*	*Species occurrence*	*PDA*	*Pre-construction*	*Once*	*Summer*	*Species presence/ absence*
	Construction	*Ground surveys to monitor species of concern and protection measures*	*Species occurrence*	*ESS*	*During construction*	*Annual*	*Summer*	*Species presence/ absence*
	Post-construction	*Ground surveys to monitor species of concern*	*Species occurrence*	*ESS*	*1yr*	*Annual*	*Summer*	*Species presence/ absence*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, Metis and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of rare plants and mitigation performance at ESS sites within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase.*

Specialist will:

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of potential rare plant habitat sampling sites and assessment of ROW effects;*
- *Conduct pre-clearing rare plant surveys for project areas not previously surveyed;*
- *Review Environmental Inspector and Monitor daily reports for identification of potential rare plant sampling sites;*
- *Design and conduct specific survey methods that sample known rare plant sites for presence/absence to verify accuracy of EIS predictions and effectiveness of mitigation measures implemented;*
- *Adhere to Manitoba's Hydro's Biosecurity procedures;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on rare plants discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Manitoba Sustainable Development may be requested to:

- *Provide historical and current data of species of concern to inform ongoing analyses related to biophysical monitoring (e.g. population survey data, observations, reports); and*
- *Provide guidance regarding mitigation strategies should unanticipated effects occur as a result of the project.*

Decision Trigger(s)/Threshold(s) for Action:

- *Species of conservation concern has been disturbed by construction activities.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*
  - *Action: Implement site specific rehabilitation measures as required.*
- *Discovery of new location of species of conservation concern.*

- *Action: Report locations to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*
- *Action: Develop and maintain a 30 meter buffer around plant species protected under legislation, and contact Manitoba Conservation Data Centre for further guidance on necessary mitigation.*

Approach to Adaptive Management:

- *Passive - Implement environmental protection plan measures and apply experience from previous transmission development projects (i.e. implement buffers and setback around identified plants or plant groupings) adjust buffer distance when advised by SD.*

4.4.3 Invasive Plant Species

As outlined in Chapter 10 of the EIS, the prevalence of non-native and invasive plant species (including noxious species) may increase as a result of the Project. Non-native species are plants that grow outside of their normal range while invasive species are plants that out-compete native species when introduced outside of their natural setting. Noxious have the ability to spread rapidly ana are designated by regulation, *The Noxious Weed Ac*t (Manitoba).

Construction equipment and vehicles can introduce non-native and invasive plants. During the field assessments in 2014, 10 noxious non-native species were observed at 36 different locations in the PDA. About half of the species were encountered in areas of disturbance (i.e., cleared areas, gravel pits, roads, ATV trail edges) or near agricultural fields (cultivated and pasture). Most common were Canada thistle (*Cirsium arvense*), common dandelion (*Taraxacum officinale*), quackgrass (*Elymus repens*), and field sow-thistle (*Sonchus arvensis*).

Non-native and invasive species are problematic for a number of reasons: these plants are capable of growing under a wide range of climatic and soil conditions; they produce abundant seeds that are easily disseminated and seeds that are long lived or can remain dormant through the winter season; they can continue to persist even after the removal of vegetative portions of the plant, and they often have vigorous growth and produce seeds under conditions adverse for other plants, and can therefore out compete native species. So to validate EIS predictions, verify implementation of mitigation measures, and to allow for adaptive management, pre-construction, construction and post-construction monitoring will identify changes in baseline composition and abundance of invasive species.

Objectives

- *Pre-construction surveys to identify non-native and invasive species;*
- *Monitoring to document the composition and abundance of non-native and invasive plant species at selected sites; and*
- *Recommend appropriate control and eradication measures, if there is a spread of species.*

Applicable Project Component(s): *New RoW for the D604I Transmission Line, borrow sites*

Monitoring Activities:

Table 4-5 Invasive Plant Species

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurable Parameter(s)
Non-native and Invasive Species Survey	*Baseline Information*	*Desktop and field surveys*	*Species names and locations*	*Sites surveyed in PDA, LAA*	*1 field season*	*Once*	*2014*	*Species composition and abundance*
	Pre-construction	*Ground surveys to record non-native and invasive species*	*Species occurrence*	*PDA*	*Pre-construction*	*Once*	*Summer*	*Species composition and abundance*
	Construction	*Ground surveys to identify and measure occurrence of invasive species on ROW and monitor protection measures*	*Species occurrence*	*PDA*	*During construction*	*Annual*	*Summer*	*Species composition and abundance*
	Post-construction	*Ground surveys to identify and measure occurrence of invasive species on ROW*	*Species occurrence*	*PDA*	*1yr*	*Annual*	*Summer*	*Species composition and abundance*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, Metis and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of invasive plants within project footprint or access routes, and equipment cleaning stations;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase.*

Specialist will:

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of invasive and non-native species sampling sites and assessment of ROW effects;*
- *Conduct pre-clearing surveys to record invasive and non-native species information;*
- *Review Environmental Inspector and Monitor daily reports for identification of potential invasive and non-native species sampling sites;*
- *Design and conduct specific survey methods that sample invasive and non-native species sites for composition and abundance to verify accuracy of EIS predictions and effectiveness of mitigation and control measures implemented;*
- *Adhere to Manitoba's Hydro's Biosecurity procedures;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on invasive and non-native species discovered through monitoring activities;*
- *Prescribe vegetation management options for invasive species control where required;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Decision Trigger(s)/Threshold(s) for Action:

- *Establishment and spread of invasive species along ROW.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed. Discuss the species, nature of spread and management options.*

Approach to Adaptive Management:

- *Passive - Implement current mitigation measures for existing patches of invasive species and discuss monitoring results with the Regulator and or the local weed supervisor regarding the species, nature of spread and management options.*

4.4.4 Traditional Use Plant Species

As outlined in Chapter 11 of the EIS, a change in traditional plant species abundance and distribution is a concern to First Nations and Metis. Plants and plant communities have been identified as being particularly important to First Nations and Metis. These areas are valued for their provision of resources used by First Nations and Metis including gathering of food and medicines and harvesting plants and trees.

The ATKS Management Team (Black River First Nation, Swan Lake First Nation, Long Plain First Nation), Peguis First Nation, Dakota Plains Wahpeton Oyate, Roseau River Anishinabe First Nation, Sagkeeng First Nation and the Manitoba Metis Federation (MMF) submitted ATK reports for the proposed Project.

To validate EIS predictions, verify implementation of mitigation measures, and to allow for adaptive management, pre-construction, construction and post-construction monitoring will identify changes in baseline composition and abundance of traditional use plant species.

Objective(s):

- *Document the composition of vegetation at known traditional use sites;*
- *Confirm actual Project effects on vegetation at known traditional use sites; and*
- *Verify the implementation and effectiveness of protection measures at known traditional use sites.*

Applicable Project Component(s): *New RoW for D604I Transmission Line*

Monitoring Activities:

Table 4-6 Traditional Use Plant Species

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurable Parameter(s)
Traditional Use Plant Species Survey	*Baseline Information*	*Desktop, field surveys and ATK reports,*	*Species names and locations*	*Sites identified in PDA, LAA*	*1 field season*	*Once*	*2014*	*Species composition and abundance*
	Pre-construction	*Ground surveys to identify traditional use plant species*	*Species occurrence*	*PDA*	*Pre-construction*	*Once*	*Summer*	*Species composition and abundance*
	Construction	*Ground surveys to confirm traditional use plant species presence and monitor protection measures*	*Species occurrence*	*ESS*	*During construction*	*Annual*	*Summer*	*Species composition and abundance*
	Post-construction	*Ground surveys to confirm traditional use plant species presence*	*Species occurrence*	*ESS*	*2 yrs.*	*Annual*	*Summer*	*Species composition and abundance*

Manitoba Hydro will:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, Metis and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of tradition use plant species and mitigation performance at ESS sites within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase.*

Specialist will:

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of sampling sites for plant communities important to First Nations and Metis and assessment of ROW effects;*
- *Conduct pre-clearing vegetation surveys to record baseline information within known plant communities important to First Nations and Metis;*
- *Review Environmental Inspector and Monitor daily reports for identification of potential traditional use plant species sampling sites;*
- *Design and conduct specific survey methods that sample known locations of traditional use plant species for composition and to verify accuracy of EIS predictions and effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on traditional use plant species discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

First Nations and the MMF may be invited to:

- *Provide historical and current data of traditional use plant species important to First Nations and Metis people to inform ongoing analyses related to biophysical monitoring; and*
- *Provide guidance regarding mitigation strategies should unanticipated effects occur as a result of the project.*

Decision Trigger(s)/Threshold(s) for Action:

- *Significant decrease in abundance of traditional use plant species (excluding trees) at locations identified by communities in the PDA.*
    - *Action: Report results to community that identified the traditional use areas and discuss any potential mitigation measures, such as revised vegetation management options.*

Approach to Adaptive Management:

- *Passive - Report results to communities that identified the traditional use areas and discuss any potential mitigation measures.*

4.5 WILDLIFE AND WILDLIFE HABITAT

4.5.1 Amphibians

As outlined in Chapter 9 of the EIS, herptiles favoring wetland habitat for part or all of their life cycle may be vulnerable to changes in habitat availability as a result of Project activity. The northern leopard frog (*Lithobates pipiens*) is a Species of Conservation Concern (SOCC) found in wetlands within the Project's Regional Assessment Area (RAA). Eastern tiger salamanders (*Ambystoma tigrinum)* will also be included in amphibian monitoring because their distribution and population status are poorly understood in southeastern Manitoba, and may extend into the RAA.

Wetland monitoring, including water quality data collection and amphibian surveys, help characterize baseline habitat conditions and identify sensitive sites at permanent and semi-permanent ponds. Wetland water-quality information aids in providing baseline conditions or 'benchmark' data for comparison of pre-Project water quality to future construction-phase water quality conditions. Amphibian surveys also aid in providing benchmark data, as related to SOCC abundance and richness, as well as breeding and wintering staging activity for pre- and post-construction conditions.

To establish a robust benchmark for wetland condition prior to construction, further amphibian surveys and water quality parameters will be measured at wetlands known to support northern leopard frogs. To validate EIS predictions and verify implementation of mitigation protocols, construction-phase wetland monitoring will take place during the amphibian breeding and developmental periods immediately following construction activity with the goal of detecting any changes in water quality and breeding activity following construction activity. Sites examined will include wetlands and waterbodies previously surveyed (Wildlife and Wildlife Habitat TDR 2015) and found to support northern leopard frogs. Construction phase monitoring would be conducted at wetlands within 500 m of locations where Project activity had occurred. This buffer represents the maximum activity restriction setback for northern leopard frog breeding ponds (Environment Canada 2009).

Objectives:

- *To monitor the presence of amphibians (as represented by the northern leopard frog and eastern tiger salamander) and water quality conditions at wetlands located within the PDA; and*
- *To verify the implementation and effectiveness of prescribed mitigation.*

Applicable Project Component(s): *New ROW for the D604I Transmission Line*

Monitoring Activities:

Table 4-7 Amphibians

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Wetland Amphibian Survey	*Baseline information*	*Assess water quality & presence of northern leopard frogs and eastern tiger salamanders at wetland sites located on or adjacent to the PDA*	*Water quality; Presence of northern leopard frogs, eastern tiger salamanders*	*Suitable wetland habitat on or adjacent to PDA*	*1 field season*	*Once*	*2014*	*pH, electrical conductivity, TDS, TSS, water temperature, turbidity; Presence/absence of breeding activity & individual frogs/salamanders*
	Pre-construction	*Assess water quality & presence of northern leopard frogs and eastern tiger salamanders at wetland sites located on PDA*	*Water quality; Presence of northern leopard frogs, eastern tiger salamanders*	*Suitable wetland habitat on or adjacent to the PDA*	*Pre-construction*	*Annual*	*Spring, summer and Fall*	*pH, electrical conductivity, TDS, TSS, water temperature, turbidity; Presence/absence of breeding activity & individual frogs/salamanders*

	Post-construction	*Revisit wetland sites to monitor presence of northern leopard frogs and eastern tiger salamanders and assess whether wetlands mitigation was successful*	*Riparian buffer, Water quality; Presence of northern leopard frogs, eastern tiger salamander*	*Suitable wetland habitat on or adjacent to PDA*	*2 yrs.*	*Annual*	*Spring, Summer and Fall*	*Riparian buffer width (m); pH, electrical conductivity, TDS, TSS, water temperature, turbidity; Presence/absence of breeding activity & individual frogs/salamanders*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, the MMF, Indigenous organizations and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of northern leopard frogs and eastern tiger salamanders and mitigation performance at ESS sites within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase.*

Specialist will:

- *Use FRI habitat classifications, digital ortho-rectified imagery, and/or georeferenced video/photo products provided by Manitoba Hydro for identification of wetland habitat;*
- *Conduct pre-construction surveys during peak breeding activity in spring, summer larval stage and during overwintering staging in the fall to identify important wetland sensitive sites and to monitor possible changes to wetland habitat post construction;*
- *Review Environmental Inspector daily reports for identification of additional northern leopard frog or eastern tiger salamander habitat;*
- *Design and conduct specific survey methods to verify effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on northern leopard frog or eastern tiger salamander discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Thresholds for Action/Decision Triggers:

- *Insufficient riparian buffer retained.*
  - *Action: Implement site specific rehabilitation measures as required.*

- *Significant decline of wetland water quality within or adjacent to PDA.*
    - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*
- *Decline of breeding activity of northern leopard frog near proposed infrastructure.*
    - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*
- *Discovery of an eastern tiger salamander.*
    - *Report to SD Conservation Data Centre as incidents are detected.*

Approach to Adaptive Management:

- *Passive - Implement environmental protection plan measures (i.e. implement site-specific rehabilitation measures) and adjust measures when deemed necessary.*

4.5.2 Common Garter Snakes

As outlined in Chapter 9 the EIS, the dependency of common garter snakes on overwintering den sites leaves snake populations vulnerable to disturbance, degradation and local extirpation (Kendell 1998). Common garter snakes overwinter in hibernacula or dens which are located in specific substrates, including limestone bedrock. No hibernacula were identified during desktop review, field studies or Key Person Interviews (Wildlife and Wildlife Habitat TDR). For this project, disturbance to snake hibernacula was identified as a key Project-related potential effect. Transmission line tower installation at or near suitable garter snake habitat could negatively impact local garter snake populations.

Potential garter snake habitat occurs within and adjacent to the PDA. Areas around Lonesand and Sundown, MB have the highest potential to support hibernacula based on surficial limestone mapping and abundance of snakes observed crossing roads and highways. In order to reduce the potential for Project-related disturbance, pre-construction (i.e. prior to RoW clearing) surveys for snake hibernacula at tower sites will occur in areas where the PDA overlaps with Sundown Road (near Lonesand Lake). If snake hibernacula are found, the effectiveness of mitigation applied (*i.e.* 200 m buffer) will be verified through follow-up monitoring.

Objectives:

- *To identify common garter snake hibernaculum sites located near proposed tower sites; and*
- *To verify the implementation and effectiveness of mitigation measures.*

Applicable Project Component(s): *New ROW for the D604I Transmission Line.*

Monitoring Activities:

Table 4-8 Common Garter Snakes

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Snake Hibernacula Survey	*Baseline Information*	*Desktop surveys*	*Presence of garter snake hibernacula*	*PDA, LAA, RAA*	*1 field season*	*Once*	*2014*	*Presence/absence of hibernacula*
	Pre-construction	*Investigate specific areas of the PDA having high potential to support snake hibernacula*	*Presence of garter snake hibernacula*	*Suitable garter snake hibernacula habitat within 200 m of proposed tower sites.*	*Pre-construction*	*Biannual*	*Spring and Fall*	*Presence/absence of hibernacula*
	Post-construction	*Revisit any identified snake hibernacula to monitor presence*	*Continued use of hibernacula by garter snakes*	*ESS*	*2 years*	*Biannual*	*Spring and Fall*	*Presence/absence of garter snakes in hibernacula*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*

- *Share results of key monitoring activities with interested local stakeholders, First Nations, the MMF, Indigenous organizations and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of potential snake hibernacula and mitigation performance at ESS sites within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase*.

Specialist will:

- *Use FRI habitat classifications, digital ortho-rectified imagery, and/or georeferenced video/photo products provided by Manitoba Hydro for identification of garter snake sampling sites and assessment of ROW effects;*
- *Where suitable garter snake habitat occurs, conduct pre-construction surveys for garter snake hibernacula during peak breeding activity in spring and/or possible movements back to hibernacula in the fall;*
- *Based on pre-construction survey results, provide recommendations for tower placement adjustments and/or mitigation measures to limit or avoid disturbance to hibernacula;*
- *Review Environmental Inspector and Monitor daily reports for identification of additional garter snake sampling sites;*
- *If suitable hibernacula habitat is identified, design and conduct specific survey methods that sample garter snake presence/absence to verify effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on common garter snake discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Thresholds for Action/Decision Triggers:

- *Presence of hibernacula within 200 m of tower sitting foundation.*
  - *Action: Report the site to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed. Develop and maintain an appropriate sized construction buffer around the hibernacula site.*
- *Hibernacula located within tower sitting foundation.*
  - *Action: Discuss tower design and location with Manitoba Hydro engineers.*

Approach to Adaptive Management:

- *Passive – Re-evaluate tower sitting if proposed on a hibernacula, apply environmental protection measures (i.e. construction buffer around the hibernacula site), and adjust when deemed necessary.*

4.5.3 Bird – Wire Collision

As outlined in Chapter 9 of the EIS, the presence of transmission lines in proximity to areas of high bird activity may lead to bird – wire collisions which result in the injury and death of birds. In these areas, larger-bodied species such as waterbirds (ducks and geese), cranes and herons, are particularly vulnerable to collisions due to their daily movement patterns, which peak during low light periods around sunrise and sunset. The degree of risk is influenced by several factors relating to transmission line design, location, and mitigation, as well as physical characteristics of the bird (species, size) and flight behavior (flocking, aerial courtship displays). Manitoba Hydro has committed to installing bird diverters along transmission line sections which transect areas of high bird activity that were found during EIS studies. Field surveys have served to verify Environmentally Sensitive Sites (ESS) for birds and gauge the level of bird activity at these sites at biological important times such as during migration and the rearing of offspring. The monitoring program will involve post-construction phase studies to quantify any mortality to birds caused by the transmission line and will direct adaptive mitigation strategies to reduce or prevent any future mortality events.

Objectives:

- *Monitor avian mortality caused by transmission line infrastructure using a control-impact study design; and*
- *Determine the effectiveness of mitigation measures and, if appropriate, propose revisions to the existing plans or develop new mitigation options should high levels of avian mortality occur as a result of the transmission line.*

Applicable Project Component(s): *D604I Transmission Line*

Monitoring Activities:

Table 4-9 Bird – Wire Collision

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Bird- Wire Collision Survey	*Baseline information*	*Desktop and field surveys*	*Collision rates*	*RAA*	*1 field season*	*Once*	*2014*	*Mortality Presence/Absence*
	Post-construction	*Bird wire collision survey to evaluate diverter effectiveness*	*Mortality*	*Bird ESS sites*	*2 yrs.*	*Annually*	*Spring, Summer and Fall*	*Mortality Presence/Absence*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows access to daily inspection and monitoring reports from construction period;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, the MMF, Indigenous organizations and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of high bird activity areas within project footprint;*
- *Record observations with photo and waypoint and store in EPIMS; and*

- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase*.

Specialist will:

- *Review Environmental Inspector and Monitor daily reports for identification of bird-wire collision sampling sites;*
- *Design and conduct specific survey methods that sample bird presence/absence, abundance, mortality and flight paths to verify accuracy of EIS predictions and effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on birds discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Thresholds for Action/Decision Triggers:

- *Bird mortality statistics are above expected based on baseline abundance/flightpath surveys.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed, and if required, adjust mitigation measures.*

Approach to Adaptive Management:

- *Active – Test the hypothesis that bird diverters are sufficient in reducing mortality of birds due to collisions with the transmission line to a level that is negligible in areas determined to have a high risk of collision. Discuss monitoring results with the SD and if required, adjust mitigation measures.*

4.5.4 Sharp-tailed Grouse Lekking Sites

As identified in the EIS, grassland birds have experienced widespread habitat loss through most of the prairies, including Sharp-tailed Grouse (*Tympanuchus phasianellus*). Three active sharp-tailed grouse leks supporting approximately 25 sharp-tailed grouse were identified in the Regional Assessment Area (RAA) during the 2014 surveys. All three leks occur adjacent to the New ROW in areas southwest of Ste. Genevieve, MB and north and south of La Broquerie, MB. Sharp-tailed grouse may be affected by the temporary loss of some habitat at tower sites and the compaction of vegetative concealment cover along the New ROW. Sharp-tailed Grouse are particularly vulnerable to increased rates of predation if birds of prey (raptors) use transmission line towers as perches when hunting or nesting, near lek sites. This monitoring program will validate EIS predictions and work to determine any project-related effects to sharp-tail grouse (pre- versus post-construction).

Objectives:

- *Identify the presence of leks along the transmission line;*
- *Monitor reaction behaviours of sharp-tailed grouse on leks in proximity to the transmission line compared to that at control sites;*
- *Identify an association between raptor and ground predators, sharp-tailed grouse and transmission lines; and*
- *Determine the effectiveness of mitigation measures and, if appropriate, propose revisions to the existing plans or develop new mitigation options should unexpected impacts to sharp-tailed grouse occur as a result of the transmission line.*

Applicable Project Component(s): *New ROW for the D604I Transmission Line*

Monitoring Activities:

Table 4-10 Sharp-tailed Grouse Lekking Sites

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Sharp-tailed Grouse Lek Survey	*Baseline information*	*Desktop and field surveys*	*Lek location, number of grouse*	*RAA*	*1 field season*	*Once*	*2014*	*Presence/Absence, Abundance*
	Pre-construction	*Lek site identification, flush count and camera trap survey*	*Lek abundance, number of males and behavioural changes*	*Where suitable breeding habitat overlaps with Project components (e.g., towers) and at Control sites.*	*Pre-construction*	*Once*	*April 1 – May 31*	*Presence/Absence Abundance, Time budget behaviour, Number of raptor nests, Ground predator abundance*
	Construction	*Flush count and camera trap survey*	*Lek abundance, number of males and behavioural changes*	*Leks found within 1500 m of right-of-way (ROW) where construction activities overlap lekking activity and at Control sites.*	*During construction*	*Annual*	*April 1 - May 31*	*Presence/Absence Abundance, Time budget behaviour, Number of raptor nests, Ground predator abundance*

	Post-construction	*Flush count and camera trap survey*	*Lek abundance, number of males and behavioural changes*	*Leks found within 1500 m of ROW where operation activities overlap lekking activity*	*Up to 10 yrs.*	*Annual*	*April 1 - May 31*	*Presence/Absence Abundance, Time budget behaviour, Number of raptor nests, Ground predator abundance*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows access to daily inspection and monitoring reports from construction period;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, the MMF, Indigenous organizations; and*
- *Participate as a stakeholder in committees or working groups whose purpose is for the ongoing conservation of wildlife.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of lekking sites and mitigation performance at ESS sites within project footprint;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase*.

Specialist will:

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of potential lekking sites;*
- *Conduct pre-construction surveys for lekking sites within 1500m of ROW;*
- *Review Environmental Inspector and Monitor daily reports for identification of lekking sites;*
- *Review Manitoba Hydro ungulate aerial survey data for sharp-tailed grouse sightings;*
- *Design and conduct specific survey methods that sample bird presence/absence, abundance, mortality and behaviour to verify accuracy of EIS predictions and effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on lekking sites discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Manitoba Sustainable Development will:

- *Provide guidance regarding mitigation strategies should unanticipated effects occur as a result of the project.*

Thresholds for Action/Decision Triggers:

- *Leks discovered near project footprint.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*
- *Leks are disturbed by construction activities.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed. Develop and maintain an appropriate sized construction buffer around the lek site until the breeding season is over.*
- *Leks near project footprint have significant reduction in male grouse abundance, or alert behavior, compared to pre-construction baseline and control lekking sites away from the project.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed. If required implement site specific vegetation management, and or install raptor perch deterrents.*
- *Raptor nests or perching on transmission towers near leks.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed. If required, implement site specific vegetation management, and or install raptor perch deterrents.*

Approach to Adaptive Management:

- *Active -Test the hypothesis the installation of the transmission line affects the abundance of male sharp-tailed grouse displaying at lekking sites, and 2) that the installation of the transmission line increases the abundance of alert behaviours and decreases time spent on the lek due to predator flushes. Discuss monitoring results with the SD and if required, implement best management practices (i.e. implement site specific vegetation management, install raptor perch deterrents).*

4.5.5 Bird Species of Conservation Concern

Species of conservation concern (SOCC) include species of that are protected under MESEA, SARA or are listed as rare by the MBCDC. These species generally exist in low numbers and are sensitive to changes in habitat. As described under SARA (subsection 79(2)), monitoring of potential adverse project effects on SARA-listed wildlife species is required (SARA 2011). Fourteen bird species of conservation concern were identified in the RAA during the 2014 surveys. Of particular concern for this Project, and the only bird species within the RAA to have defined critical habitat, is the Golden-winged Warbler (*Vermivora chrysoptera*). Critical habitat overlaps with the eastern part of the RAA near Ross, MB, south through Richer, and up to La Broquerie. Eight golden-winged warblers were detected during the 2014 breeding bird surveys at locations south of Richer, east of La Broquerie, west of Marchand and northwest of Lonesand. Information from the recent *Manitoba Breeding Bird Atlas* survey effort was also used to understand the spatial distribution of golden-winged warblers in the LAA and RAA. Manitoba Hydro has been a supporter of the Manitoba Breeding Bird Atlas since its inception and considers it efforts very valuable to the ongoing monitoring of species of conservation concern. Field observations from this project as with all Manitoba Hydro major projects will continue to be shared and incorporated into the atlas, and with the MBCDC.

ROW clearing is the primary project activity that may result in a direct and measurable change in habitat for bird species of conservation concern, particularly for Golden-winged warbler, because it involves clearing in forested and successional areas of the ROW and grubbing at transmission tower sites. Indirect effects on habitat are those that reduce the effectiveness of existing or remaining habitat for wildlife. Indirect effects may occur through sensory disturbances (e.g., noise, light) causing temporary displacement of some wildlife from otherwise suitable habitat. In recognition of this, Manitoba Hydro has developed a “Right-of-Way Habitat Management Plan for Managing Critical Golden-winged Warbler Habitat during Construction and Operation of the Manitoba–Minnesota Transmission Project”. Therefore, the monitoring program will validate EIS predictions, verify implementation of mitigation measures, and concentrate on determining any project-related effects to golden-winged warbler (pre- versus post-disturbance).

Objectives:

- *Identify the location of golden-winged warbler within or in close proximity to the Project footprint with the purpose of establishing a Before-After-Control-Impact monitoring program for known individuals and/or groups;*
- *Monitor golden-winged warbler in close proximity to the transmission line and compare habitat use and density to nearby control sites; and*
- *Determine the effectiveness of mitigation measures and, if appropriate, propose revisions to the existing plans or develop new mitigation options should unexpected impacts to birds occur as a result of construction or operation activities.*

Applicable Project Component(s): *All Project Components*

Monitoring Activities:

Table 4-11 Bird Species of Conservation Concern

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Bird Species of Conservation Concern Survey with a focus on golden-winged warbler	*Baseline information*	*Desktop and field surveys*	*Presence/Abundance, location*	*RAA*	*1 field season*	*Once*	*2014*	*Species richness, density/habitat type*
	Pre-construction	*Call-playback and vegetation surveys*	*Presence of golden-winged warbler and habitat suitability*	*Golden-winged warbler Habitat Management Sites (HMS) and PDA*	*One-time*	*Once*	*April 1 - July 31*	*Presence/Absence Abundance, Density, Habitat (Ha)*
	Construction	*Call-playback and vegetation surveys*	*Presence of golden-winged warbler and habitat suitability*	*Golden-winged warbler HMS and PDA*	*During construction*	*Annual*	*April 1 - July 31*	*Presence/Absence Abundance, Density, Habitat (Ha)*
	Post-construction	*Call-playback and vegetation surveys*	*Presence of golden-winged warbler and habitat suitability*	*Golden-winged warbler HMS and PDA*	*2 yrs.*	*Annual*	*April 1 - July 31*	*Presence/Absence Abundance, Density, Habitat (Ha)*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows access to daily inspection and monitoring reports from construction period;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Share results of key monitoring activities with interested local stakeholders, First Nations the MMF, Indigenous organizations; and*
- *Participate as a stakeholder in committees or working groups whose purpose is for the ongoing conservation of wildlife.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of bird species of concern and mitigation performance at ESS sites within project footprint;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase*.

Specialist will:

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of potential species of concern habitat;*
- *Review Environmental Inspector and Monitor daily reports for identification of bird species of concern, with a focus on golden-winged warbler;*
- *Design and conduct specific survey methods that sample habitat use and density;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on species of concern discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Manitoba Sustainable Development will:

- *Provide updated data of species of concern populations with a focus on golden-winged warbler to inform ongoing analyses related to biophysical monitoring (e.g. population survey data, observations, reports); and*
- *Provide guidance regarding mitigation strategies should unanticipated effects occur as a result of the project.*

Thresholds for Action/Decision Triggers:

- *Species of concern are observed within the project footprint and at control locations.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*
- *Habitat Management Sites (HMS's) within project footprint have significant reduction in density compared to pre-construction baseline and control point counts away from the project.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*

Approach to Adaptive Management:

- *Active - Implement site-specific clearing measures and habitat management plans that are outlined in "Right-of-Way Habitat Management Plan for Managing Critical Golden-winged Warbler Habitat during Construction and Operation of the Manitoba–Minnesota Transmission Project, testing the hypothesis that clearing measures can promote the creation of suitable habitat and minimize the adverse affects of transmission line clearing on habitat quality and density of golden-winged warbler. Discussing monitoring results with SD to help determine the success of site specific clearing and vegetation management schedules or prescriptions.*

4.5.6 Golden-Winged Warbler Habitat

The Golden-winged warbler (*Vermivora chrysoptera*) is a species of conservation concern listed as Threatened by *The Endangered Species and Ecosystems Act* (MESEA) in Manitoba, the federal *Species at Risk Act* (SARA), and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). In Manitoba, the golden-winged warbler is ranked as uncommon throughout its range or in the province, with breeding status (S3B), by the Manitoba Conservation Data Centre (MBCDC). The golden-winged warbler is a ground-nesting songbird that breeds in shrubby habitats adjacent to mature stands of deciduous and mixedwood forest. It uses forest edge habitat and openings containing shrubs and grasses. Habitat is often regenerated by natural and human disturbances, including hydroelectric utility corridors, which can be preferred habitat for this species if corridors are maintained in a manner that retains shrubs and herbs along forest edges.

Golden-winged warblers were identified as a species requiring careful consideration due to their Threatened designation, and the identification of critical habitat along a portion of the Project area. As outlined in the environmental assessment, Manitoba Hydro carried out detailed studies on the breeding locations, habitat preferences, and species biology in preparing the Construction Environmental Protection Plan and Environmental Monitoring Plan. As part of Manitoba Hydro's Research and Development program, Manitoba Hydro was a major sponsor of Bird Studies Canada - Manitoba Breeding Bird Atlas. This project has helped identify the breeding range of all birds in Manitoba, including the golden-winged warbler.

Clearing of the ROW is the primary project activity that may result in a change in habitat for the golden-winged warbler. In recognition of this, Manitoba Hydro has developed a "Right-of-Way Habitat Management Plan for Managing Critical Golden-winged Warbler Habitat during Construction and Operation of the Manitoba–Minnesota Transmission Project". To validate EIS predictions, verify implementation of mitigation measures, and to allow for adaptive management, pre-construction, construction and post-construction monitoring will identify changes to golden-winged warbler habitat.

Objectives

- *Analyze pre-construction imagery for golden-winged warbler habitat to confirm location and collect baseline vegetation information;*
- *Monitoring to document the composition and abundance of vegetation in golden-winged warbler habitat at selected sites; and*
- *Verify the implementation of the Golden-winged Warbler Habitat Management Plan, with respect to vegetation.*

Applicable Project Component(s): *New RoW for the D604I Transmission Line*

Monitoring Activities:

Table 4-7 Golden-Winged Warbler Habitat

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurable Parameter(s)
Golden-Winged Warbler Habitat Surveys	*Baseline Information*	*Desktop and field surveys*	*Habitat location*	*Identified in PDA, LAA, RAA*	*1 field season*	*Once*	*2014*	*Habitat composition; auditory or visual detection*
	Pre-construction	*Analyse imagery to confirm location and record baseline vegetation information*	*Vegetation cover*	*PDA*	*Pre-construction*	*Once*	*Summer*	*Species composition and abundance*
	Construction	*Ground surveys to identify vegetation changes not discernible from habitat mapping*	*Vegetation cover*	*PDA*	*During construction*	*Annual*	*Summer*	*Species composition and abundance*

	Post-clearing	*Ground surveys to identify vegetation changes not discernible from habitat mapping*	*Vegetation cover*	*PDA*	*2yr.*	*Annual*	*Summer*	*Species composition and abundance*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Map golden-winged warbler habitat on project footprint;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, the MMF, Indigenous organizations and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of mitigation performance within project footprint;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase.*

Specialist will:

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of golden-winged warbler habitat sampling sites;*
- *Analyze imagery to confirm location of habitat and record baseline vegetation information;*
- *Review Environmental Inspector and Monitor daily reports for identification of other potential golden-winged warbler habitat sampling sites;*
- *Design and conduct specific survey methods that sample vegetation for composition and abundance of golden-winged warbler habitat;*
- *Adhere to Manitoba's Hydro's Biosecurity procedures;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on golden-winged warbler habitat discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Decision Trigger(s)/Threshold(s) for Action:

- *Golden-winged warbler habitat has been disturbed by construction activities, where prescriptions outlined in the Habitat Management Plan were not implemented.*
  - *Action: Implement site specific rehabilitation measures as required.*

- *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*

Approach to Adaptive Management:

- *Active - Implement site-specific clearing measures and habitat management measures that are outlined in "Right-of-Way Habitat Management Plan for Managing Critical Golden-winged Warbler Habitat during Construction and Operation of the Manitoba–Minnesota Transmission Project, testing the hypothesis that clearing measures can promote the creation of suitable habitat and minimize the adverse affects of transmission line clearing on habitat quality and density of golden-winged warbler. Discussing monitoring results with SD to help determine the success of site specific clearing and vegetation management schedules or prescriptions.*

4.5.7 Birds of Prey

As described in Chapter 9 of the EIS, raptor nests are considered important habitat features as they can be used year after year by different species. While land clearing of the ROW has the potential to destroy raptor nests, the resulting transmission towers have shown to provide suitable nesting habitat where electrical safety concerns are not an issue. Only one raptor nest (unknown species) was identified near, but outside of the ROW during the 2014 aerial surveys (northwest of Ste-Genevieve, approximately 140 m west of the FPR); however, the absence of evidence of nests within the ROW does not preclude the possibility that a nest was overlooked or that a new nest has not appeared prior to clearing of the ROW. As such, ongoing ROW surveys for raptor nests are proposed for the purpose of determining removal or relocation once nest has been abandoned.

Objectives:

- *Identify raptor nests in Project footprint that require removal or relocation*

Applicable Project Component(s): *D604I Transmission Line and Glenboro South Station Transmission Line Modifications*

Monitoring Activities:

Table 4-12 Birds of Prey

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurable Parameter(s)
Raptor Nest Survey	*Baseline information*	*Field survey*	*Location*	*RAA*	*1 field season*	*Once*	*2014*	*Presence/Absence*
	Pre-construction	*Raptor Nest Search*	*Nest site locations*	*PDA*	*Pre-construction*	*Once*	*Fall*	*Presence/Absence of nests, Number of nests requiring removal or relocation*

Manitoba Hydro is committed to:

- *Supply nest site locations, nest removal or relocation activities and any mortality locations observed to SD; and*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages project monitoring data and allows access to daily inspection and monitoring reports from construction period and a Transmission Line Maintenance System that records raptor nest observations and nest relocations during operation period.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of raptor nests, mortality and mitigation performance at ESS sites within project footprint;*
- *Work with Specialist, and based on pre-clearing survey results, flag buffer zones around bird nests;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase*.

Specialist will:

- *Conduct pre-clearing non-invasive nest surveys;*
- *Supply nest site locations to the Environmental Monitor and support for buffer zone selection;*

- *Review Environmental Inspector and monitor daily reports for identification of raptor nests;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on raptors discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Manitoba Sustainable Development may be requested to:

- *Provide guidance regarding mitigation strategies should unanticipated effects occur as a result of the project.*

Thresholds for Action/Decision Triggers:

- *Active nest site identified in pre-construction survey.*
    - *Action: Develop and maintain an appropriate sized construction buffer around the nest site until the nest is no longer active. If nest removal required, consult with SD biologist/manager and consider relocating near ROW.*

Approach to Adaptive Management:

- *Passive - Implement environmental protection plan measures and apply experience from previous transmission development projects (i.e. relocate nest or erect replacement nest tower).*

4.5.8 Ungulates and Predators

White-tailed deer are the predominate ungulate in the Project area. Transmission line corridors create habitat edges for white-tailed deer that provide an ecotone with high quality forage resources and accessible hiding cover in adjacent forest (Reimers *et al*. 2000). Disturbed vegetation is favoured by white-tailed deer because of the high diversity of plants in those areas (Stewart *et al.* 2011). Riparian areas, edge habitats, and linear features function as important habitats for travel and forage. Therefore, white-tailed deer are not particularly susceptible to the effects of habitat fragmentation, but may be susceptible to increased mortality associated with moving through higher risk areas created as a result of habitat loss and degradation of matrix quality (Stewart *et al*. 2011). The ROW and project-related access development may enhance predator mobility into areas that were previously secure habitat for prey species, decrease predator search times for prey, and/or make prey escape more difficult. Predators such as wolves and coyotes may benefit from enhanced access, leading to increased predation of ungulates.

Chapter 9 of the EIS identified a potential project effect of increased mortality risk from hunters and predators as a result of enhanced access of white-tailed deer habitat in eastern portions of the project, however the effect is expected to be minimal with no measurable effect on abundance anticipated. In that portion of the project, deer concentrations were noted in areas near Ste. Genevieve, Richer, Sundown and Piney, MB, and in the Watson P. Davidson and Spurwoods WMAs. The deer population in the area is considered to be stable. Habitat loss and sensory disturbance effects from ROW clearing are considered minimal and short-term, ultimately resulting in a positive effect of enhanced deciduous browse forage and increased edge habitat during the operation phase.

As described in Chapter 9 of the EIS, the Vita elk population in Manitoba (fall/winter range) is shared with Minnesota (summer range) and is the only elk population with potential to interact with the Project. Long-term census data in Manitoba for this elk population are limited, with a stable population estimate of 100-150. Annual surveys (2004-2008) conducted in Minnesota estimated the population at 112 – 215 elk (MDNR 2009). The Vita elk range in Manitoba may overlap an eastern portion of the Project RAA in areas near Vita and Caliento, however, EIS field studies did not detect elk occurrence within the ROW or Local Assessment Area (LAA; a 1 km buffer around the project footprint), or Regional Assessment Area (RAA; a 15 km buffer around the project footprint). The closest observations during baseline surveys were 20 km from the final preferred route. The ROW avoids the core areas known to support elk near Vita and Arbakka, with no anticipated significant adverse project effects on the population. Since the filing of the EIS, Manitoba Hydro has joined with the RM of Stuartburn, Manitoba Sustainable Development, and the Nature Conservancy Canada to form the *Vita Cross-Border Elk Monitoring Partnership*. This new partnership is aimed to understand movements and home range size of elk by utilizing GPS collar technology in southeast Manitoba.

Moose were a common ungulate species in southeastern Manitoba prior to the late 1990s but populations in the region have since collapsed (Dettman 2015, pers. comm.; Leavesley 2015, pers. comm.; Rebizant 2015, pers. comm.). Despite the presence of suitable moose habitat (e.g., shrubby wetlands, alder swamps, sub-climax deciduous forest; Banfield 1974), moose are rare in southeastern Manitoba due to a combination of factors such as habitat fragmentation, predation by wolves, parasites, fires suppression, and unregulated harvest (Leavesley 2015, pers. comm.; Rebizant 2015, pers. comm). The areas south of the Watson P. Davidson Wildlife Management Area heading southeast to the Spur Woods WMA and south of Piney, in the RAA was identified as containing moose habitat, especially near Piney (Black River First Nation, Long Plain First Nation and Swan Lake First Nation 2015). No specific monitoring for moose is being proposed, however moose observations in all aerial survey and camera trap surveys will be documented.

White-tailed deer, elk and moose are highly valued by resource users, First Nations and Metis. White tailed deer are an important livelihood for local outfitters. There is public concern that the Project may increase white-tailed deer vulnerability to mortality (hunting and predation) resulting from increased access. Change in habitat availability associated with ROW clearing and mortality resulting from increased access is anticipated to be negligible for the Vita elk population because routing of the ROW avoids the core areas known to support them.

Monitoring will focus on validating EIS predictions, verifying the implementation of mitigation measures, and assist in determining if project-related access has altered distribution and occurrence of ungulates and predators, resulting is altered mortality-risk from hunters and predators, relative to baseline state (pre- versus post-disturbance).

Objective(s):

- *Expanding the baseline knowledge of occurrence, distribution and abundance of ungulates and predators interacting with the Project;*
- *Investigating the influence of the Project on white-tailed deer at two scales:*
    a. *Local Scale: Spatial dynamics using indicators such as occurrence and distribution patterns relative to Project-related access development before and after construction in relation to predator occurrence and project-related linear disturbance. Mortality risks will be assessed as they pertain to predicted Project effects if sufficient and suitable data can be acquired.*
    b. *Range Scale: Population occurrence and distribution in relation to project-related changes in habitat availability (fragmentation/increased edge habitat) and access.*

Applicable Project Component(s): *New ROW for the D604I Transmission Line*

Monitoring Activities:

Table 4-13 Ungulates and Predators

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Distribution / Occurrence Mapping Surveys and Camera Trap Survey	*Baseline Information*	*Desktop, winter aerial surveys, remote IR camera traps*	*Occurrence and / or seasonal distribution relative to project infrastructure and wolf distribution*	*Survey blocks on various portions of RAA*	*1 field season*	*Annual (aerial component)* *Continuous (ground component*	*2014*	*Range scale change in population occurrence and seasonal distribution*
	Pre-construction	*Winter aerial surveys and remote IR camera traps*	*Occurrence and / or seasonal distribution relative to project infrastructure and wolf distribution*	*Survey blocks on eastern portion of RAA*	*2 field season*	*Annual (aerial component)* *Continuous (ground component*	*2015, 2016*	*Range scale change in population occurrence and seasonal distribution*
	Construction	*Winter aerial surveys and remote IR camera traps*	*Change in occurrence and / or seasonal distribution relative to project infrastructure and wolf distribution*	*Survey blocks on eastern portion of RAA*	*During construction*	*Annual (aerial component)* *Continuous (ground component*	*Winter (aerial component)* *Year-round (ground component)*	*Range scale change in population occurrence and seasonal distribution*
	Post-construction	*Winter aerial surveys and remote IR camera traps*	*Change in occurrence and / or seasonal distribution relative to project infrastructure and wolf distribution*	*Survey blocks on eastern portion of RAA*	*2 yrs.*	*Annual (aerial component)* *Continuous (ground component)*	*Winter (aerial component)* *Year-round (ground component)*	*Range scale change in population occurrence and seasonal distribution*

Vehicle Collision Statistic Gathering	*Construction*	*Gather statistics on project-related vehicle collisions*	*White-tailed Deer/Moose vehicle collisions*	*RAA*	*During construction*	*Continuous*	*Year-round*	*Number of project related deer/moose vehicle collisions*
Mineral Lick Survey	*Baseline Information*	*Desktop and Field surveys*	*Location of mineral licks*	*RAA*	*1 field season*	*Annual*	*2014*	*Location of mineral licks*
	Pre-construction	*Field survey*	*Location of mineral licks*	*LAA*	*Pre-construction*	*Annual*	*2015, 2016*	*Location of mineral licks*
Support the "Vita Cross-Border Elk Monitoring Partnership" (RM of Stuartburn, Nature Conservancy Canada, Manitoba Sustainable Development)	*Pre-construction, Construction*	*Work with partners to study regional elk movements and home range.*	*Change in movement of elk into project study area*	*Adjacent to the RAA*	*Pre-construction tthough construction*	*Annual*	*Year-round*	*Movement of collared elk into the RAA, LAA, and PDA*
Support a Memorial University PhD project titled "Testing the Effects of Hydropower Transmission Line Right-of-Ways on Wildlife Movements and Predator-Prey Dynamics"	*Pre-construction, Construction*	*Work with a PhD student to study wolf and prey movements in southeastern Manitoba in relation to linear features.*	*Rate of wildlife movement on hydropower transmission line right-of-ways*	*Southeast Manitoba*	*Pre-construction through construction*	*Annual*	*Year-round*	*Change in population occurrence and distribution*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Share results of key monitoring activities with interested local stakeholders , First Nations and Metis; and*
- *Participate as a stakeholder in relevant committees or working groups whose purpose is for the ongoing conservation of wildlife.*
- *Support the Vita Cross-Border Elk Monitoring Partnership, and the Memorial University PhD student "Testing the Effects of Hydropower Transmission Line Right-of-Ways on Wildlife Movements and Predator-Prey Dynamics"*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of deer/moose and tracks, mineral licks, human access, and mortality sites within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase*.

Specialist will:

- *Use existing habitat suitability model to predict suitable ungulate habitat and to assess project footprint effects on habitat suitability and occurrence (pre-disturbance vs. post disturbance)*
- *Design and conduct specific survey methods to collect ungulate occurrence and distribution data during the disturbance and post-disturbance project phases, in relation to project linear disturbance and predator occurrence*
- *Collect and analyze ungulate and predator data to assess if there are project-related effects at the local (LAA) or landscape (RAA) scale on occurrence or seasonal distribution.*
- *Report on monitoring efforts, including identification to Manitoba Hydro of any unanticipated effects on ungulates discovered through monitoring activities*
- *Through an adaptive management process, make recommendations for ongoing improvements to the monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analyses*

Manitoba Sustainable Development may be requested to:

- *Provide guidance regarding mitigation strategies should unexpected impacts occur as a result of the transmission line*

Decision Trigger(s)/Threshold(s) for Action

- *More than five ungulate project related vehicle collisions per year.*
  - *Action: Provide SD Conservation Officer with GPS location and circumstances as incidents are detected.*
- *Elk observed within the LAA during aerial, camera trap surveys, or as a result of Vita Cross Border Elk Monitoring Partnership.*
  - *Action: Provide SD regional wildlife biologist/manager with GPS location and circumstances as incidents are detected. Consider altering, changing or removing human access points, adjusting vegetation management schedules or prescriptions, adjusting transmission line inspection and maintenance schedules and adjustments to elk monitoring activities.*
- *Identification of mineral lick within LAA.*
  - *Action: Provide SD regional wildlife biologist/manager with GPS location and proposed contingency action.*
- *Significant change in ungulate or predator occurrence or, distribution relative to baseline data.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed. Consider altering, changing or removing human access points, adjusting vegetation management schedules or prescriptions, adjusting transmission line inspection and maintenance schedule.*

Approach to Adaptive Management:

- *Active - Monitor elk movements into project area. Discuss results with SD and consider altering, changing or removing human access points, adjusting vegetation management schedules or prescriptions, adjusting transmission line inspection and maintenance schedules and adjustments to elk monitoring activities.*
- *Active - Test hypotheses related to the project adversely affecting distribution and mortality of white-tailed deer, wolves, or coyotes. Discuss results with SD and consider altering, changing or removing human access points, adjusting vegetation management schedules or prescriptions, adjusting transmission line inspection and maintenance schedules.*

4.5.9 Black Bear

Black bears favor high landscape connectivity and are sensitive to significant habitat changes and disturbances that affect access to, and availability of, food resources (Gunson 1993, Kindell & Van Manen 2007, Rogers & Allen 1987). They are widely distributed as a consequence of food resource availability both spatially and seasonally (Costello & Sage 1994, Gunson 1993, Pelton *et al.* 1999, Pelton 2000), but local abundance may be variable depending on annual severity of weather and food availability. Bears may avoid linear development with active human activity with typical avoidance distances of >200m (Forman *et al.* 1997). Denning black bears are particularly sensitive to noise disturbance within 1 km of dens (especially within 200m of dens), and may abandon the den in response to disturbance, especially early in the denning period (Linnell *et al*. 2000).

The EIS indicates the black bear population within the RAA is stable (possibly increasing), with common occurrence and widespread distribution throughout areas supporting forest habitat; particularly at the forest-agricultural habitat interface, primarily east and south of the Watson P. Davidson WMA. Field studies identified bear activity within the vicinity of the proposed D604I ROW, along existing transmission line M602F, and other forested parts of the RAA, occupying forested areas near the communities of Richer, Marchand, Sundown, and Piney.

Black bears are an important species to subsistence users (First Nations and Metis) and to the livelihood of local commercial outfitters. The Project footprint will contribute to habitat fragmentation of natural habitat patches that may affect bear habitat availability, occurrence, and distribution. Measurable changes in abundance are not anticipated as a result of Project activities or disturbance because of routing and scheduling of construction activities. Monitoring will focus on validating EIS predictions, verifying the implementation of mitigation measures, and assist in determining if project-related disturbance has significantly impacted habitat availability, or altered occurrence and distribution relative to baseline state,

Objective(s):

- *Expand the baseline knowledge of distribution, abundance, and population characteristics of black bears interacting with the Project*
- *Investigating the influence of the Project on black bear at two scales:*
  a. *Local Scale: Monitor the influence of the Project on black bear prevalence in areas along the ROW using remote IR cameras to examine spatial dynamics using indicators such as local occurrence and distribution patterns relative to Project-related access development before and after construction, where pre-existing baseline data permits.*
  b. *Range Scale: Habitat suitability modeling to assess population occurrence and distribution in relation to project-related changes in habitat availability (fragmentation/increased edge habitat) and access.*

Applicable Project Component(s): *New ROW for the D604I Transmission Line*

Monitoring Activities:

Table 4-14 Black Bear

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Camera Trap Survey	*Baseline information*	*Monitor black bear prevalence using remote IR cameras*	*Prevalence and occurrence*	*RAA*	*1 field season*	*Continuous*	*2014*	*# of Black bears observed, Change in prevalence*
	Pre-construction,	*Monitor black bear prevalence using remote IR cameras*	*Change in prevalence and occurrence in relation to the project footprint*	*LAA*	*1 year*	*Continuous*	*2015, 2016*	*# of Black bears observed, Change in prevalence*
	Construction	*Monitor black bear prevalence using remote IR cameras*	*Change in prevalence and occurrence in relation to the project footprint*	*LAA*	*During construction*	*Continuous*	*Year- round*	*# of Black bears observed, Change in prevalence*

Table 4-14 Black Bear

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
	Post-construction	*Monitor black bear prevalence using remote IR cameras*	*Change in prevalence and occurrence in relation to the project footprint*	*LAA*	*2 yrs.*	*Continuous*	*Year- round*	*# of Black bears observed, Change in prevalence*

Manitoba Hydro is committed to:

- *Provide camera trap equipment;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, the MMF, Indigenous organizations; and*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of bear, dens and tracks, ungulate mortality sites within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase*.

Specialist will:

- *Use digital ortho-rectified imagery and geospatial datasets provided by Manitoba Hydro to develop a habitat suitability model to predict suitable black bear habitat, to predict project footprint effects on black bear habitat suitability and occurrence (pre-disturbance vs. post disturbance), and to inform survey design*
- *Design and conduct camera trap survey to collect black bear occurrence and distribution data*
- *Collect and analyze black bear data to assess if there are project-related effects at the local or regional scale on occurrence and distribution.*
- *Report on monitoring efforts, including identification to Manitoba Hydro of any unanticipated effects on black bear discovered through monitoring activities*
- *Through an adaptive management process, make recommendations for ongoing improvements to the monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analyses*

Manitoba Sustainable Development may be requested to:

- *Provide guidance regarding mitigation strategies should unexpected impacts occur as a result of the transmission line*

Decision Trigger(s)/Threshold(s) for Action

- *Bear den location is detected within LAA by project staff.*
  - *Action: Provide Conservation Officer with GPS location and circumstances as incidents are detected. Develop and maintain an appropriate sized construction buffer around the black bear den site until the den is not longer active.*
- *Significant project-related change in black bear occurrence.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*

Approach to Adaptive Management:

- *Passive - Implement environmental protection plan measures and apply experience from previous transmission development projects (i.e. apply construction buffer, implement site-specific rehabilitation measures).*

4.6 SOCIO-ECONOMIC AND RESOURCE USE

4.6.1 Employment and Economy

The economic monitoring activities that will occur during construction include employment, income and business outcomes associated with the project. The estimates of the economic impact of the project are documented in the EIS, and the intent is to compare predictions made in the EIS to actuals.

The EIS estimated the workforce for all project components. Estimates vary by project component and year depending on the activity. The majority of employment opportunities will occur during the construction phase of the project with fewer opportunities during the operations phase of the project. Due to seasonality constraints for some aspects of the work certain project components will have activities concentrated at specific times of the year, while other project construction components will occur throughout the entire year. Monitoring employment results will provide data on actuals incurred on the project and will provide an indication of the overall economic impact of the project.

Construction of the project will result in business opportunities locally, regionally and throughout the province and Canada. Manitoba Hydro has policies in place to promote local businesses on its projects. The goal is to enhance business relationships with the communities and to assist them in building capacity and competitiveness of their businesses through involvement in Manitoba Hydro contracts. Monitoring both direct and indirect business effects will provide data on the success and effectiveness of efforts to enhance local business participation, as well as an indication of the general economic impact of the project in communities in the vicinity of the Project.

Labour income is an important indicator of direct economic impact of a project. Income levels also affect the general standard of living of individuals and families by influencing the acquisition of basic human needs including housing, food and clothing. Consequently, monitoring income levels can provide a general indication of a project's contribution to the overall standard of living. The estimate of labour income reflects the direct income of wages and salaries associated with direct person-years employment. Regarding taxation, direct taxes paid reflect incremental revenue sources generated for governments as a result of the project. The incremental revenues, in turn, contribute to societal programs and general well-being.

Objective(s)

- *The objective of economic monitoring it to gather project information relating to economic parameters and compare to predictions made in the EIS regarding employment and workforce, business opportunities, labour income and tax revenue.*

Applicable Project Component(s): *All Project Components*

Monitoring Activities:

Table 4-15 Employment and Economy

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Project Employment Reporting	*Construction*	*Determine project employment associated with the project*	*Collect and report using Construction Employment Database.*	*All project components*	*During construction*	*Annual*	*April*	*Total person years of employment for each project component,* *Total number of hire,* *Total number of employees,* *Type (job classifications) of work available.*

Direct/Indirect Business Opportunities Reporting	*Construction*	*Determine direct/indirect business opportunities*	*Collect and report using Manitoba Hydro's existing accounting and tracking system and purchasing reports.*	*All project components*	*During construction*	*Annual*	*April*	*To determine the extent of direct/indirect business effects associated with the project.*
Direct Labor Income and Taxes Reporting	*Construction*	*Determine direct labor income and taxes generated by the project.*	*Manitoba Hydro's existing accounting and tracking system and labour reports.*	*All project components*	*During construction*	*Annual*	*April*	*To determine direct labor income and contribution of the project to tax revenue.*

Manitoba Hydro is committed to:

- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, the MMF, Indigenous organizations and Manitoba Sustainable Development.*

Approach to Adaptive Management:

- *Passive - Report results to local stakeholders, First Nations, the MMF, Indigenous organizations, and Manitoba Sustainable Development providing an opportunity for feedback and recommendations for improvement.*

4.6.2 Infrastructure and Services

4.6.2.1 Transportation

The construction of each major component will have distinct effects on the existing road network. The road network consists of provincial highways and municipal roads in southeast Manitoba. Each Project component has unique traffic generation, vehicle mix, travel patterns and mode choices, which are variable throughout the life of the Project. Traffic accidents will be obtained through Manitoba Hydro reporting to the extent possible. This data will be used to potentially link project related incidents to certain conditions, whether it be related to the traffic volume, truck load size, time of collision, weather or road conditions.

Objective(s)

- *The objective of traffic monitoring is to track the number of accidents/potential near misses associated with the project and to track traffic volumes at key locations and to compare to baseline volumes*

Applicable Project Component(s): *All Project Components*

Monitoring Activities:

Table 4-16 Transportation

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Traffic Monitoring Survey	*Baseline Information*	*Determine traffic volumes*	*Traffic volumes*	*RAA*	*1 year*	*Annual*	*Continuous*	*Number of vehicles*
	Construction	*Determine the increase in traffic volumes, near misses and accidents on key roadways potentially as a result of the project.*	*Increase in traffic volumes, near misses and accidents on key roadways.*	*All project components*	*During construction*	*Annual*	*Continuous*	*Traffic volumes – compare actual traffic volumes from estimates in the EIS on key roadways.* *Traffic accidents and near misses in the project area on key roadways through Manitoba Hydro incident reports as available.*

Manitoba Hydro is committed to:

- *Implementing recommendations to minimize traffic accidents and near misses;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, the MMF, Indigenous organizations; and*

Specialist will:

- *Design and conduct traffic monitoring survey to collect traffic volume, near misses and accidents as a result of the Project*
- *Report on monitoring efforts, including identification of any unanticipated effects on traffic volumes and accidents discovered through monitoring activities*

- *Through an adaptive management process, make recommendations for ongoing improvements to the monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analyses.*

Approach to Adaptive Management:

- *Passive - Apply best management practices and experience from previous transmission development projects (i.e. carefully select traffic and turning points to minimize traffic accidents and near misses).*

4.6.3 Outfitting and Falconry

4.6.3.1 Outfitter Resource Use

Manitoba Hydro is planning to continue its work with the local black bear outfitter in the project area to further understand development effects on their operations. In 2014, camera traps were established at bait sites within the Project Development Area and in control areas to understand baseline conditions of bear occurrence and prevalence. As some bait sites are in close proximity to the Final Preferred Route, it is possible that their continued use may be affected by the Project. Manitoba Hydro is proposing to work with the outfitter to establish new bear bait sites prior to construction and include them in a continued camera trap survey along with the baseline locations. Bear occurrence and prevalence is measured by number of trail camera trigger events occurring at minimum 30 minute intervals.

Objective(s)

- *The objective of the Black Bear Bait Site Camera Trap Survey is to analyse bear occurrence and prevalence at bait site locations prior to, during and post construction of the Project*

Applicable Project Component(s): *New ROW for the D604I Transmission Line*

Monitoring Activities

Table 4-17 Outfitter Resource Use

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Black Bear Bait Site Camera Trap Survey	*Pre-construction*	*Camera Trap survey to measure use of bear bait sites prior to development*	*Number of black bears frequenting bait sites*	*Bear Bait Sites*	*Pre-construction*	*Biannual*	*2014*	*Occurrence and Prevalence*
	Construction	*Camera Trap survey to measure use of bear bait sites during to development*	*Number of black bears frequenting bait sites*	*Bear Bait Sites*	*During construction*	*Biannual*	*2015, 2016*	*Occurrence and Prevalence*
	Post-construction	*Camera Trap survey to measure use of bear bait sites post development*	*Number of black bears frequenting bait sites*	*Bear Bait Sites*	*2 yrs*	*Biannual*	*Spring and Fall*	*Occurrence and Prevalence*

Manitoba Hydro is committed to:

- *Provide camera trap equipment;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, the MMF, Indigenous organizations and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of bear, dens and tracks, ungulate mortality sites near bait sites within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS.*

Specialist will:

- *Work with local outfitter to conduct camera trap survey to collect black bear occurrence and prevalence data*
- *Collect and analyze black bear data to assess if there are project-related effects on outfitter operations.*
- *Report on monitoring efforts, including identification to Manitoba Hydro of any unanticipated effects on black bear bait sites discovered through monitoring activities*
- *Through an adaptive management process, make recommendations for ongoing improvements to the monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analyses*

Decision Trigger(s)/Threshold(s) for Action

- *Trail camera trigger events at bait site locations near the PDA decline significantly relative to bait site locations distant from the PDA.*
  - *Action: Report results to the local outfitter and discuss findings.*

Approach to Adaptive Management:

- *Active - Test hypotheses related to the project adversely affecting black bear observations at bait sites near project area. Report results to the local outfitter and discuss findings.*

4.6.3.2 Peregrine Falcon Conservation Centre

Manitoba Hydro is planning to continue its work with a local peregrine falcon conservation centre in the project area to further understand potential development effects on their operations. In 2016, Manitoba Hydro provided GPS radio transmitters and supporting equipment to Parkland Mews to help them understand and record movements and flight patterns of peregrine falcons bred at the conservation centre. This flight information is digitally recorded and provides baseline information of peregrine falcon movements in local region, including any potential interactions the proposed project right-of-way that is located approximately 2.5 km north of the conservation centre.

Objective(s)

- *The objective of the peregrine falcon flight recordings is to measure peregrine falcon movements around the conservation center and proposed project right of way prior to, during and post construction of the Project*

Applicable Project Component(s): *South Loop*

Monitoring Activities

Table 4-18 Peregrine Falcon Conservation Centre

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Peregrine Falcon Flight Recordings	*Pre-construction*	*Track movements of peregrine falcons*	*Perch sites and distance flown*	*Parkland Mews*	*Pre-construction*	*At the peregrine falcon handlers discretion.*	*2016*	*# and location of perch sites, total distance flown from mew.*
	Construction	*Track movements of peregrine falcons*	*Perch sites and distance flown*	*Parkland Mews*	*During construction*	*At the peregrine falcon handlers discretion.*	*Spring, Summer, and Fall*	*# and location of perch sites, total distance flown from mew.*
	Post-construction	*Track movements of peregrine falcons*	*Perch sites and distance flown*	*Parkland Mews*	*1 year*	*At the peregrine falcon handlers discretion.*	*Spring, Summer, and Fall*	*# and location of perch sites, total distance flown from mew.*

Manitoba Hydro is committed to:

- *Provide GPS tracking equipment;*
- *Provide technical support and training in the operations of the technology.*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, the MMF, Indigenous organizations and Manitoba Sustainable Development.*

Decision Trigger(s)/Threshold(s) for Action

- *Peregrine falcons are identified to be extensively utilizing the project ROW.*
  - *Action: Report results with Parkland Mews and discuss findings including the potential implementation of mitigation measures such as bird diverters or perch deterrents.*

Approach to Adaptive Management:

- *Active – Test the hypotheses that the Project does not affect the traversing or perching of peregrine falcons near the project area. Report results to the conservation centre and discuss findings.*

5.0 ADAPTIVE MANAGEMENT

The Canadian Environmental Assessment Agency (CEAA) defines adaptive management as "the implementation of new or modified processes, procedures and or mitigation measures over the construction and operation phases of a project to address unanticipated environmental effects" (CEAA, 2015). Adaptive management is considered a planned and systematic process used to continuously improve environmental management practices by learning about their outcomes. The use of an adaptive management process allows for the flexibility to identify and implement new mitigation measures or to modify existing ones during the life of a project (CEAA, 2015). Although definitions of adaptive management vary depending on the source, there are fundamental concepts of adaptive management that are universal and fundamental (British Columbia Ministry for Forests and Range, 2015) which include the following:

- Learning and reducing key uncertainties
- Using what is learned to change policy and practice
- Focus is on improving management
- Adaptive management is formal, structured and systematic

Manitoba Hydro has accumulated information and lessons learned from previous monitoring programs. The successes of those programs have been reviewed and considered in the development of this plan. Previous weaknesses have been adapted and improved upon to further enhance this plan's approach, methods and key environmental monitoring activities.

The Environmental Protection Program, of which the Manitoba-Minnesota Transmission Project Environmental Monitoring Plan is part of, and has been designed to be adaptive and responsive throughout the Project lifecycle. The management of any low to moderate levels of uncertainty can be achieved for the proposed project by the implementation of a passive adaptive management process which will help to facilitate actions if any unforeseen effects occur and will result in the identification of new or modified mitigation (British Columbia Environmental Assessment Office, 2013). Active adaptive management measures will be employed to manage areas of high (and some moderate) levels of uncertainty and further develop mitigation measures and environmental protection activities.

Program documents, processes, procedures and mitigation measures will be continuously evaluated by inspection, monitoring and communication programs. Audits and reviews will be conducted to facilitate updates to the program through an adaptive management process (Manitoba Hydro, 2013). Within the Environmental Protection Program, adaptive management will take place in two primary areas: at the management level, involving changes with the program structure itself; and at the implementation level, which will involve individual mitigation measures as management and implementation teams evaluate the on-site effectiveness of mitigation strategies or the program as a whole. Scheduled update meetings between

departments, annual reviews of the program and its effectiveness will take place to foster the adaptive management process.

Annual reviews will be conducted by Licensing and Environmental Assessment in consultation with Transmission Line and Civil Construction, the contractor, regulators and stakeholders. The results of each annual season review will be summarized in a report that documents the issues addressed and provides recommended updates to applicable components of the Environmental Protection Program.

6.0 REPORTING

Reports will be generated annually, and provided to Manitoba Sustainable Development and the National Energy Board. Notifications of new reports on the website will be communicated to relevant federal and provincial regulatory agencies.

In addition to annual reports summarizing activities and general findings, technical reports will be prepared at appropriate intervals during the construction and post construction phases of the Project. These reports will on a cumulative basis compile and analyze monitoring results during the relevant period, and based on those results, make recommendations concerning the need for any changes to the mitigation or monitoring approach. Manitoba Hydro will present and discuss monitoring results with the NEB, SD, First Nations, the MMF and Indigenous organizations on request as the project proceeds.

Any significant unanticipated project effects discovered through monitoring activities or where regulations dictate will be reported immediately to SD and/or the NEB.

7.0 MONITORING METHODS

This section provides detailed information on the methods to be used to monitor the Valued Components and environmental indicators identified in Section 4.0.

7.1 FISH AND FISH HABITAT

7.1.1 Stream Crossing Assessments

Stream crossing sites will be evaluated for adherence to prescribed mitigation and effectiveness of mitigation.

Field studies will be undertaken at all stream crossings assessed as fish bearing during active construction and in the first spring following construction. Riparian buffers will be evaluated by measuring their width from the stream or floodplain and comparing to the width prescribed, as well as evaluating the amount of vegetation left in the buffer and the clearing method used. Stability of stream banks and floodplain will be evaluated visually and rutting, slumping, or other damage to the ground noted. The presence of slash or disturbed sediment within the buffer will be recorded, as well as any evidence of erosion. Trail crossings will be evaluated for appropriate grade and angle across the stream, and the presence of any organic debris remaining from a temporary snow bridge. If any erosion control measures were in place (blankets, silt fences) their effectiveness will be evaluated. Tower locations will be assessed to determine if they adhered to prescribed mitigation. Any further erosion control measures and reclamation needed to meet the prescribed mitigation will be recommended.

7.2 VEGETATION AND WETLANDS

Information collected and prepared for the Project that will assist with vegetation and wetland monitoring.

To select monitoring sites for the Project, the Environmental Protection Information Management System (EPIMS) map viewer will be used to view recent project footprint imagery (pre-clearing digital ortho-rectified imagery). Previous sampled sites and environmentally sensitive sites, identified from the Project EIS, will be considered for potential sampling locations. Suitable sites will also be selected based on vegetation type, accessibility, disturbance, landowner permission, and whether invasive and non-native species may establish and proliferate. Sites selected on private lands will be used to determine property ownership and contact information.

7.2.1 Wetlands

Wetland vegetation will be sampled, and the accuracy of EIS predictions and effectiveness of mitigation measures implemented will be verified. Digital ortho-rectified imagery will be used for identification of wetlands and potential sampling sites for assessment of RoW effects. Pre-construction surveys will involve quantitative native vegetation surveys in selected wetlands along the transmission line RoW.

Sites selected for native vegetation surveys will have plots established for future vegetation monitoring. The native vegetation survey will consist of establishing sample plots on sites with relatively homogenous vegetation. Vegetation will be sampled for composition, abundance and structure. Sampling of selected sites will follow methods outlined by Redburn and Strong (2008) and involve the establishment of five 2.5 m by 2.5 m quadrats with a 1 m by 1 m nested quadrat spaced at 5 m increments along a 30 m transect for wetland shrubs 1 - 2.5 m tall and herbs and low shrubs ≤1 m tall, respectively. Transects will be located on sites considered representative of the stand being sampled. The first quadrat will be placed at the 5 m mark. The composition of wetland tree cover >2.5 m tall will be estimated using a 20 m by 30 m plot centered on each transect. Transects will be permanently located along the transmission line RoW, longitudinally, and approximately in the centre of the RoW, but off the equipment path. Plant cover will be estimated to the nearest 1% for species <15% cover and nearest 5% for those with higher cover. Other incidentally observed species will be recorded. GPS coordinates and photographs will be taken at each sampling site. Wetlands will be classified according to the Canadian Wetland Classification System (National Wetlands Working Group 1997).

Environmental monitoring of wetlands will occur on cleared portions of the RoW. Environmental monitoring will involve vegetation monitoring using the identical quantitative methods described above (native vegetation survey). Wetlands will be sampled for herbaceous and shrub cover along the RoW to assess the vegetation. Incidental species observations will be recorded. All sites will be photographed.

Permanently located sampling areas will be used to record the change in vegetation that can be systematically monitored through time. The collection of wetland vegetation information will occur at a similar time during the growing season to maximize the comparability of data. After field sampling, the data will be digitized and mean values for vegetation cover will be calculated. Total species cover, species richness and diversity measures will be calculated for each plot. Statistical testing may be used to determine if differences occur between baseline samples and post-clearing.

7.2.2 Plant Species of Conservation Concern

Surveys for species of conservation concern, and the accuracy of EIS predictions and effectiveness of mitigation measures implemented will be verified. Pre-construction surveys for species of conservation concern will be conducted in portions of the project footprint that were not previously surveyed and have the greatest potential for supporting these plants along the transmission line RoW. Digital ortho-rectified imagery will be used for the identification of potential survey sites and assessment of RoW effects.

Rare plant surveys initially will involve the review of species observed previously along the transmission line RoW, as well as the database compiled by the Manitoba Conservation Data Centre for species of conservation concern, which includes species that are rare, disjunct, or at risk throughout their range or in Manitoba. Species of conservation concern encompasses plants ranked very rare to uncommon by the Manitoba Conservation Data Centre, and those listed under the provincial *Endangered Species and Ecosystems Act*, the federal *Species at Risk Act,* or listed by the Committee on the Status of Endangered Wildlife in Canada. Flowering times and preferred habitat for species of conservation concern known to occur in the Project area will be reviewed.

In the field, a combination of meander and transect searches will be used. Parallel transects are favoured in more open and homogenous landscapes, while meander searches are conducted in areas of difficult terrain, unique habitats, and where unusual landscape features occur. Rare plant locations will be recorded using a GPS receiver. Rare plant individuals will be counted, phenology will be recorded and population extent will be estimated. Additional information collected will include associated plants observed. Photographs will be captured in the field.

Environmental monitoring for species of conservation concern will occur after clearing of the RoW. Monitoring for species of conservation concern will involve the review of species previously observed during pre-construction surveys. Monitoring will occur at selected sites along the RoW to investigate the presence/absence of the plants which were observed prior to clearing and construction. Species of concern observed in the field will have the following information recorded: GPS coordinates verification, individuals counted, population extent estimated, phenology recorded, and associated plants recorded. Photographs will be captured in the field.

7.2.3 Invasive Plant Species

Sampling will occur for invasive plant species introduction, and the accuracy of EIS predictions and effectiveness of mitigation measures implemented will be verified. Initially, digital ortho-rectified imagery will be used for identification of potential sampling sites and assessment of RoW effects. Pre-construction surveys will involve quantitative vegetation surveys at selected

sites along the transmission line RoW. Other locations will involve roadside assessments for invasive and non-native species, where detailed surveys are unable to be conducted.

Sites selected for vegetation surveys will have plots established for future vegetation monitoring. The vegetation survey will consist of establishing sample plots on sites near roads, rail lines, rivers or disturbances, which may provide pathways for these species. Vegetation will be sampled for composition, abundance and structure. Sampling of selected sites will involve the establishment of five 2.5 m by 2.5 m quadrats with a 1 m by 1 m nested quadrat spaced at 5 m increments along a 30 m transect for shrubs 1 - 2.5 m tall and herbs and low shrubs ≤1 m tall, respectively. The first quadrat will be placed at the 5 m mark. The composition of tree cover >2.5 m tall will be estimated using a 20 m by 30 m plot centered on each transect. Transects will be permanently located along the transmission line RoW, longitudinally, and approximately in the centre of the RoW, but off the equipment path. Plant cover will be estimated to the nearest 1% for species <15% cover and nearest 5% for those with higher cover. Other incidentally observed species will be recorded. Ground cover estimates (%) will be recorded and include exposed soil, litter, rock, water and wood. Site condition measurements will include slope and aspect. GPS coordinates and photographs will be taken at each sampling site.

Environmental monitoring will occur after clearing, and along the RoW. Environmental monitoring will involve vegetation monitoring using the identical quantitative methods described above (vegetation survey). Vegetation will be sampled for herbaceous and shrub cover along the RoW. Incidental species observations will be recorded. All sites will be photographed.

Permanently located sampling areas will be used to record the change in vegetation species that can be systematically monitored through time. The collection of vegetation information will occur at a similar time during the growing season to maximize the comparability of data. After field sampling, the data will be digitized and mean values for vegetation cover will be calculated. For each plot, species measures will be determined (e.g., total species cover, richness, diversity). Statistical testing may be used to determine if differences occur between baseline sampling and post-clearing.

7.2.4 Traditional Use Plant Species

Vegetation will be sampled for traditional use plant species important to First Nations and Metis based on information provided through the ongoing First Nation and Metis engagement process. The accuracy of EIS predictions and effectiveness of mitigation measures implemented will be verified. Digital ortho-rectified imagery will be used for identification of potential sampling sites for assessment of RoW effects. Pre-construction surveys will involve native vegetation surveys at selected sites along the transmission line RoW, at known traditional use sites.

Sites selected for surveys will have plots established for future vegetation monitoring. Vegetation will be sampled for composition, abundance and structure. Sampling of selected sites will involve the establishment of quadrats spaced at 5 m increments along a 30 m transect for shrubs and herbs. The composition of tree cover will be estimated using a plot centered on each transect. Transects will be permanently located along the transmission line RoW, longitudinally, and approximately in the centre of the RoW, but off the equipment path. Plant cover will be estimated to the nearest 1% for species <15% cover and nearest 5% for those with higher cover. Other incidentally observed species will be recorded. Ground cover estimates (%) will be recorded and include exposed soil, litter, rock, water and wood. Site condition measurements will include slope and aspect. GPS coordinates and photographs will be taken at each sampling site.

Environmental monitoring will occur after clearing, and along the RoW. Environmental monitoring will involve vegetation monitoring using the identical methods described above. Vegetation will be sampled for herbaceous and shrub cover along the ROW. Incidental species observations will be recorded. All sites will be photographed.

Permanently located sampling areas will be used to record the change in vegetation that can be systematically monitored through time. The collection of vegetation information will occur at a similar time during the growing season to maximize the comparability of data. The data will be digitized and mean plant values will be calculated, after sampling. Species measures will be determined and assessed for each plot.

7.3 WILDLIFE AND WILDLIFE HABITAT

Monitoring wildlife and wildlife habitat will aim to track vital measures of populations (e.g., presence, distribution, relative abundance, and movement) that are associated with (i.e., linked) potential Project effects. In some cases, changes in habitat quality will be used to help determine the potential response. Determining the basis of causality in complex biological systems can be difficult. When analysing the results of hypothesis testing, considerations will be given for the most influential factors which drive wildlife populations (e.g., habitat, predators, disease, winter severity) and other lesser factors (e.g., accidents). As with most complex biological systems, some assumptions regarding the response will have to be made through but will be supported with peer-reviewed literature and professional opinion to provide the most accurate explanation possible in annual reporting.

7.3.1 Herptiles

7.3.1.1 Amphibians

To further characterize wetland condition prior to construction, wetland surveys will be conducted at wetlands supporting northern leopard frogs. Pre-construction wetland surveys will

include water quality measurements and amphibian surveys in the spring, summer and fall, at wetlands that are within or are adjacent to the Project Development Area (PDA). Spring surveys (late-April through mid-May) will overlap the northern leopard frog breeding period; summer surveys (early to mid-July) will target eastern tiger salamander larval stage and leopard frog juvenile stage; fall surveys (late-August to late-September) will overlap their overwintering congregation period. Any additional sites within or adjacent to the PDA not previously examined during baseline environmental surveys will be identified through land cover mapping and ortho-photo interpretation and will be included in the wetland surveys. Eastern tiger salamander surveys will focus on summer larval surveys but observation of salamanders will be made throughout the northern leopard frog surveys.

Water quality data to be collected will include: pH, specific conductance, total dissolved solids, total suspended solids, temperature, and turbidity. Measurements will be taken at three locations in the shallow water zone at the edge of each wetland at approximately 30-50 cm depth and 2-5 m from the shoreline. Measurements from the three locations will be averaged to estimate site composite values at each wetland. Other than total suspended solids, measurements will be taken *in situ* with a handheld water quality meter. Measurement of total suspended solids requires laboratory analysis and water samples will be collected at the *in situ* sites and sent to an accredited laboratory for analysis. Additional site characteristics will be recorded, including vegetation community (e.g., dominant plant species, presence of emergent and submergent vegetation) and weather conditions (e.g., temperature, wind direction and speed, cloud cover and precipitation).

Amphibian surveys during the spring survey period will include daytime call surveys during water quality monitoring, nocturnal call surveys, visual encounter surveys (VES), and incidental detections. Summer surveys will include larval salamander surveys using funnel-trap sampling (i.e., minnow traps) and VES for northern leopard frog. Fall surveys will include (VES) and incidental detections of both northern leopard frogs and salamanders.

Call surveys consist of a 5 minute listening period following a 2 minute waiting period to allow disturbance associated with observer access to subside. Relative abundance and call rank will be recorded, based on the widely accepted protocol by Mossman et al. (1998) and Saskatchewan Ministry of Environment (2014a, 2014b). In the case of nocturnal call surveys, surveys will be conducted between 0.5 hrs after sunset and 0100h and in weather conditions with winds <20km/hr, ambient temperature ≥5°C, water temperature ≥10°C, and/or rain no heavier than a drizzle (Kendell 2002; USGS 2012). Visual encounter surveys will consist of two biologists walking side by side 5 m apart along wetland margins or stream banks while documenting any amphibians observed within the waterbody 1 m from shore, in a 1 m strip of the shoreline, and within 3 m upland from the shoreline/water's edge. The VES will be conducted for a prescribed amount of time (20 minutes) and under seasonal air temperatures. Surveys will be suspended if precipitation exceeds a light rain or ambient air temperatures drop

below 15°C. Incidental observational data will be collected opportunistically throughout the survey periods.

In wetland ponds that may be suitable for salamanders (i.e. no fish, not marshy), funnel-traps will be used to sample for eastern tiger salamander larvae. Funnel-traps will be set in the evening and checked the following morning with traps set in approximately 15-25 cm deep water (Bennett et al 2012). Snout-length and total length will be recorded for all larval tiger salamanders captured and a tissue sample (tail tip) will be collected and submitted to the Manitoba Conservation Data Centre (MBCDC) for DNA analysis. Tissue sample collection and storage will adhere to the MBCDC protocol. All amphibian larvae captured will be identified to species and released. The appropriate scientific permit will be sought from Manitoba Sustainable Development prior to the initiation of the field program.

Construction phase wetland monitoring will take place during the amphibian breeding and overwintering congregation periods immediately following construction activity. Water quality readings will be taken at similar times of day to pre-construction readings. Construction phase monitoring would only take place within wetlands where Project activity had occurred.

7.3.1.2 Common Garter Snakes

Pedestrian surveys will occur within 200 m of select portions of the New ROW tower locations prior to ROW clearing where potential suitable habitat or hibernacula is identified. The pedestrian survey will be conducted by two biologists, and will include a grid-like walk of the area while 10 m apart. Where suitable habitat or hibernacula are identified (i.e. rock piles, rock outcrops, or pits), the effectiveness of applied mitigation (*i.e.*, setback distances) will be verified through follow-up monitoring. Monitoring will consist of a walk-through of the known suitable habitat or hibernacula area immediately following construction to determine compliance with mitigation measures.

7.3.2 Birds

7.3.2.1 Bird – Wire Collisions

Baseline data for bird-wire collisions were gathered in fall 2014 using methods described in Chapter 9 of the EIS. Methods included carcass searches, scavenger removal trials and searcher efficiency trials. Sixteen sites were sampled in agriculture, grassland and forest habitats with low to high bird-wire collision risk.

Bird diverter monitoring will test the hypothesis that bird diverters are sufficient in reducing mortality of birds due to collisions with the transmission line to a level that is negligible in areas determined to have a high risk of collision. As such, the null and alternate hypotheses state:

- H_0 (null): The mortality of birds at high-risk areas with bird diverters will not be different than the mortality of birds at low-risk areas without bird diverters.
- H_1 (alternate): The mortality of birds at high-risk areas with bird diverters will be greater than the mortality of birds at low-risk areas without bird diverters.

To test this hypothesis, a Control-Impact study design will be implemented. The Before-After Control-Impact design study cannot be implemented for this study as mortality of birds is not expected prior to the installation of the transmission lines. For the purpose of this study, control sites will consist of ESS's considered to be 'low-risk' and impact sites will consist of ESS's considered to be 'high-risk', as identified in the EIS.

If transmission lines containing diverters yield negligible avian mortality, then the mortality of birds relative to the number of bird passes at high-risk transmission lines with diverters should be comparable or lower than those at low-risk transmission lines with no diverters. Using the ratio of mortality to number of bird passes instead of simply the numbers of avian mortality allows correction for differences in bird activity between 'high-risk' and 'low-risk' sites.

Statistical analysis will be conducted using Generalized Linear Models to compare estimated mortality rates at high-risk versus low-risk sites. Assumptions of parametric testing will be determined and data transformations applied where necessary and/or appropriate. Non-parametric testing will be applied where assumptions were violated and/or data could not be transformed. Analyses will be conducted separately for each season and then with data from all seasons pooled. If no significant difference is observed between high-risk versus low-risk sites, then mitigation measures (placement of diverters) will be considered effective in maintaining low avian mortalities due to collisions with wires. Additionally, mortality studies may allow for the determination of the biological, environmental and engineering factors important in influencing collisions as well as the circumstances (e.g., weather, time of day, season) under which birds are most likely to collide with the wires.

Flight Activity Surveys

Before every mortality survey, biologists will monitor flight activity of birds across the transmission line right-of-way (ROW) section being searched that day. Biologists will count the number of birds that fly across the ROW within each of the paired spans within a period of three hours (three one-hour intervals). Mortality searches will be conducted directly after these visual flight surveys. All birds will be recorded to allow for collision rate estimates (CRE). CRE will be calculated as the estimate of total collisions (based on carcass surveys and correction factors described below) divided by the estimated number of possible bird-wire interactions per day.

Carcass Searches

To estimate the mortality of birds along the transmission line per year at the Project site and test the adequacy of diverters, carcass searches will be conducted at select ESS's. Due to the many confounding variables involved in monitoring avian mortality at transmission lines, no standardized protocols have been developed for post-construction mortality searches for transmission lines. The Avian Power Line Interaction Committee (APLIC,2012) and methodology proposed by De la Zerda and Rosselli (2002) and by Barrientos *et al*. (2011) provide valuable guidance and considerations for designing mortality studies and these will be included in this proposed monitoring plan. Other insights for the study design will reflect those protocols recommended for carcass searches at wind turbines (Canadian Wildlife Service 2007). The appropriate scientific permit will be sought from Environment Canada prior to the initiation of the field program.

Searches for dead or injured birds will be performed at high-risk sites identified in the EIS, at an equivalent number of low-risk sites, and at known sharp-tailed grouse leks that are located within 1,000 m of the Project footprint. Each of the mortality monitoring sites will consist of the area under one span of transmission conductors. A span is defined as the length of ROW between two transmission towers. The spans closest to the location where monitoring is desired will be surveyed. Surveys will be focused during peak activity seasons which will include spring migration and mid-breeding season for Sharp-tailed grouse (April and early May), late breeding season when adults will be feeding chicks (mid- June and July) and fall migration (late August to late September). During each of the three survey seasons, four rounds of carcass searches will be conducted at each ESS.

Carcass searches will be conducted by trained searchers. Every morning, searchers will conduct both mortality searches and bird passage monitoring. Teams will note environmental conditions at the start and end of each survey day including notable weather events during the previous seven days (high winds, storms, fog) based on Environment Canada historical data, where available. Surveyors will position themselves at the start of a linear transect running from one of the transmission towers to the other. During each visit, the searchers will walk parallel survey lines within 5 to 10 m of each other to assure that complete coverage of the ground occurs. This procedure will be repeated until the entire width of the ROW under each span is covered. While conducting searches, searchers will search for any dead birds within a 5 m field of view. Upon finding an avian carcass, the following data will be recorded as possible:

- GPS position of the carcass;
- Location of the carcass with respect to the transmission line;
- Species;
- Sex;
- Age;
- Date or approximate time of death;

- Physical injuries and general body condition;
- Probably cause of death; and
- Evidence of scavenging.

Sampling Biases

Several factors affect the accuracy of mortality estimates recorded in the field. Four sampling biases are of particular importance in estimating the number of birds killed by a section of transmission line:

- Searcher efficiency;
- Scavenger removal;
- Habitat differences; and
- Crippling loss.

Searcher Efficiency Trials

Searchers conducting mortality searches within the ROW may not find all of the carcasses present. Carcasses may be overlooked depending on a number of factors including the density and height of vegetation in the ROW, the route walked by the searcher, the state of the carcass, etc. As such, searcher efficiency trials aid in correcting this bias. During the course of the mortality search studies, a known number of carcasses will be placed by a tester at locations within the search area unknown to searchers being tested. The proportion of purposefully placed carcasses found by searchers will represent their searcher efficiency and will be used to correct for this bias when estimating avian mortality at the Project site. To account for differences in searcher efficiency between different sized birds, if feasible, birds of all major size categories will be represented in searcher efficiency trials.

Scavenger Removal Trials

Scavenger removal trials are used to estimate the rate at which carcasses are removed from the ROW by other wildlife. Scavenger removal trials will consist of placing carcasses at known locations within the ROW and checking these locations periodically to determine if and when they are removed. Trials will continue until all carcasses are removed or have completely decomposed. Scavenger removal trials may be conducted concurrently with mortality searches. To account for differences in scavenging rates between different sized birds, birds of all major size categories will be represented in the scavenger removal trials.

Habitat Differences

Due to a variety of factors, some portions of a PDA may not be searchable. Most of the unsearchable habitats will be avoided to the extent possible during the initial selection of ESS's.

For sites where this is not possible, the total area searched at those sites will be calculated and search area will be corrected in the calculated mortality estimates.

Crippling Loss

Crippling loss is the percentage of birds killed or injured by striking a component of a transmission line, yet may fall or move beyond the Study Area. Crippling loss may be studied by monitoring the number and behaviour of birds flying past a section of transmission line or may be implied from other studies.

Estimating the number of birds that collide with structures but fall out of the search area, or injured birds that move out of the search area before succumbing to their injuries, is extremely difficult to quantify (Bevanger 1999, APLIC 2012) and rarely incorporated into estimates (Rioux et al. 2013). Estimating crippling loss bias requires a great deal of time and effort to monitor flights near hazards, record collisions, locate injured or dead birds (CEC 2003, APLIC 2012), and importantly, results in small sample sizes (Paddington 1993, Savereno et al 1996, Crowder 2000). Some studies suggest that to provide more accurate estimates, it may be reasonable to apply crippling loss bias estimates from other studies (Beaulaurier 1981, Bevanger 1995, Janns and Ferrer 2000, CEC 2003, Sundar and Choudhury 2005). However, the application of estimates from other studies is inappropriate and very misleading due to the effects of bird size and weight on crippling loss bias (APLIC 2012, Rioux et al. 2013).

7.3.2.2 Sharp-tailed Grouse Lekking Sites

Baseline data for sharp-tailed grouse were gathered in spring 2014 using field methods described in Chapter 9 of the EIS. Location data for sharp-tailed grouse leks were mapped within the RAA from field surveys and from data provided by Manitoba Sustainable Development. Sharp-tailed grouse have a reproductive system known as lekking, where males form large groups and vocalize and display at the same time in attempts to attract females. Leks are generally elevated sites associates with sparse or disturbed vegetation and are typically used for many years. Sharp-tailed grouse nesting usually occurs in shrub habitat located close to the lek.

The construction and installation of the transmission line has the potential to adversely affect the abundance of sharp-tailed grouse at lekking sites by way of habitat loss or disturbance during construction. It also has the potential to increase rates of predation if birds of prey (raptors) nest on nearby transmission line towers. Conversely, male lek displays may reduce nest-related predation by decoying predators away from nests and alerting incubating females when a predator is approaching. The sentinel/decoy model predicts a region of decreased predator density just inside the maximum range at which predators are attracted by displaying males. The expected ring of successful nests is evident in data from three species of North American prairie grouse (Phillips 1990). As such, sharp-tailed grouse lek monitoring will test two

hypotheses:

Hypothesis 1:

- H_0 (null): The installation of the transmission line does not affect the abundance of male sharp-tailed grouse at lekking sites.
- H_1 (alternate): The installation of the transmission line does affect the abundance of male sharp-tailed grouse at lekking sites.

Hypothesis 2:

- H_0 (null): The installation of the transmission line does not increase sharp-tailed grouse alert behaviour or decrease time spent on the lek.
- H_1 (alternate 1): The installation of the transmission line does increase sharp-tailed grouse alert behaviours.
- H_2 (alternate 2): The installation of the transmission line does decrease time spent on the lek by male sharp-tailed grouse.

To test these hypotheses, a Before-After Control-Impact design study will be implemented. Monitoring for Sharp-tailed grouse will require conducting searches for leks in the vicinity of Sharp-tailed grouse habitat and grouse observations as presented in the EIS. Manitoba Hydro will collaborate with Manitoba Sustainable Development to determine the status and distribution of leks in the RAA. In addition, due to the large area of habitat for this species along the proposed transmission line route, an aerial survey for groups of Sharp-tailed grouse will be undertaken in conjunction with ungulate and predator surveys (Section 7.3.3) in winter to scope for potential lekking locations. Sharp-tailed grouse stay close to breeding sites all year-round, meaning baseline observations may indicate the nearby presence of a lekking site. The location and number of flushed grouse will be recorded on a GPS and the lek will be subsequently surveyed from the ground. Impact and reference sites will be selected in areas within and beyond the predicted zone of impact, respectively.

Once leks are identified, ground surveys will consist of scanning candidate lekking sites with binoculars and a spotting scope and listening for sounds of displaying grouse. Surveys will be conducted on foot or by driving along roads and stopping near candidate sites. When a lek is located, it will be monitored two times using the Sharp-tailed Grouse Survey Protocol (WDNR, 2013) and Sensitive Species Inventory Guidelines (Government of Alberta, 2010), using a flush count. Following the WDNR (2013) protocol, surveys will begin 45 minutes before sunrise and will end 3 hours after sunrise. All lekking activities will be recorded as well as the number of birds present. Weather conditions will be recorded and surveys will only be conducted on clear, calm mornings with winds less than 15 km/hr. Other environmental conditions such as anthropogenic noise, nearby infrastructure or the presence of other wildlife (particularly nesting

or perching raptors) will also be recorded. All efforts will be made by surveyors to minimize disturbance to all birds present at the lekking sites.

Confounding factors that could affect the results include raptor nest density, abundance of ground predators and habitat quality. Data collected from the Birds of Prey Study (Section 7.3.2.3) to map raptor nests, and data from the remote infrared camera trap arrays situated along the ROW and adjacent suitable habitat, which monitor ungulates and ground predators (Section 7.3.3) will be used to evaluate changes in predator activity. Modelled habitat quality will be mapped within 2 km of a lek to control for the level of fragmentation (i.e., the density of linear features on the landscape) surrounding each lek and the availability of grassland, shrubland and forest required by sharp-tailed grouse for survival. Accidental mortality will be reported in Section 7.3.2.1, Bird-Wire Collisions. If available, these data will be used to corroborate the potential effects of depredation during operation of the new transmission line.

Statistical analysis will be conducted using Generalized Linear Models and/or non-parametric techniques to evaluate the effects of the Project on the abundance and behaviour of Sharp-tailed grouse on the lek. Time budget analysis will be used to calculate the proportions of males eliciting behaviours, with an focus on predator alert frequency and time spent on versus off the lek.

7.3.2.3 Birds of Species of Conservation Concern

Species of conservation concern, which includes SAR and provincially rare species, have the potential to be adversely affected by the construction of the transmission line. In particular, the Golden-winged Warbler (*Vermivora chrysoptera*) is considered “threatened” under Schedule 1 of the *Species at Risk Act*, and is the only species in the RAA to have defined critical habitat (Environment Canada 2014). Baseline data for golden-winged warbler and other SAR were gathered in spring 2014 using field methods described in Chapter 9 of the EIS. Location data for eight golden-winged warbler were mapped within the RAA during field surveys, another 48 records exist in the LAA, indicating a concentration of golden-winged warbler in the areas surrounding St-Genevieve, Ross and Richer.

Potential adverse effects to golden-winged warbler during construction may include displacement of birds and/or decreased nesting success due to habitat disturbance, and long-term loss of habitat during operations. Bird species of conservation concern monitoring will test the hypothesis that the development of the transmission line adversely affects the habitat quality and density of golden-winged warbler. During construction and maintenance, vegetation management is expected to reduce adverse impacts and increase the long-term benefits to the local golden-winged warbler population and habitat.

Hypothesis 1:

- H_0 (null): The construction and installation of the transmission line does not affect the habitat quality or density of golden-winged warbler.
- H_1 (alternate): The construction and installation of the transmission line does affect the habitat quality or density of golden-winged warbler.

To test these hypotheses, a BACI study design will be implemented to evaluate Project-related effects on golden-winged warblers, Permanent monitoring plots will be developed within the transmission line ROW and areas that are predicted to not be affected by the Project (control areas). Golden-winged warbler monitoring sites will be established within the areas of the ROW that intersect five critical habitat squares delineated in the Recovery Strategy for the Golden-winged Warbler in Canada (Environment Canada 2014). This area is referred to as the golden-winged warbler ROW Habitat Management Sites (HMS).

The amount of golden-winged warbler habitat presented in the EIS will be verified using a combination of baseline and post-construction vegetation surveys (see Section 7.3.2.4 Golden-winged Warbler Habitat) and remotely-sensed data, including LiDAR (light detection and ranging) and high-resolution imagery. Survey points will then be selected in Habitat Management Sites (HMS), which are 10 ha areas in the ROW that are equivalent to the area between three transmission towers (two spans). Using a stratified random design based on habitat characteristics, HMSs will be selected for golden-winged warbler surveys. Within selected HMSs, two survey points, spaced a minimum of 400 m apart. Control survey points that are within the five critical habitat squares will be selected using the same procedure and will be as similar as possible to ROW survey points. Surveys for golden-winged warbler will occur early in the breeding season from May 27 to June 15, depending on local climatic conditions.

Qualified biologists will map the occurrences of golden-winged warbler. Hand-held recorders may be used for verification purposes. A call-playback method will be used to increase the probability of detecting golden-winged warblers. At each stop, the survey protocol will consist of three minutes of passive listening, five minutes of call-playback, and two minutes of passive listening. The 5-minute recording will consist of 16 bouts of type one golden-winged warbler song each separated by 17 seconds of silence. This protocol was selected based on unpublished work conducted on golden-winged warblers in Manitoba by Bird Studies Canada in 2008 and 2009 (C. Artuso, Unpubl.Report). If a golden-winged warbler is heard or observed, observers will note if it occurs within or outside of the transmission line ROW. The appropriate scientific permit will be sought from Manitoba Sustainable Development prior to the initiation of the field program.

The first year of the study will provide baseline data of golden-winged warblers in the proposed ROW and control areas. During construction and operation, a statistical comparison of golden-winged warbler density between survey points within HMSs and in control areas can be conducted to determine the effects of these activities and the proposed vegetation management

using Generalized Linear Models and/or non-parametric techniques.

7.3.2.4 Golden-winged Warbler Habitat

Golden-winged warbler habitat will be sampled, and the implementation of the golden-winged warbler management plan will be verified. A primary objective will be to validate the amount of potential golden-winged warbler habitat present within the proposed ROW. A combination of remotely-sensed data and high-resolution imagery will be used to determine potential habitat. Mapped information is anticipated to include tree and shrub species and heights, and open patches.

Habitat Management Sites (HMS) will be approximately 10ha (roughly equivalent to the ROW area between three transmission towers), which is derived from recommendation by Roth et al. (2012). Both habitat mapping and ground surveys will inform the selection of HMS. Habitat preferences for the golden-winged warbler are generally described as shrub cover interspersed with herbaceous openings, adjacent to mature forest.

Digital imagery and habitat mapping will assist in the ground clearing activities and low impact cutting in golden-winged warbler critical habitat. Within each HMS, clearing will occur in two separate zones, which is detailed in the Habitat Management Plan for this species. Zone 1 is approximately the equipment path (0-12m) on either side of the centreline and includes the tower foundations. All trees and shrubs will be removed in this zone. Zone 2 is 12-50m on either side of the centreline of the ROW between tower footprints, and will involve all trees to be removed while retaining shrub and herb cover to the extent possible. This vegetation clearing prescription applies to forest stands, to retain existing golden-winged warbler habitat. New habitat may result from woody vegetation regeneration along the ROW, adjacent to mature forest.

Environmental monitoring of golden-winged warbler habitat (after construction) will to assess the change in vegetation. Environmental monitoring will involve quantitative native vegetation surveys, along the transmission line RoW. Sites selected for surveys will have plots established for future vegetation monitoring. Vegetation will be sampled for composition, abundance and structure. Sampling of selected sites will follow methods outlined by Redburn and Strong (2008) and involve the establishment of five 2.5 m by 2.5 m quadrats with a 1 m by 1 m nested quadrat spaced at 5 m increments along a 30 m transect for shrubs 1 - 2.5 m tall and herbs and low shrubs ≤1 m tall, respectively. Transects will be located on sites considered representative of the stand being sampled. The first quadrat will be placed at the 5 m mark. The composition of tree cover >2.5 m tall will be estimated using a 20 m by 30 m plot centered on each transect. Transects will be permanently located along the transmission line RoW, longitudinally, and approximately in the centre of the RoW, but off the equipment path. Plant cover will be

estimated to the nearest 1% for species <15% cover and nearest 5% for those with higher cover. GPS coordinates and photographs will be taken at each sampling site.

Permanently located sampling areas will be used to record the change in vegetation and measure the success in retaining golden-winged warbler habitat, that can be systematically monitored through time. The collection of vegetation information will occur at a similar time during the growing season to maximize the comparability of data. After field sampling, the data will be digitized and mean values for vegetation cover will be calculated. Total species cover, species richness and diversity measures will be calculated for each plot. Statistical testing may be used to determine if differences occur between baseline samples and post-clearing.

7.3.2.5 Birds of Prey

Baseline data for raptors were gathered in spring and fall 2014 using methods described in Chapter 9 of the EIS. Because raptor nests change over time, a follow-up aerial survey for raptor and other large stick nests will be conducted prior to construction to locate any raptor stick nests within the PDA, or within 500 m of the proposed footprint

Surveys will occur on calm, clear days with good viewing conditions and will be flown at an altitude of 150 feet and at a speed of 100 km/hr. One observer skilled in identifying raptor species and their nests will be positioned on both sides of the helicopter.

During construction, environmental inspectors will be given instructions on how to look for large raptor stick nests while clearing vegetation for the ROW and other project components, in order to prevent destroying these nests.

Post-construction, incidental surveys for raptor nests will be conducted by maintenance staff during asset inspection surveys.

7.3.3 Ungulates and Predators

7.3.3.1 Elk

Baseline data for elk were gathered using a combination of methods described in Chapter 9 of the EIS: large mammal survey using camera trap arrays, aerial winter track surveys, and elk breeding survey using call broadcasts.

The camera trap program consisted of 56 cameras, 18 of which were located in a paired configuration along the final preferred route, 18 in a paired configuration along an alternate route, and 20 non-paired cameras along the existing M602F 500 kv transmission line (EIS Map 7-1). In the paired configurations, one camera was located on a proposed transmission line route and the other in comparable habitat located approximately 500-800 meters from the route

(i.e., in control sites). Control cameras were located at distances greater than the zone of reported linear disturbance effects on elk (Storlie 2006; Morgantini [1996] in Jalkotzy 2005). The cameras recorded mammal data between April and October, 2014. In 2015 and 2016, they were redeployed along the final preferred route (FPR) and select locations along M602F from April to October.

Systematic aerial winter track surveys were conducted in five 20 x 20 km survey blocks in February 2014 (EIS Map 7-2), in four 20 x 20 km survey blocks in January 2015 (EIS Map 7-3), and in two 20 x 20 km survey blocks in March 2016 (EIS Map 7-4). Survey design was modified each year as route options were refined. In 2016, surveys focused on the southernmost survey blocks (EIS Map 7-4) having the greatest potential to support elk. The area between these survey blocks was also surveyed to increase coverage of the entire southern portion of the preferred route (EIS Map 7-4).

Elk breeding surveys were conducted along five road-based transects during the elk breeding period (September 2014) (EIS Map 7-5). Surveys were repeated throughout the month to improve the potential of detecting elk if elk were present in the area.

As described in the EIS, a change in habitat availability associated with ROW clearing is anticipated to be negligible for the Vita elk herd because routing of the New ROW avoids the core areas known to support the elk (*i.e.*, near Vita and Arbakka, MB). As such, elk monitoring will test the following null and alternate hypotheses:

Hypothesis 1:

- H_0 (null): The construction and operation of the transmission line does not affect the distribution of the Vita elk population.
- H_1 (alternate): The construction and operation of the transmission line does affect the distribution of the Vita elk population.

To test this hypothesis, a Before-After-Control-Impact (BACI) study will be implemented using methods applied during baseline mammal surveys. The distribution and occurrence of the Vita elk population will be mapped using data gathered from systematic aerial track surveys, incidental observations (by project staff, and reported by other sources), and remote infrared (IR) camera trap arrays (Kays *et al.* 2009) situated along the ROW and adjacent suitable habitat where the RAA and the Vita elk range overlap. In Manitoba, the Vita elk range is considered to be fall/winter range, therefore monitoring effort will largely be concentrated during the fall and winter period, during the construction and initial operation stages of the Project. Annual spring pellet group transects (Kie 1988) will be considered as a supplemental or alternative method (if needed based on the initial year of data collection using other methods) to monitor occurrence and distribution during construction and operation phases. Elk-crop damage reports from

Manitoba Sustainable and Manitoba Agriculture will be compiled and reviewed for evidence that would suggest elk use of the LAA is changing.

A change in mortality-risk will be measured by monitoring incidents of elk-vehicle collisions (construction phase) related to project access and activities. Change in available access, and elk occurrence in relation to project-related access will be used to help measures change in hunter and predator accessibility to suitable elk habitat. Occurrence of predators (i.e. wolves utilizing project disturbance) will be compared to elk location data to qualitatively assess overlap and potential predation-risk to elk from pre-disturbance state.

Large Mammal Camera Trap Study

Large mammals, particularly white-tailed deer and black bear, are the primary targets of the camera trap study, but incidental observations of other species and human activity will also be collected. In this study, IR camera trap arrays are used to monitor mammal activity along the FPR (*i.e.*, potentially affected sites) and adjacent control areas (>500 m from the FPR).

Survey efforts will focus on large, contiguous patches of intact forested habitats between Provincial Highway 12 and the Canada-U.S. border that are most likely to be affected by habitat fragmentation. The LAA in this extent includes softwood forest (36% total area), hardwood forest (18%), and mixedwood forest (4%) (MCWS 2001). Site selection aimed to sample each forested habitat equally in both potentially affected sites and control sites; however, the lack of mixedwood forest within the LAA limited its inclusion.

A total of 24 camera trap arrays will be used in the camera trap study, with 12 cameras located in potentially affects areas along the FPR and 12 cameras located in reference or control areas. To maintain the Before-After-Control-Impacted (BACI) survey design implemented during the baseline data collection and to adjust for alignment of the FPR, 11 sites (six potentially affected sites and five control sites) that were surveyed in either 2014, 2015, or 2016 will continue to be surveyed during pre-construction, construction and operation monitoring phases. Thirteen new sites (six potentially affected sites and seven control sites) will also be monitored throughout the pre-construction, construction and operation phases.

IR camera traps will be deployed from early May to late October (approx. 6 months) to capture late spring, summer, and fall wildlife activity. Twenty-four camera traps have the potential to contribute 4,320 camera-days of wildlife monitoring data between Provincial Highway 12 and the Canada-US border (along approximately 50 km of the FPR). This level of effort will cover approximately 67% of accessible crown lands traversed by the FPR, and will exceed standards for minimum camera-days required in wildlife studies as outlined in Rovero *et al.* (2013).

The six new potentially affected survey sites were randomly selected within a series of 1x1 km grid cells overlying the center of the FPR. These grid cells are considered potentially affected

due to their proximity to the FPR. In these areas, IR camera traps will be located along the FPR and within the dominant habitat type found within the selected grid cell. The seven new control sites are located ≥500 m from potentially affected sites to maintain independence and increase efficiency of IR camera trap deployment and maintenance. Randomly selected survey sites that could not be reasonably accessed by foot were excluded (e.g., require helicopter access or >1.5 km from the nearest trail) as were sites not located on crown lands.

An annual relative abundance index (RAI; number of photo events / camera-days) will be calculated for key species (e.g., white-tailed deer and black bear) at each of the 24 IR camera trap sites. Box and whisker plots of annual RAIs will be used to visualize differences between IR camera trap treatments (*i.e.*, potentially affected sites vs. control sites). Analysis of variance (ANOVA) can be used to test for statistical differences between treatments and time periods.

Aerial Winter Track Survey

Aerial winter track surveys will be conducted in 2- 20 x 20 km survey blocks located along the FPR. In 2016, the area between these two blocks (a 10 km buffer of the FPR; EIS Map 7-4) was added to enhance coverage of the section of the FPR with the greatest potential for improved local hunter and predator access. This area will also be monitored during construction and operation.

Surveys are conducted along 400-m-wide, east-west transects spaced 1 km apart using a Bell 206 Jet Ranger helicopter and three observers: the front-left and rear-right observers act as primary observers on their respective sides while the data recorder in the rear-left acts as a secondary observer. Surveys are conducted at approximately 120 m above ground level at speeds between 90-110 km/hr during periods of good environmental conditions:

- wind <30 km/h;
- cloud ceiling >150 m;
- precipitation not exceeding a light, intermittent snowfall;
- absence of fog;
- during periods of adequate daylight (from one half hour after sunrise to one half hour before sunset); and
- with a snow base of ≥25 cm (MCWS 2015, unpublished).

To identify mammal tracks in the snow during aerial surveys, surveys are typically undertaken within two to three days after a snowfall event (5-10 cm; BC RIC 1998).

A handheld GPS will be used to collect a track log that recorded coordinates at one-second intervals. Upon observation of a mammal track or individual, the data recorder will record the species, number of tracks, and number of individuals, along with the associated time (hh:mm:ss) which will be used to extract a matching coordinate from the GPS track log. The georeferenced data will be summarized and mapped using ArcGIS® (ESRI 2012).

Logistic regression will be used to relate track and individual densities to the FPR and reference areas while accounting for variation in underlying habitat data.

7.3.3.2 White-tailed Deer

Baseline data for white-tailed deer were gathered using a combination of methods described in Chapter 9 of the EIS: large mammal survey using camera trap arrays and aerial winter track surveys. Both of these survey programs, summarized under Section 7.3.3.1, also yielded data on white-tailed deer.

As described in the EIS, clearing of the new ROW during construction may cause temporary avoidance by white-tailed deer due to sensory disturbance. However, as vegetation re-establishes along the ROW during operation, deer may be attracted to the edge habitat that forms along parts of the ROW, particularly in areas previously forested. The use of the ROW by deer and the access it creates for predators (e.g., wolves and coyotes) and hunters may elevate mortality risk to deer during operation. As such, white-tailed deer monitoring will test the following null and alternate hypotheses:

Hypothesis 1:

- H_0 (null): The construction of the transmission line does not affect the distribution of white-tailed deer.
- H_1 (alternate): The construction of the transmission line does affect the distribution of white-tailed deer.

Hypothesis 2:

- H_0 (null): The operation of the transmission line does not affect the distribution of white-tailed deer.
- H_1 (alternate): The operation of the transmission line does affect the distribution of white-tailed deer.

Hypothesis 3:

- H_0 (null): The operation of the transmission line does not change the mortality risk for white-tailed deer.
- H_1 (alternate): The operation of the transmission line does affect the mortality risk for white-tailed deer.

To test these hypotheses, a Before-After-Control-Impact (BACI) study will be implemented using methods applied during baseline mammal surveys. Distribution mapping of white-tailed deer will involve systematic winter aerial surveys of monitoring blocks along the project ROW to

assess change in seasonal distribution relative to project infrastructure and predator (e.g., wolf and coyote) distribution. Monitoring will focus on suitable habitat on the eastern portion of the RAA. The survey blocks will be consistent with those used in 2015 and 2016 so that direct comparisons can be made between baseline state and project disturbance states (construction and initial operation phases) (pre- versus post-disturbance). More information on how baseline data was collected can be found in the Wildlife and Wildlife Habitat technical data report. Annual spring pellet group transects (Kie 1988) may be considered as a supplemental or alternative method (if needed based on the initial year of data collection using other methods) to monitor occurrence and distribution during the construction and initial operation phases.

Mortality-risk will primarily be assessed by monitoring incidents of deer-vehicle collisions (construction phase) related to project access and activities. Change in hunter and predator accessibility to suitable deer habitat will be assessed by comparing winter deer occurrence (pre- versus post-disturbance) relative to project-related access. Occurrence of predators (wolves/coyotes) utilizing project disturbance will be compared to deer location data to assess overlap and potential predation-risk to white-tailed deer.

A change in mortality-risk will be measured by monitoring incidents of deer-vehicle collisions (construction phase) related to project access and activities. Change in available access, and deer occurrence in relation to project-related access will be used to help measures change in hunter and predator accessibility to suitable deer habitat. Occurrence of predators (i.e. wolves utilizing project disturbance) will be compared to deer location data to qualitatively assess overlap and potential predation-risk to elk from pre-disturbance state.

Large Mammal Camera Trap Study

The large mammal study data analysis for white-tailed deer will be carried out in the same manner as described previously for elk (See Section 7.3.3.1).

Aerial Winter Track Surveys

Aerial winter track surveys data analysis for white-tailed deer will be carried out in the same manner as described previously for elk (See Section 7.3.3.1).

7.3.3.3 Black Bear

Baseline data for black bear were gathered during the Large Mammal Study using camera trap arrays as described for elk in Section 7.3.3.1.

As described in the EIS, movement patterns of mammalian predators including black bear, may change in response to the cleared ROW. In areas of contiguous forest, use of the ROW by predators may increase during Project operations due to the ease of mobility. The use of the

ROW by hunters may increase the mortality risk to black bears using the transmission line ROW As such, black bear monitoring will test the following null and alternate hypotheses:

Hypothesis 1:

- H_0 (null): The construction and operation of the transmission line does not affect the distribution of black bear.
- H_1 (alternate): The construction and operation of the transmission line does affect the distribution of black bear.

To test this hypothesis, a Before-After-Control-Impact (BACI) study will be implemented using methods applied during baseline mammal surveys. Distribution of black bear will be mapped relative to the project ROW using data collected by remote IR camera trap arrays (Kays *et al.* 2009). Use of cameras is a non-invasive and effective method to collect distribution data. During the construction phase Project workers will also record incidental sightings of black bear.

7.3.3.4 Wolves and Coyotes

Baseline data for wolves and coyotes were gathered using a combination of methods described in Chapter 9 of the EIS: large mammal survey using camera trap arrays and aerial winter track surveys. Both of these survey programs, summarized under Section 7.3.3.1, also yielded data on wolves and coyotes.

As described in the EIS, movement patterns of mammalian predators, including wolves and coyotes, may change in response to the cleared ROW. In areas of contiguous forest, use of the ROW by predators may increase during Project operations due to the ease of mobility. Use of the ROW by predators may increase the mortality risk to prey species such as white-tailed deer. As such, predator monitoring will test the following null and alternate hypotheses:

Hypothesis 1:

- H_0 (null): The construction and operation of the transmission line does not affect the distribution and occurrence of wolves and coyotes.
- H_1 (alternate): The construction and operation of the transmission line does affect the distribution and occurrence of wolves and coyotes.

To test this hypothesis, a Before-After-Control-Impact (BACI) study will be implemented using data gathered during mammal baseline and monitoring surveys. Distribution of wolves and coyotes will be mapped relative to the project ROW using data collected during aerial surveys and by remote IR camera trap arrays (Kays *et al.* 2009). Use of cameras is a non-invasive and effective method to collect occurrence and distribution data. During the construction phase Project workers will also record incidental sightings of wolves and coyotes.

Large Mammal Camera Trap Study

The large mammal study and data analysis for wolf and coyote will be carried out in the same manner as described previously for elk (See Section 7.3.3.1).

Aerial Winter Track Surveys

Aerial winter track surveys and data analysis for wolf and coyote will be carried out in the same manner as described previously for elk (See Section 7.3.3.1).

7.4 EMPLOYMENT AND ECONOMY

7.4.1 Project Employment

The EIS estimated the workforce for all project components. Estimates vary by project component and year depending on the activity. The majority of employment opportunities will occur during the construction phase of the project with fewer opportunities during the operations phase of the project. Monitoring parameters for employment/workforce include employment data to be collected for all project components during the construction phase could include:

- Total person years of employment for each project component – Person years of employment are defined as the amount of work that one worker could complete during twelve months of full-time employment;
- Total number of hires – Refers to the number of people hired on the project site for any duration;
- Total number of employees – Refers to the number of individuals hired. The variance between hires and employees can be attributed to an individual being hired to the project more than once;
- Employment duration; and
- Type (job classification) of work available

Employment data will be collected on-site by contractors through an employee self-declaration form designed for the project. All completed forms will be provided by on-site contractors to Manitoba Hydro and stored in a central database. Analysis of data will occur on an annual basis and reported in the annual report.

7.4.2 Business Opportunities

Monitoring of direct business effects will provide data on the success and effectiveness of efforts to enhance local business participation The following parameters will be monitored in conjunction with the project:

- Direct project expenditures;

Purchasing data of supplies and services will be collected through Manitoba Hydro's existing accounting and tracking systems. Data will be collected on the total number and value of purchases made.

7.4.3 Labour Income and Tax Revenue

Labour income is an important indicator of direct economic impact of a project. Income levels also affect the general standard of living of individuals and families by influencing the acquisition of basic human needs including housing, food and clothing. The following parameters will be monitored during the construction phase:

- Labour income – direct income earned by workers from employment on the project
- Taxes paid:
  - Provincial sales tax
  - Payroll tax
  - Corporate capital tax
  - Fuel tax

Labour income that will be calculated using aggregate information on wages paid to employees based on information provided by contractors and Manitoba Hydro. Taxes paid will reflect Manitoba Hydro's actual payments to government associated with the project - examples include sales tax, payroll tax, corporate capital tax and fuel tax.

7.5 INFRASTRUCTURE AND SERVICES

7.5.1 Transportation

The construction of each major component will have distinct effects on the existing road network. The road network consists of provincial highways and municipal roads in southeast Manitoba. Each Project component has unique traffic generation, vehicle mix, travel patterns and mode choices, which are variable throughout the life of the Project.

Parameters to be monitored during the construction phase will include:

- Traffic volumes – compare actual traffic volumes from estimates in the EIS at key locations in the Manitoba – Minnesota Transmission Project area;
- Traffic accidents and near misses on key roadways through Manitoba Hydro reporting processes.

Existing Manitoba Infrastructure and Transportation traffic counters or other methods will be used to acquire monitoring information relating to traffic.

Traffic accidents and near misses will be obtained through Manitoba Hydro reporting processes.

7.6 OUTFITTING AND FALCONRY

7.6.1 Outfitter Resource Use

The objective of the black bear bait site camera trap survey is to analyse bear occurrence and prevalence at bait site locations prior to, during and post construction of the Project.

Manitoba Hydro is planning to continue its work with a local black bear outfitter in the project area to further understand potential construction effects. Camera traps were established at bait sites within the Project Development Area and in control areas to understand baseline conditions of bear occurrence and prevalence. As some bait sites are in close proximity to the Final Preferred Route, it is possible that their use may be affected by the Project. Manitoba Hydro will be analyzing bear observations at bait sites as a function of distance to project and lbs of bait, before and during construction.

7.6.2 Peregrine Falcon Conservation Center

The objective of the peregrine falcon flight recordings is to measure peregrine falcon movements around the conservation center and proposed project right of way prior to, during and post construction of the Project

Manitoba Hydro is planning to continue its work with a local peregrine falcon conservation centre in the project area to further understand potential development effects on their operations. In 2016, Manitoba Hydro provided a Marshall GPS System radio transmitter and a supporting Ipad device to Parkland Mews to help them understand and record movements and flight patterns of peregrine falcons bred at the conservation centre. This flight information is digitally recorded and will baseline information of peregrine falcon movements in the local region. Data collected will include total distance travelled from the conservation centre, location of preferred perch sites, number of times a bird traverses or parallels the project ROW. As such, peregrine conservation center monitoring will test the following null and alternate hypotheses:

Hypothesis:

- H_0 (null): The operation of the transmission line does not affect the traversing or perching of peregrine falcons.
- H_1 (alternate): The operation of the transmission line does affect the traversing or perching of peregrine falcons.

To test this hypothesis, a Control-Impact study design will be implemented. The Before-After Control-Impact design study cannot be implemented for this study as any effects are not

expected prior to the installation of the transmission lines.

8.0 REFERENCES

Section 4.0

Canadian Environmental Assessment Act, 2012, S.C. 2012, c. 19, s. 52

Canadian Environmental Assessment Agency. 2012. Operational Policy Statement. Follow-up Programs under the Canada Environmental Assessment Act.

National Energy Board. 2015. NEB's Regulatory Framework. Available online at http://www.neb-one.gc.ca/sftnvrnmnt/prtctng/index-eng.html

Aboriginal Traditional Knowledge

Black River First Nation, Long Plain First Nation and Swan Lake First Nation. 2015. Preliminary Aboriginal Traditional Knowledge Study Community Report submitted by Black River First Nation, Long Plain First Nation and Swan Lake First Nation. 72 pp.

Dakota Plains Wahpeton Nation Traditional Knowledge Study. 2016. Manitoba-Minniesota Transmission Project. 30 pp.

Manitoba Metis Federation. 2017. The Manitoba Metis Federation Metis Land Use and Occupancy Study - Assessment of Potential Effects Prior to Mitigation. Manitoba-Minniesota Transmission Project. 413 pp.

Peguis First Nation. 2015. Report to Peguis First Nation and Manitoba Hydro - Peguis First Nation Draft Land Use and Occupancy Interview Project for the Manitoba-Minnesota Transmission Project. 32 pp.

Roseau River Anishinabe First Nation. 2015a. Oral History Interview – Bishew (Lynx). Recorded and Transcribed by June Thomas, Community Project Coordinator. May 13, 2015. 3 pp.

Roseau River Anishinabe First Nation. 2015b. Oral History Interview – Eagle Songs. Recorded and Transcribed by June Thomas, Community Project Coordinator. May 19, 2015. 3 pp.

Roseau River Anishinabe First Nation. 2015c. Roseau River Anishinabe First Nation Aboriginal Traditional Knowledge Report. 8 pp.

Sagkeeng O-Pimatiziiwin 2. 2015. Traditional Knowledge Study. Manitoba Minnesota Transmission Project. 32 pp.

Vegetation and Wetlands

Black River First Nation, Long Plain First Nation and Swan Lake First Nation. May 2015. Aboriginal Traditional Knowledge Study Community Report. Prepared for the Manitoba Minnesota Transmission Line Project.

Government of Canada. 2015. Canadian Wildlife Species at Risk. Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Canadian Wildlife Service, Environment Canada, Gatineau, QC. Available at: http://www.cosewic.gc.ca/eng/sct5/index_e.cfm.

Government of Canada. 2015. *Species at Risk Act* (SARA). Available at: http://laws-lois.justice.gc.ca/eng/acts/S-15.3/.

Government of Canada. 1991. The Federal Policy on Wetland Conservation. Director General, Canadian Wildlife Service, Ottawa, Ontario. Available at: http://publications.gc.ca/collections/Collection/CW66-116-1991E.pdf.

Government of Manitoba. 2015. *Endangered Species and Ecosystems Act* (MESEA). Available at: http://web2.gov.mb.ca/laws/statutes/ccsm/e111e.php.

Government of Manitoba. 2015. MBCDC Species of Conservation Concern: Conservation Data Centre Ranks (Global and Provincial). Available at: http://www.gov.mb.ca/conservation/cdc/consranks.html. Accessed May 2015.

Hanson, A., L.Swanson, D. Ewing, G. Grabas, S. Meyer, L. Ross, M. Watmough, and J. Kirkby. 2008. Wetland Ecological Functions: Assessment: An Overview of Approaches. Canadian Wildlife Service: Technical Report Series Number 497. Atlantic Region. 56 pp.

Halsey, L.A., D.H. Vitt and S.C. Zoltai. 1997. Climate and physiographic controls on wetland type and distribution in Manitoba, Canada. Wetlands, 17(2): 243-262.

National Wetlands Working Group. 1997. Canadian Wetland Classification System. *Eds* B.G. Warner and C.D.A. Rubec. Wetlands Research Center, University of Waterloo, Ontario Canada.

Redburn, M.J. and W.L Strong. 2008. Successional development of silviculturally treated and untreated high-latitude *Populus tremuloides* clearcuts in northern Alberta, Canada. Forest Ecology and Management, 255: 2937-2949.

Roth, A.M., Rohrbaugh, R.W., Aldinger, K., Bakermans, M.H., Barker Swarthout, S., Buehler, D.A., Confer, J.L., Crawford, D., Friis, C., Fowlds, R.M., Larkin, J.L., Loegering, L.J., Lowe, J.D., Piokowski, M., Rosenberg, K.V., Smalling, C., Terhune, T.M., Vallender, R., Will, T., and Wood, P.B. 2012. Golden-winged warbler breeding season conservation plan. In Roth, A.M. Roohrbaugh, R.W., Will, T., Beuhler, D.A. editors. Golden-winged warbler status review and Conservation Plan. Available fro.

Wildlife and Wildlife Habitat - Amphibians and Reptiles

Bennett, S.H., J.L. Waldron and S.M. Welch. 2012. Light bait improves capture success of aquatic funnel-trap sampling for larval amphibians. Southeastern Naturalist, 11(1):49-58.

Environment Canada. 2009. Petroleum Industry Activity Guidelines for Wildlife Species at Risk in the Prairie and Northern Region. Canadian Wildlife Service, Environment Canada, Prairie and Northern Region, Edmonton Alberta. 64p.

Kendell, K. 1998. Red-sided garter snake (*Thamnophis sirtalis parietalis*) literature review. Submitted to Alberta Environmental Protection, Natural Resources Service, Fisheries and Wildlife Management Division. 38 pp.

Kendell, K. 2002. Survey Protocol for the Northern Leopard Frog. Alberta Species at Risk Report No. 43. Available at: http://esrd.alberta.ca/fish-wildlife/species-at-risk/species-at-risk-publications-web-resources/amphibians/documents/SAR43-SurveyProtocol-NorthernLeopardFrog-Feb2002.pdf.

Mossman, M.J., L.M. Hartman, R. H. Hay, J. R. Sauer and B. J. Dhuey. 1998. Monitoring long-term trends in Wisconsin frog and toad populations. Pp. 169-198 *In* M. J. Lannoo (Ed.). Status and Conservation of Midwestern Amphibians. University of Iowa Press, Iowa City, Iowa.

Saskatchewan Ministry of Environment. 2014a. Amphibian auditory survey protocol. Fish and Wildlife Branch Technical Report No. 2014-1.0. 3211 Albert Street, Regina, Saskatchewan. 11pp.

Saskatchewan Ministry of Environment. 2014b. Amphibian visual survey protocol, Fish and Wildlife Branch Technical Report No. 2014-2.0. 3211 Albert Street, Regina, Saskatchewan. 9pp.

United States Geological Service (USGS). 2012. North American amphibian monitoring program NAAMP. United States Geological Service. Available online at https://www.pwrc.usgs.gov/naamp/naamp_protocol.pdf. Accessed January 8, 2015.

Wildlife and Wildlife Habitat - Birds

Artuso, C. 2009. Golden-winged warbler in Manitoba. Unpublished report (13 October 2009) by Bird Studies Canada. 18pp

Avian Power Line Interaction Committee (APLIC). 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC. Washington, D.C.

Balderson, K., D. Eslinger and J. Nicholson. 2013. Greater sage-grouse (*Centrocerus urophhasianus*) monitoring in southeast Alberta: 1968-2012. Alberta Species at Risk Report No. 147, Alberta Environment and Sustainable Resource Development. 28pp.

Barrientos, R., J.C. Alonso, C. Ponce and C. Palacín. 2011. Meta-analysis of the Effectiveness of Marked Wire in Reducing Avian Collisions with Power Lines. Conservation. Biology, 25: 893–903.

Canadian Wildlife Service. 2007. Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds. Prepared by Canadian Wildlife Service/Environment Canada. Available at: http://www.ec.gc.ca/Publications/C8CE090E-9F69-4080-8D47-0622E115A4FF/CWSWindTurbineAndBirdsMonitoringGuide2007.pdf

De la Zerda, S. and L. Rosselli. 2002. Mitigating Collisions of Birds against Transmission Lines in Wetland Areas in Colombia by Marking the Ground Wire with Bird Flight Diverters (BFD), *In* Proceedings of the Seventh International Symposium on Environmental Concerns in Rights-of-Way Management (Eds.: J.W. Goodrich-Mahoney, D. Mutrie and C. Guild). Elsevier Science Ltd. Pages 395-402.

Environment Canada. 2014. Recovery Strategy for the Golden-winged Warbler (*Vermivora chrysoptera*) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. vi + 57 pp.

Gibson, D., E.J. Blomberg, G.L. Patricelli, A.H. Krakauer, M.T. Atamian and J. S. Sedinger. 2013. Effects of radio collars on survival and lekking behavior of male Greater Sage-Grouse. The Condor 115(4):769–776Government of Alberta. 2013. Sensitive Species Inventory Guidelines. Accessed January 2017 from http://esrd.alberta.ca/fish-wildlife/wildlife-management/documents/.

Morkill, A.E. and S.H. Anderson. 1991. Effectiveness of Marking Powerlines to Reduce Sandhill Crane Collisions. Wildlife Society Bulletin, 19:442-449.

Phillips, J.B. 1990. Lek behaviour in birds: do displaying males reduce nest predation? Animal Behaviour (39): 555-565.

Wisconsin Department of Natural Resources (WDNR). 2013. Sharp-tailed Grouse Survey Protocol.

Wildlife and Wildlife Habitat - Mammals

Anderson, D.R., and K.P. Burnham. "Avoiding pitfalls when using information-theoretic methods." The Journal of Wildlife Management (2002): 912-918.

Jalkotzy, M.G. Selected Ecological Resources of Alberta's Castle Carbondale: A Sypnosis of Current Knowledge. Arc Wildlife Services, 2005.

Kays, R., P.A. Jansen, C. Carbone & M. Rowcliffe. 2009. Camera traps as sensor networks for monitoring animal communities. International J. of Research and Reviews in Wireless Sensor Networks (IJRRWSN) 1(2): 19-29.

Kie, J.G. 1988. Performance in wild ungulates: measuring population density and condition of individuals. USDA. Forest Service. General Tech. Rep. PSW-106. 21 pp.

Kie, J.G., R.T. Bowyer, M.C. Nicholson, B.B. Boroski & E.R. Loft. 2002. Landscape heterogeneity at differing scales: effects on spatial distribution of mule deer. *Ecology* 83:530-544.

Kie, J.G., R.T. Bowyer & K.M. Stewart. 2003. Ungulates in western forests: habitat requirements, population dynamics, and ecosystem processes. Pp 296-340 in Mammal Community Dynamics: Management and Conservation in the Coniferous Forests of Western North America. C.J. Zabel & R.G. Anthony (eds). Cambridge University. New York.

Leavesley, Kelly. 2015. Regional Wildlife Manager, Manitoba Conservation and Water Stewardship, Lac Du Bonnet, MB. Correspondence with Mike Sweet, Stantec Consulting Ltd., Winnipeg, MB, March 30, 2015.

Linnell, J. D., Swenson, J.E, Andersen, R., and B. Barnes. 2000. How vulnerable are denning bears to disturbance? *Wildl. Soc. Bull.* 28: 400-413.

Minnesota Department of Natural Resources. 2009. Strategic management plan for elk. Minnesota Dept. Nat. Resour. 35 pp. On-line at: http://files.dnr.state.mn.us/recreation/hunting/elk/elk_mgt_plan.pdf.

Pelton, M. R., A. B. Coley, T. H. Eason, D. L. Doan Martinez, J. A. Pederson, F. T. van Manen, & K. M. Weaver. 1999. American black bear conservation action plan. In: C. Servheen, S. Herrero, and B. Peyton (eds). Bears. Status survey and conservation action plan. pp: 144-146. IUCN/SSC Bear and Polar Bear Specialist Groups. IUCN, Gland, Switzerland and Cambridge, UK.

Pelton, M.R. 2000. Black Bear. In: Demarais, S. and P.R. Krausman (eds). Ecology and Management of Large Mammals in North America. Prentice-Hall Inc., Upper Saddle River, New Jersey. pp 389-408.

Storlie, J.T. Movements and habitat use of female Roosevelt elk in relation to human disturbance on the Hoko and Dickey Game Management Units, Washington. Diss. Humboldt State University, 2006.

Rebizant, Ken. 2015. Big Game Manager, Manitoba Conservation and Water Stewardship, Winnipeg, MB. Interview with Mike Sweet, Stantec Consulting Ltd., Winnipeg, MB, March 9, 2015.

Reimers, E., K. Flydal & R. Stenseth. 2000. High voltage transmission lines and their effect on reindeer: a research program in progress. *Polar Research* 19(1): 75-82.

Rogers, L.L. & A.W. Allen. 1987. Habitat suitability index models: black bear, Upper Great Lakes Region. US Dept. of Interior. Fish and Wildlife Serv. Washington. 54 pp.

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Canadian Environmental Assessment Agency. 2015. Practitioners Glossary for the Environmental Assessment of Designated Projects under the Canadian Environmental Assessment Act, 2012. Available online at https://www.ceaa-acee.gc.ca.

British Columbia Ministry of Forests and Range. 2015. Defining Adaptive Management. Accessed online at https://www.for.gov.bc.ca in June 2015.

British Columbia Environmental Assessment Office. 2013. Guideline for the Selection Valued Components and Assessment of Potential Effects. Available online at http://www.eao.gov.bc.ca/pdf/EAO_Valued_Components_Guideline_2013_09_09.pdf.

Manitoba Hydro. 2013. Bipole III Environmental Protection Plan. Available online at https://www.hydro.mb.ca/projects/bipoleIII/pdfs/environmental_protection/bipoleIII_environnmental_protection_plan.pdf