Radisson to Henday (R44H) Transmission Project

Environmental Assessment Report

Prepared by Manitoba Hydro

Asset Planning and Delivery

Transmission & Distribution Environment and Engagement

January 2024

Prepared for:

Environmental Approvals Branch

Available in accessible formats upon request

Land acknowledgement

Manitoba Hydro has a presence across Manitoba – on Treaty 1, Treaty 2, Treaty 3, Treaty 4 and Treaty 5 lands – the original territories of the Anishinaabe, Anishininew, Cree, Dakota, and Dene peoples and the homeland of the Red River Métis. We acknowledge these lands and pay our respects to the ancestors of these territories.

Manitoba Hydro acknowledges that the Radisson to Henday transmission line is located on Treaty Five territory and on the traditional territories of the Cree peoples and the Red River Métis. We acknowledge the longstanding cultural and spiritual connections with the land and water throughout the territory and acknowledge the impacts of our projects and operations. The legacy of the past remains a strong influence on our relationships with Indigenous communities today. We are committed to having meaningful and mutually beneficial relationships, and to honour agreement commitments arising from Manitoba Hydro projects and operations. Let us reaffirm our relationship with one another. This is important as we move forward together in a spirit of truth and reconciliation.

Executive summary

Manitoba Hydro has developed this report to outline the environmental assessment carried out for the Radisson to Henday 230-kV transmission line project.

This report outlines the proposed project, project engagement, the biophysical and socio-economic environment in which the project will be built and operated, the potential effects of the project, and our assessment of the significance of those effects.

Using input from project engagement and drawing from our experience with the design and construction of transmission lines, and proven mitigation, we feel the proposed project meets the intent of sustainable development. We also feel that the proposed project will ensure that the environment is protected and maintained in such a manner as to sustain a high quality of life, including social and economic development, recreation, and leisure for present and future generations.

The proposed project consists of the:

- Construction of a 42-km long 230-kV transmission line, and
- Installation of equipment at the Radisson and Henday converter stations to terminate the new transmission line.

The project will be on Treaty Five territory and on the traditional territories of the Cree peoples and the Red River Métis. These lands have been occupied and cared for by Indigenous people for thousands of years.

The project footprint will be in an existing right-of-way corridor and will parallel existing transmission lines. Land cover in the proposed transmission line right-of-way is dominated by wetland shrub, with smaller portions of sparse coniferous forest, tall shrub vegetation, dense mixedwood forest, exposed land, and waterbodies.

The assessment process was developed through a review of regulations, current practice in environmental assessment and experience from assessments of similar projects, as well as feedback received during project engagement. Based on the above, the environmental assessment was focused on the following eight valued components:

- Vegetation
- Wildlife and wildlife habitat
- Fish and fish habitat
- Harvesting and recreation
- Important sites
- Infrastructure and community services

- Economic opportunities, and
- Health and safety

The proposed project will alter the landscape affecting the biophysical and socio-economic environments.

The changes to the biophysical environment are primarily through vegetation clearing to establish a transmission line right-of-way with varying affects to birds and wildlife depending on habitat preferences. The project will increase edge habitat and linear features on the landscape. However, routing preferences to parallel existing linear features and developed areas have minimized these effects. The project could disrupt harvesting and recreational activities; disturb heritage resources or cultural features and sites; increase noise and traffic on PR 280 and PR 290; diminish locals' perceived sense of safety due to the presence of the project workforce, particularly during construction. However, considering Manitoba Hydro's planned mitigation, past experience with similar projects in Northern Manitoba, and on-going engagement of First Nations, the Manitoba Métis Federation, and other interested audiences, the project's adverse effects are not anticipated to be substantive.

As previously mentioned, the project will be on lands occupied and cared for by Indigenous people for thousands of years. Manitoba Hydro aims for sustainable development and understands that any change to the landscape alters the human-nature relationships and land use. We will continue to engage on the project and use the knowledge gathered to continually improve how we undertake projects and assess the effects of these projects.

Manitoba Hydro's environmental protection program and associated protection plans, including project specific mitigation measures, have been adapted and updated to minimize the overall impacts of the project.

The proposed project was considered in the context of the current landscape, including past changes, as well as future changes to determine the significance of the project. Overall, the assessment conclusion is that the proposed project's effects to the environment will be not significant and that the project meets the intent and purpose of sustainable development.

Authors' acknowledgement

The following individuals contributed to the preparation of this environmental assessment report:

Names	Organization
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Acronyms and abbreviations

AAC	Annual allowable cut
AHCCD	Adjusted and homogenized Canadian climate data
BBA	Breeding bird atlas
CAAQS	Canadian Ambient Air Quality Standards
CEnvPP	Construction environmental protection plan
CHRPP	Culture and heritage resources protection plan
CIW	Canadian index of well-being
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWB	Community well-being
dBA	decibels
EA	Environmental assessment
ECCC	Environment and Climate Change Canada
ELF	Extremely low frequency
EMF	Electromagnetic fields
EPP	Environmental protection program
FNMEP	First Nation and Métis engagement process
FPR	Final preferred route
FRI	Forest resource inventory
GDP	Gross domestic product
HADD	harmful alteration, disruption, or destruction

HRB	Historic Resources Branch
HWM	High water mark
IAP2	International Association for Public Participation
ICNIRP	International Commission on Non-Ionizing Radiation Protection
KHFL	Kivalliq Hydro-Fibre Link
LAA	Local assessment area
MBCDC	Manitoba Conservation Data Centre
MESEA	Manitoba Endangered Species and Ecosystems Act
MMF	Manitoba Métis Federation
PEP	Public engagement process
PDA	Project development area
RAA	Regional assessment area
RCEA	Regional cumulative effects assessment
RCP	Representative concentration pathways
RHA	Regional health authority
SAR	Species at risk
SARA	Species at Risk Act
SDOH	Social determinants of health
SOCC	Species of conservation concern
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
VC	Valued component

Glossary

Term	Definition
Adaptive management	The process of updating management practices in response to ongoing observations.
Adverse effects	Negative effects on the environment and people that may result from a proposed project.
Committee on the Status of Endangered Wildlife in Canada (COSEWIC)	An independent advisory panel to the Minister of Environment and Climate Change Canada that meets twice a year to assess the status of wildlife species at risk of extinction. Members are wildlife biology experts from academia, government, non-governmental organizations and the private sector responsible for designating wildlife species in danger of disappearing from Canada.
Cumulative effect	The effect on the environment, which results when the effects of a project combine with those of the past, existing, and future projects and activities (CEAA 2018). OR the incremental effects of an action on the environment when the effects are combined with those from other past, existing, and future actions (Cumulative Effects Assessment)
Decommissioning	Planned shutdown, dismantling and removal of a building, equipment, plant and/or other facilities from operation or usage and may include site clean-up and restoration.
Developed	Land that has been altered for residential, commercial, or industrial use. Includes buildings, regularly managed green space and associated roads, parking lots, and trails.
Direct effect	An environmental effect that is: • A change that a project may cause in the environment; or • Change that the environment may cause to a project. It is a consequence of a cause-effect relationship between a project and a specific environmental component.

eCampaign	A notification mechanism targeted to self-identified interested parties. Email campaign recipients can unsubscribe from the email campaign service at any time, forward to other individuals, post on Twitter or share on Facebook.
Ecoregion	Characterized by distinctive regional ecological factors, including climate, physiography, vegetation, soil, water, and fauna.
Ecozone	An area of the earth's surface representative of large and very generalized ecological units characterized by interactive and adjusting abiotic and biotic factors.
Engaged audiences	A term used to refer to audiences engaged on the project inclusive of First Nations, the Manitoba Métis Federation, and interested parties.
Environmental management system	Part of an organization's overall management practices related to environmental affairs. It includes organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing, and maintaining an environmental policy. This approach is often formally carried out to meet the requirements of the International Organization for Standardization (ISO) 14000 series.
Environmental protection plan	Within the framework of an environmental protection program, an environmental protection plan prescribes measures and practices to avoid and minimize potential environmental effects of a proposed project.
Heritage sites / objects	Any site, object, work, or assembly of works of nature or human endeavor that is of value for its archaeological, paleontological, pre-historic, historic, cultural, natural, scientific, or aesthetic features.
Intangible cultural heritage	The UNESCO definition of intangible cultural heritage includes the traditions and living expressions that are transmitted from one generation to the next. Intangible cultural heritage manifests through five domains: oral traditions and expressions, performing arts, social practices and rituals, community knowledge and traditional craftsmanship.

Interested party	A general term used to describe an individual or group that would potentially have feedback to provide, may be affected by the project or decisions about the project, have a specific interest or mandate in the area, data to share, ability to disseminate information to membership or a general interest in the area. Interested party is used in place of the term stakeholder. For the project, it is not meant to include First Nations or the Manitoba Métis Federation or Indigenous peoples.
Linear infrastructure	An existing network or system composed of transportation or utility-based facilities (e.g., roads, highways, railways, pipelines, and transmission lines).
Marshalling yard	An open area used to stockpile, store, and assemble construction materials.
Mitigation	Means measures to eliminate, reduce, control, or offset the adverse effects of a project, and includes restitution for any damage caused by those effects through replacement, restoration, compensation, or any other means (Impact Assessment Act, 2019).
Natural environment	Naturally occurring physical features of the landscape. These features are represented by the hydrography, flora, fauna, and topography of a given area.
Public engagement process	The process of identifying interested individuals, including interested parties and the public, sharing information about the project, and providing opportunities for them to design how they want to participate and share their feedback and experiences. The process includes sharing how feedback and knowledge influenced decision making.
Remedial action scheme	A scheme designed to detect predetermined system conditions and automatically take corrective actions that may include, but are not limited to, adjusting or tripping generation (MW and Mvar), tripping load, or reconfiguring a System(s)”

Species of conservation concern	Species that are rare, disjunct, or at risk throughout their range in Manitoba and in need of further research. The term also encompasses species that are listed under (Manitoba) *The Endangered Species and Ecosystems Act of Manitoba*, (federal) *Species at Risk Act*, or that have a special designation by the Committee on the Status of Endangered Wildlife in Canada.
Species at Risk (SAR)	Is an extirpated, endangered, or threatened species or a species of special concern, as defined by the *Species at Risk Act*.
Wildlife management area	Lands that exist for the benefit of wildlife and for the enjoyment of people including biodiversity conservation, wildlife-related forms of recreation, hunting and trapping.

1.0 Introduction

This environmental assessment (EA) report outlines the assessment of potential effects of the proposed project in pursuit of a provincial Class 2 Environment Act Licence.

The proposed project consists of the construction of a new 230-kV transmission line (R44H) between the Radisson and Henday converter stations and includes:

1. Construction of a 42-km long 230-kV transmission line, and
2. Installation of equipment at the Radisson and Henday converter stations to terminate the new transmission line.

The proposed new transmission line will be in an existing right-of-way corridor and will parallel existing transmission lines.

The transmission line and associated station work are being done to increase the transfer capacity between Bipole I and Bipoles II/III.

Based on the conclusions of the assessment, the potential effects of constructing, operating, and decommissioning the proposed transmission line are deemed not significant.

1.1 Manitoba Hydro's environmental assessment process

Manitoba Hydro acknowledges that the Radisson to Henday transmission line is located on Treaty Five territory and on the traditional territories of the Cree peoples and the Red River Métis. We acknowledge the longstanding cultural and spiritual connections with the land and water throughout the territory and acknowledge the impacts of our projects and operations. The legacy of the past remains a strong influence on our relationships with Indigenous communities today. We are committed to having meaningful and mutually beneficial relationships, and to honour agreement commitments arising from Manitoba Hydro projects and operations. Let us reaffirm our relationship with one another. This is important as we move forward together in a spirit of truth and reconciliation.

As part of our endeavour to fulfill this commitment, over the last several years, Manitoba Hydro's approach to undertaking environmental assessments has been evolving in pursuit of increasing the presentation of information in ways that better reflect Indigenous worldviews and values, versus presenting information solely from a mostly Eurocentric worldview.

1.2 Regulatory framework

Manitoba Hydro projects are subject to provincial and federal regulations. The following sections describe the regulatory framework of the project.

1.2.1 Provincial regulatory framework

The project involves the construction of a 230-kV transmission line, which requires a provincial licence for a Class 2 development (i.e., transmission lines of 115-kV and over but not exceeding 230-kV) under *The Environment Act* (Manitoba).

The environmental assessment is conducted in accordance with Manitoba Hydro’s corporate and environmental policies and satisfies Manitoba’s environmental assessment legislation. It is also consistent with Canadian and international environmental assessment best practices and guidance. This environmental assessment report is submitted as part of the Environment Act proposal for the project.

1.2.2 Federal regulatory framework

Federally, the project is not considered a physical activity under the Physical Activities Regulations SOR/2019-285 and therefore does not trigger an environmental assessment under the *Impact Assessment Act*.

1.3 Manitoba Hydro’s mission and goals

Manitoba Hydro’s mission is to “Help all Manitobans efficiently navigate the evolving energy landscape, leveraging their clean energy advantage while ensuring safe, clean, reliable energy at the lowest possible cost.”

For more than 50 years Manitoba Hydro’s projects have primarily focused on the development of renewable hydroelectric power and have played a major role in the development of the provincial economy and the province. Manitoba Hydro operates based on our foundational principles of safety, environmental leadership, respectful engagement with interested parties and communities, and respect for each other.

The energy services that we offer Manitobans rely on natural resources which are of critical importance to us all, and that is why environmental leadership is identified as a key principle of our business.

We consider the environmental impacts of our activities, products, and services. To deliver on this commitment effectively, we employ an Environmental Management System (EMS) that aligns with ISO 14001 Standard by:

- Ensuring that the work performed by our employees and contractors meets environmental, regulatory, contractual, and voluntary commitments
- Recognizing the needs and views of its interested parties and ensuring that relevant information is communicated
- Assessing its environmental risks to ensure they are managed effectively
- Reviewing its environmental objectives regularly, seeking opportunities to improve its environmental performance
- Considering the life cycle impacts of its products and services
- Ensuring that its employees and contractors receive relevant environmental training
- Fostering an environment of continual improvement

1.4 Purpose of the document

The purpose of this report is to support Manitoba Hydro's application for a Class 2 development licence under *The Environment Act* (Manitoba), to construct and operate the R44H transmission line. For Class 2 developments, proponents are required to submit a cover letter, an Environment Act Proposal Form, an EA report, and an application fee to Manitoba Environment and Climate Change's Environmental Approvals Branch.

This EA report identifies and assesses the potential effects of the project and identifies the mitigation measures that will be used to address adverse environmental effects and enhance benefits associated with the project and forms part of the Environment Act proposal.

1.5 Environmental assessment report outline

Chapter 2.0 (Project description) describes the project including anticipated project components, considered alternatives, and schedule.

Chapter 3.0 (Project engagement) summarizes the engagement undertaken for the project, including the goals, objectives, and methods of engagement, as well as a summary of the feedback received.

Chapter 4.0 (Environmental assessment methods) outlines the methods used to conduct the environmental assessment, including the selection of valued components (VC), spatial and temporal boundaries, existing conditions, assessment of project effects and cumulative effects, mitigation, and determination of significance.

Chapter 5.0 (Environmental setting) provides existing condition information for aspects that are not covered in individual VC chapters which is relevant for the environmental assessment (e.g., climate, physiography and drainage, geology, soils, and historical and cultural setting).

Chapters 6.0 to 13.0 present the assessment of potential project effects on each of the eight VCs considered relevant for the project. In order of presentation, the eight VCs are vegetation, wildlife and wildlife habitat, fish and fish habitat, harvesting and recreation, important sites, infrastructure and community services, economic opportunities, and health and safety. Each VC chapter identifies specific mitigation measures, characterizes residual effects, assesses cumulative effects, presents follow-up and monitoring, and describes sensitivity to future climate change scenarios, for that VC.

Chapter 14.0 (Effects of the environment on the project) discusses the effects of the environment on the project.

Chapter 15.0 (Greenhouse gases and climate change) summarizes greenhouse gas and climate change information compiled for the project.

Chapter 16.0 (Accidents and malfunctions) outlines unplanned events that may occur due to project activities.

Chapter 17.0 (Environmental protection program) describes the environmental protection program for the project including the various plans, roles, and communication protocols that will be in place to mitigate project activities and effects.

Chapter 18.0 (Conclusion) provides a conclusion for the document.

Chapter 19.0 (References) lists the references from which information was drawn.

Following Chapter 19.0, the document ends with appendices in Chapter 20.

2.0 Project description

The proposed project consists of the construction of a new 230-kV transmission line (R44H) between the Radisson and Henday converter stations (see Map 2-1) and includes the following:

- Approximately 42 km of new 230-kV transmission line located in an existing transmission corridor
- Termination of the transmission line at the Radisson and Henday converter stations with associated equipment
  - Addition of a new transformer at the Radisson converter station
  - New switches at Radisson and Henday converter stations for the line termination

2.1 Project need and alternatives

The need for Manitoba Hydro to build a new 230 kV transmission line has been prompted by the ageing infrastructure of our high-voltage direct current (HVDC) system through which electricity generated at northern generating stations is transmitted to the south.

The power generated at our northern stations provides an essential service to our customers, communities, and province. Manitoba Hydro strives to ensure safety and reliability of that power every day. More than 70 per cent of the electricity delivered to our customers is generated at our northern generating stations.

Electricity is generated in alternating current (AC) at the lower Nelson River generating stations (i.e., Kettle, Long Spruce, Limestone, and Keeyask). The Northern Collector System is the network of transmission lines and switchyards that carries power from the four generating stations to the northern converter stations (i.e., Radisson, Henday and Keewatinohk) where it is converted into direct current (DC). The power is then routed to the Dorsey and Riel converter stations in southern Manitoba via the Bipoles I, II and III HVDC transmission lines (see Figure 2-1).

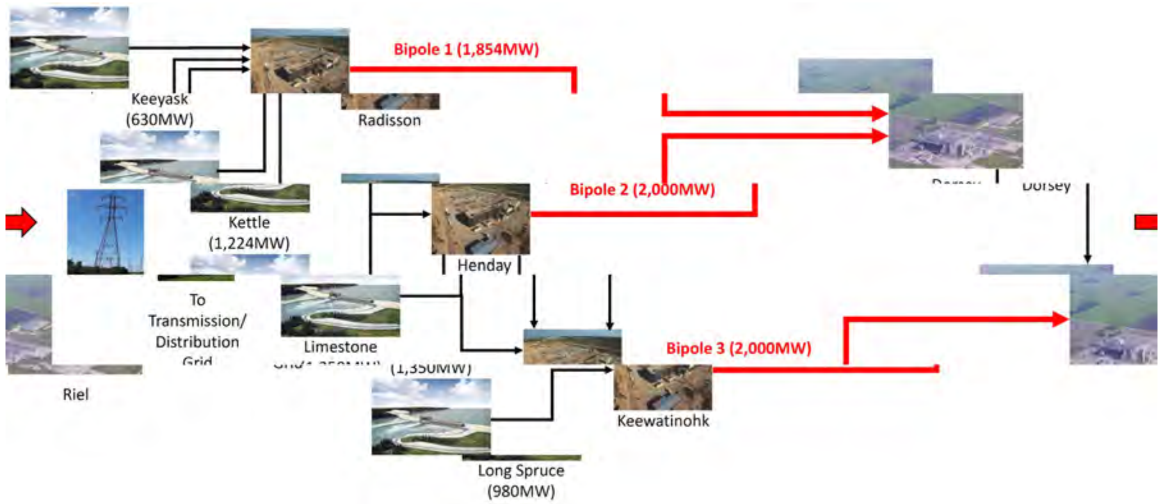


Figure 2-1: HVDC Transmission System

The Northern Collector System offers flexibility in routing the flow of power from the lower Nelson River generating stations via Bipoles I, II and III in the event of outages. Currently, the AC transfer capacity available between Bipole I and Bipoles II/III is approximately 500 MW. Based on the ageing infrastructure and the risk of equipment failure with components of Bipole I, this is not adequate, and Manitoba Hydro has identified a need to increase the transfer capacity. The proposed R44H 230-kV transmission line will improve transmission reliability by adding up to a minimum of 346 MW transfer capacity and reduce the risk of not being able to move electricity on to our customers.

The proposed transmission line will also be needed for future work associated with modernizing the HVDC system (i.e., HVDC Modernization).

2.1.1 Alternatives considered

As the risk of equipment failure increases with ageing infrastructure, the option of doing nothing is not acceptable.

Implementation of a remedial action scheme in lieu of constructing the transmission line was also considered. The remedial action scheme is designed to detect predetermined system conditions and automatically take corrective actions.

Due to the appreciable uncertainty on the timeline for full modernization of Bipole I and the continued degradation of its infrastructure, it was determined that the best value decision was to pursue both the proposed project (i.e., R44H transmission line) and the remedial action scheme as separate projects.

2.2 Schedule

Assuming the receipt of an *Environment Act* Licence for the project by December 2024, construction is anticipated to start as early as December 2024. Construction will occur over two years, with an anticipated in-service date of summer 2026. Site clean-up may extend for up to one year after the in-service date.

Table 2-1 shows the planned construction schedule for both the transmission line and work at the Radisson and Henday converter stations.

Transmission line construction will consist of four phases and generally occur under frozen ground conditions (i.e., primarily during the winter but could extend into spring/late fall):

1. Clearing
2. Foundations
3. Tower assembly / erection
4. Conductor stringing

Work at Radisson and Henday converter stations would occur year-round as access is not seasonal.

2.3 Transmission line

The proposed route for the R44H transmission line is shown on Map 2-1. A more detailed version of the route is included in the construction environmental protection plan (CEnvPP) mapbook (see Section 17.7.4.1).

The design and construction of the transmission line will meet or exceed the requirements as set out by the Canadian Standards Association (CSA), as well as the North American Electric Reliability Corporation (NERC).

Table 2-1: Construction schedule for the R44H transmission line project

Construction phase	2024	2025				2026		
	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer
Mobilization (staff presence)	Potential							
Vehicle / equipment use	Potential							
Right-of-way clearing	Potential				Potential	Potential	Potential	
Watercourse crossings	Potential							
Marshalling / fly yards	Potential							
Tower construction								
Implosive connectors								
Helicopter use								
Station Construction	Potential							

2.3.1 Transmission line components

2.3.1.1 Structures

A combination of guyed and self-supporting steel lattice transmission structures will be used including suspension, angle, and dead-end towers (see Figure 2-2). Two specialty towers will be required to cross the Nelson River.

Angle and dead-end structures will be required at specific locations to accommodate line redirection and to terminate the transmission line into the stations.

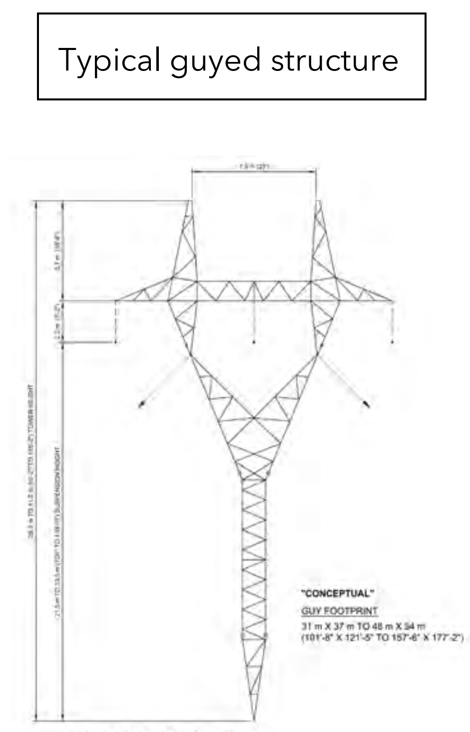
Other structure designs may be considered to mitigate site-specific issues along the route alignment.

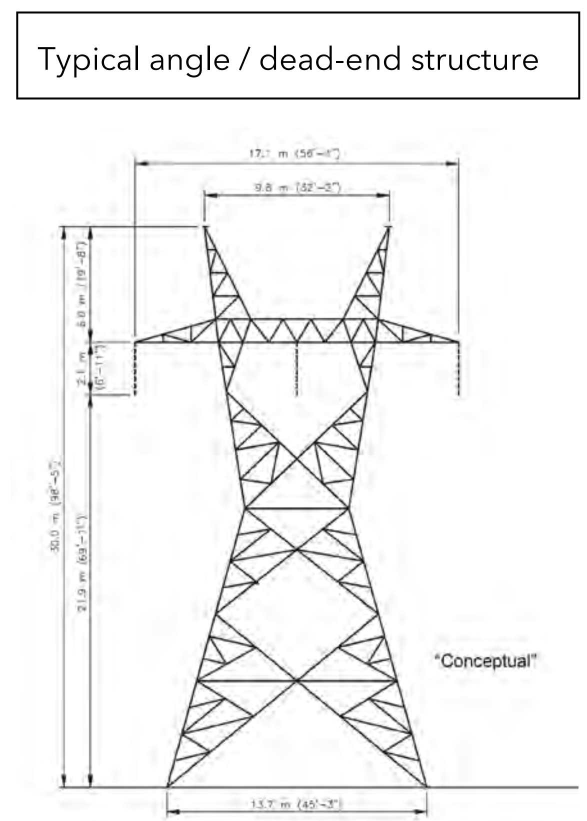
2.3.1.2 Conductors

The R44H transmission line is designed for double-bundle conductors per phase (i.e., three phases total) with 457 mm distance between sub-conductors, supported by steel structures suspended through insulators. 795.0 MCM 26/7 ACSR "DRAKE" type conductors, 28.14 mm in diameter will be used on most sections of the line and 795.0 MCM 30/19 ACSR "MALLARD" type conductors, 28.956 mm in diameter, will be used on the Nelson River crossing. Each conductor, consisting of aluminum strands with a center core of steel strands, will be supported from the structures by insulators. The ground-to-conductor heights will meet or exceed the C22.3 No. 1 "Overhead Systems" regulations.

2.3.1.3 Insulators

Overhead transmission conductors will be insulated using ceramic bell style insulator caps tied together in strings of 12 to 14 insulator bells. The insulator assemblies are suspended from the structures and support the conductors. The insulator assemblies have flexibility in movement to allow for blow-out and galloping of the conductor during various weather and electrical loading conditions.





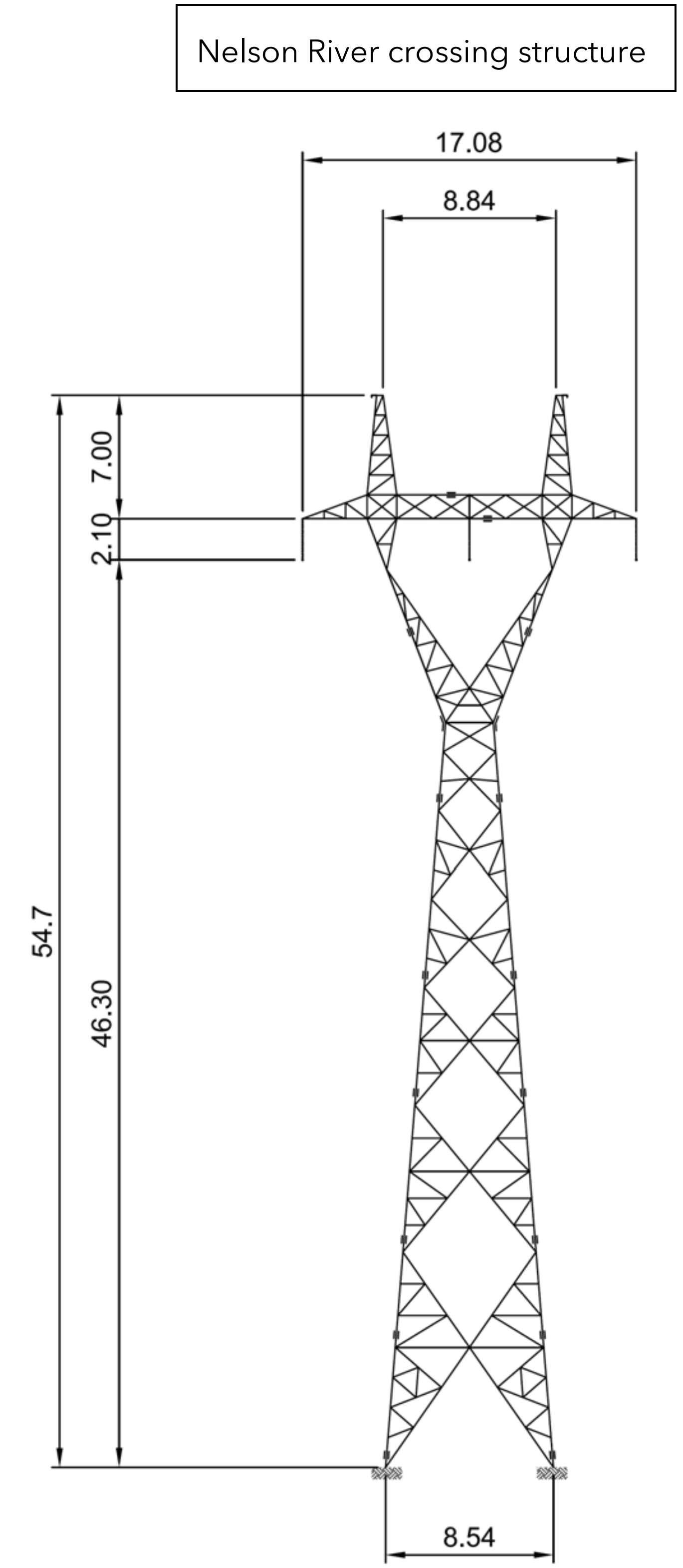


Figure 2-2: R44H structure types - Preliminary Design (Units in Meters)

2.3.1.4 Ground wires

Two shield wires will be strung at the peaks of the structures above the main conductors with the primary purpose of providing grounding and lightning protection for the transmission line. The shield wire will be 19#8 Aluminum clad steel wire, known as 19#8 Alumoweld. It has a outside diameter of 16.31 mm and an ultimate tension strength of 192 kN.

2.3.1.5 Transmission line right-of-way requirements

Right-of-way widths are determined to allow safe conductor swing or blow-out as well as tower placement. The right-of-way width provides adequate lateral distance under wind conditions to limit flashovers onto objects near the edge of the right-of-way. The typical right-of-way requirements for a 230-kV guyed lattice steel structure are illustrated in Figure 2-3.

The proposed R44H transmission line will share a right-of-way and will parallel existing transmission lines. The right-of-way width between Radisson to Henday varies from approximately 400 m to 450 m. As illustrated in Figure 2-4, the right-of-way from Radisson to Long Spruce will be shared with 4 other lines (i.e., L41R, L42R, L43R and Bipole II) and 5 other lines from Long Spruce to Henday (i.e., L48H, L47H, L46H, L61K and Bipole II).

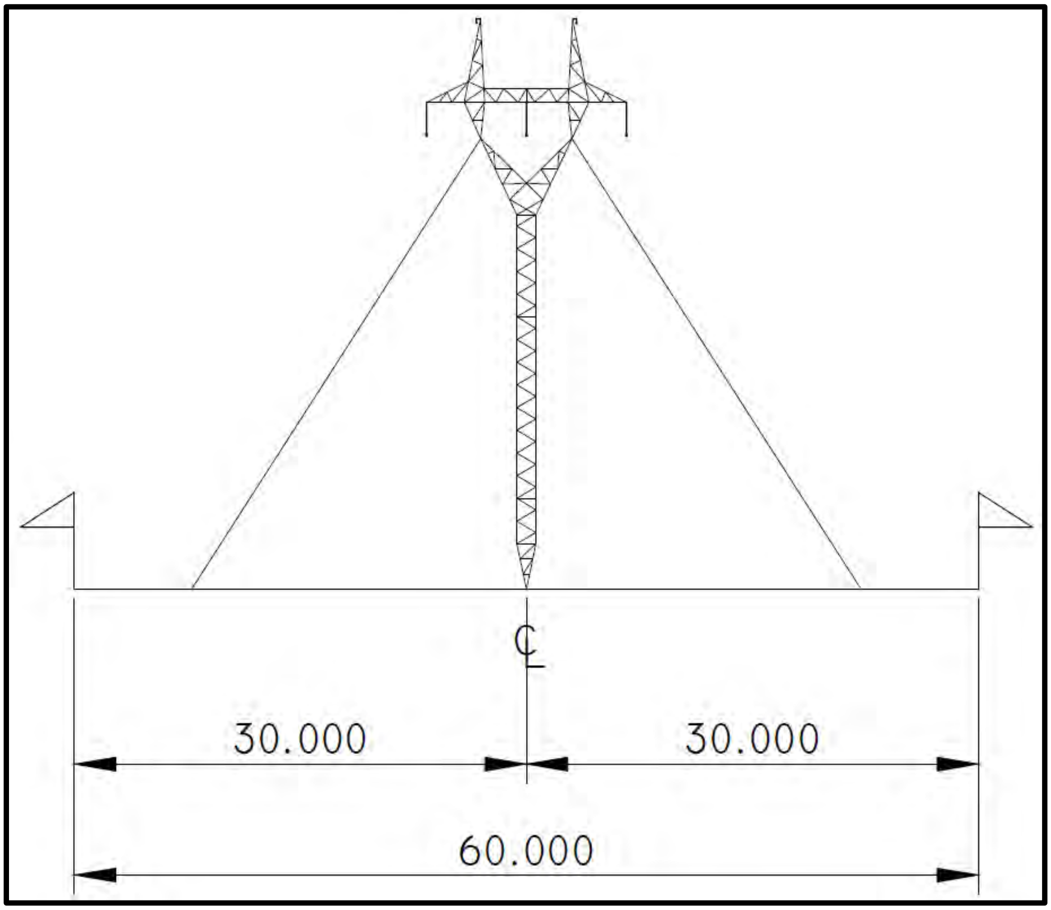
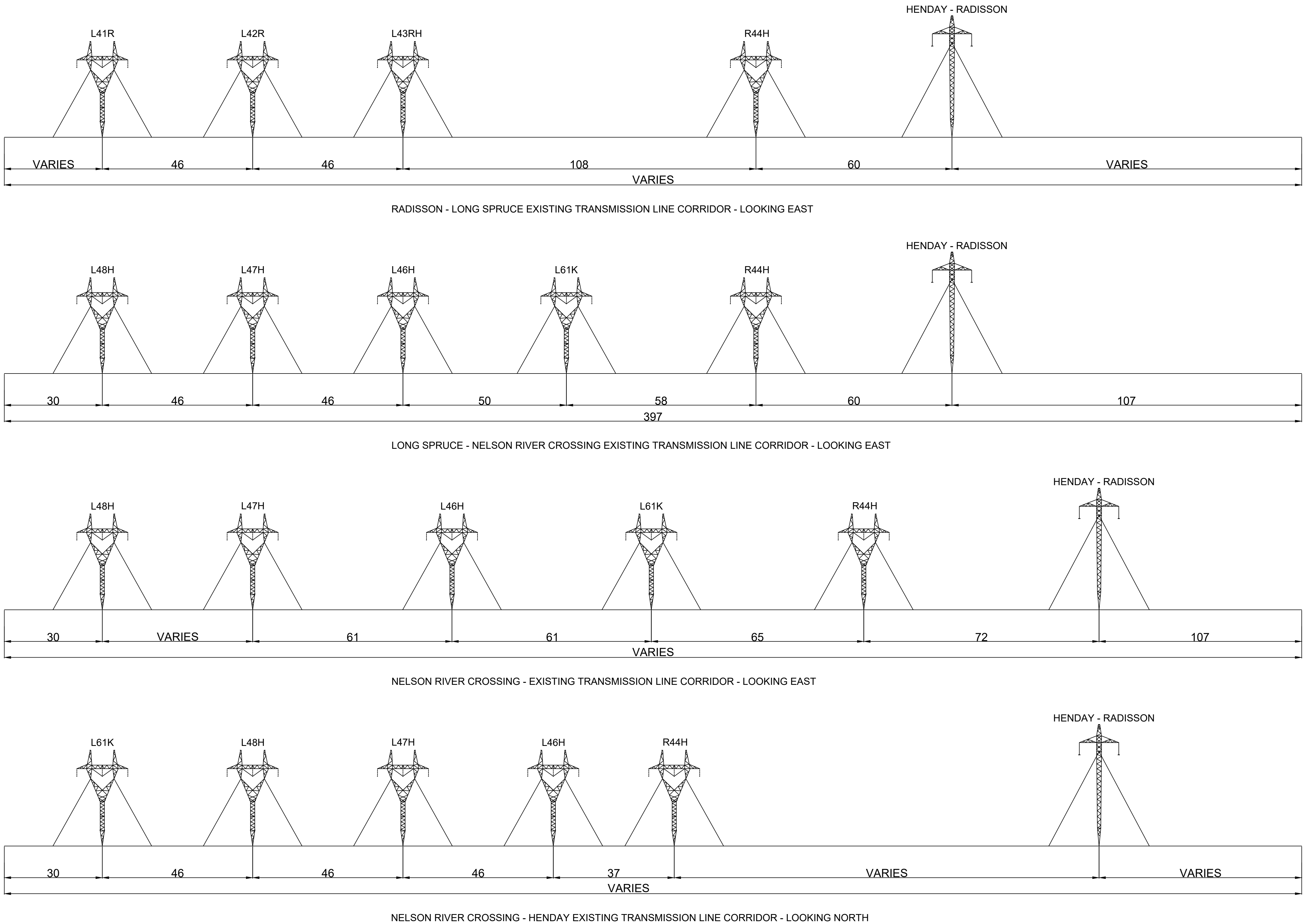


Figure 2-3: Typical right-of-way requirements in meters

From the Radisson converter station, the R44H transmission line will generally utilize an existing Manitoba Hydro easement to fulfill its right-of-way requirements.



ALL TRANSMISSION LINE TOWER DESIGN, ALIGNMENTS, AND CROSS SECTIONS ARE CONCEPTUAL AND SUBJECT TO CHANGE

Figure 2-4: Right-of-way cross section

2.3.2 Pre-construction

As part of planning and design for the project, geotechnical test drilling is planned for February to March 2024 along the proposed R44H transmission line route. Geotechnical investigations involve subsurface drilling or the excavation of test pits to create a soil profile that is used by civil designers to inform the foundation design.

2.3.3 Transmission line construction

Transmission line construction will begin after receipt of the Environment Act Licence as regulated by *The Environment Act* (Manitoba). Other work permits and/or authorizations will be obtained as required.

It is expected that construction activities will be carried out by contractors, under the supervision of Manitoba Hydro. Both Manitoba Hydro field staff and the contractors will be provided with the Environment Act Licence for the project, which will outline conditions to be fulfilled during construction phases of the project.

Manitoba Hydro will adopt the standard procedures for protecting the environment by adhering to the project specific Construction Environmental Protection Plan (CEnvPP) (see Section 17.7.4.1). The CEnvPP will outline general and site-specific mitigation, and on-ground activity for preventing or minimizing environmental effects.

Transmission line construction activities will include:

- Vehicle and equipment use
- Mobilization
  - Workforce presence
  - Accommodations and construction camps
- Access
- Right-of-way vegetation clearing
- Marshalling / fly yards
- Foundation installation
- Structure assembly and erection
- Clean-up
  - Waste disposal

2.3.3.1 Mobilization

The first step in project construction is mobilizing a workforce to an area. Mobilization includes the movement of Manitoba Hydro and contractor staff, vehicles, and equipment to the job site. It also includes the presence of the workforce at accommodations in the local community and their commute to and from the work site.

Generally, mobilization will be ongoing throughout the construction phase as different types of equipment will be required for specific activities such as clearing, tower assembly and erection, and conductor stringing.

2.3.3.1.1 Workforce presence

The anticipated construction workforce for transmission line construction will range from about 30 personnel to a peak workforce of approximately 110.

Transmission line construction will be conducted primarily during winter months, extending from December 2024 to the end of May 2026.

2.3.3.1.2 Accommodations and construction camps

It is anticipated that contractor's staff will primarily be housed at Manitoba Hydro's Kettle camp.

There is the possibility of mobile construction camps being utilized as well. Such mobile construction camps would include sleeper units, a wash car, cooking, and eating trailers, and offices. The camps would be placed along the right-of-way or in pre-disturbed locations. A diesel generator would likely be used for electrical power. Camp sizes could be in the range of 10 to as many as 110 workers, but will vary according to the activity, contract size and labour force requirements. Wastewater generated at a mobile construction camp would be directed to holding tanks and will be in accordance with Manitoba Regulation 83/2003 respecting the *Onsite Wastewater Management Systems Regulation*. If mobile construction camps are required, locations will be determined after final project planning and design are completed.

2.3.3.2 Vehicle and equipment use

Clearing and construction equipment could include:

- feller-bunchers
- skidders
- bulldozers with shear blades, dozer blades and rakes
- stringing equipment such as tensioners and pullers
- drill rigs
- mulchers
- chippers
- backhoes with attachments

- excavators with attachments and cranes
- materials delivery trucks and trailers
- Grout plant equipment, and
- various smaller equipment as required

2.3.3.3 Access

Access to the right-of-way will typically be from adjacent or intersecting roadways or existing trails. A well packed and frozen trail will also be required within existing easement, adjacent to the R44H route.

The development of the construction access routes, water crossings, drainage facilities, and erosion and sediment control plans will be developed by the contractor, subject to Manitoba Hydro approval, and in accordance with the project Environment Act Licence and the access management plan (see Section .7.5.1).

If provincial permits are required, they will be secured. Manitoba Transportation and Infrastructure (MTI) will be contacted for access from highways (i.e., Provincial Road [PR] 280 and PR 290).

Depending on the preferences of the contractors, helicopters can be used in many aspects of construction, e.g., transportation of staff, tools, and materials from structure to structure, and in conductor installation.

2.3.3.4 Right-of-way clearing

Transmission line construction is preceded by a survey to establish the centerline of the right-of-way. The edges of the right-of-way will be flagged to ensure that tree clearing is completed according to CSA and NERC standards. The survey will also establish the specific locations of each planned transmission structure.

Clearing of trees and other vegetation within the right-of-way is required for construction as well as for safety and reliability once the transmission line is operational. Clearing along the entire R44H transmission route is anticipated to occur during the first winter of construction. The clearing width required for R44H is 60 m; however, clearing will be modified in environmentally sensitive areas (e.g., river and stream crossings) and will be subject to a variety of pre-determined but adaptable environmental protection measures.

During right-of-way clearing for the R44H transmission line, maintenance clearing for the existing transmission lines would also likely occur. From Radisson converter station to Long Spruce generating station, the right-of-way will be cleared to 60 m. Between Long Spruce generating station and Henday converter station, the entire corridor will be cleared (ranges from 60-70 m) between the neighbouring transmission lines.

A variety of methods are available for right-of-way clearing. Typically, these include conventional clearing done by "V" and "KG" blades on tracked bulldozers, mulching by rotary drums, selective tree removal by feller bunchers and hand clearing, particularly in environmentally sensitive areas.

Final clearing methods to be used will be determined based on a detailed survey of the transmission line routes, and site-specific identification of environmentally sensitive features.

Trees will be cut close to ground level. Ground vegetation will not be grubbed except at structure sites where foundations are required, where access of equipment necessitates it, or for worker safety reasons. Disposal of cleared vegetation typically involves a variety of options including piling and burning, or salvage if feasible. The final decision for disposal of vegetation will be determined by the method of clearing used and conditions in the Environment Act Licence.

In circumstances where danger trees beyond the right-of-way are identified, they will be selectively removed. Herbicides will not be used for clearing the right-of-way.

The disposal of trees and other vegetation will conform to the recommendations outlined in the environmental protection program (see Section .7.5.7), as per applicable Provincial Acts and regulations.

Where practical, Manitoba Hydro may set aside a limited quantity of timber for use and/or auction but it is not anticipated there will be any merchantable timber within the right-of-way. The remaining debris/timber will be chipped or mulched.

2.3.3.5 Marshalling yards

Marshalling yards (also known as work areas) for Manitoba Hydro and the contractor are proposed to be established near the transmission line route and, where practicable, will take advantage of previously disturbed areas. This could include previous marshalling yards, borrow areas, and aggregate storage areas.

The areas will be used to support construction activities and may include temporary buildings (office, equipment maintenance, machine/parts shop), laydown and staging, material and equipment storage, tower assembly and fuel storage.

The number and location of marshalling yards will be determined once the project has received the required regulatory approvals. Contractor specifications and agreements will also influence the number and location of marshalling yards to be used.

2.3.3.6 Foundation installation

For the guyed suspension lattice steel structures, design and construction of the tower foundations will depend on soil and terrain conditions. The structure foundations and anchors proposed to be used for this project will be similar to those used for comparable terrain and soil conditions elsewhere in northern Manitoba (the dimensions noted below may be modified during the design stage). For surface or shallow bedrock conditions, the lattice structures will be founded on a steel column fixed directly to the rock by steel dowels drilled and grouted into the rock.

Where rock is not encountered, the structures will be founded on mat footings, sized to provide adequate bearing support (typically in the order of 1.8 m [6 ft.] square) and buried to a depth of approximately 3 m (10 ft.).

Depending on soil conditions, deep foundations (i.e., piles) will be used.

The guy anchor foundations will be the same types as the foundations for these structures, for shallow or surface bedrock conditions, guy anchors will be secured by drilled and grouted anchors. Where bedrock is not encountered, deadman anchors, or other deep anchors (e.g., screw anchors, overburden) will be used.

Self-supporting suspension lattice steel structures will be supported by either mat or pile foundations. Mat foundations will typically be 3 m^2 (9.8 ft.) by 3 m^2 (9.8 ft.) deep. Pile foundations will involve individual piles or pile groups, one for each leg of the structure. Piles will be helical steel pile groups with a welded cap.

Self-supporting angle and dead-end structures will be supported by either mat or pile foundations. Mat foundations will typically be 4 m^2 (13.1 ft.) by 3 m^2 (9.8 ft.) deep, for each leg of the structure. Pile foundations will typically consist of steel pile groups with a welded cap.

Dimensions will be subject to detailed design and will vary for specific foundation conditions.

Borrow materials required for construction will be purchased from local suppliers. Locations and sites will be determined based on availability and quality of product. It is expected that the use of local borrow materials will minimize the introduction of non-native and/or invasive plant species.

2.3.3.7 Structure assembly and erection

Different contractors may have different preferences as to structure assembly. Structures are generally assembled on-site or in designated marshalling yards and transported to the construction site by truck or helicopter.

The insulators are sometimes attached to the cross-arms of each structure prior to structure erection. Structures are erected by cranes or helicopters if they are assembled in marshalling yards.

2.3.3.8 Conductor installation

Reels of conductor will typically be transported by truck to the construction site. The conductors will be suspended from the insulators, attached to the structures which will separate the conductors from the towers. Conductor tensioning will be completed by machine to provide the pre-determined ground-to-conductor clearances specified at the midspan points of maximum slag.

Each reel holds about 3,200 m (10,500 ft.) of conductor and to create a continuous conductor the sections of conductor are spliced together by use of implosive sleeves. They make a loud bang and a flash like a firework (Manitoba Hydro 2022).

Implosive connectors are used to join the conductors and to secure the conductor to the deadend structures.

Contractors will have different preferences with respect to structure assembly. Some will choose to assemble structures at each tower site and then erect them by crane. Others will choose to assemble the structures at a central marshalling yard and then either truck the structures to the site and erect them by crane or use a helicopter to fly and erect them at the site.

2.3.3.9 Clean-up

The final step in construction is demobilizing the workforce from an area. Demobilization includes the movement of Manitoba Hydro and contract staff, vehicles, and equipment from the job site, as well as the clean-up (and if required, rehabilitation) of the right-of-way, marshalling / fly yards, and access routes.

Once the transmission line is constructed, all excess materials and equipment including debris, and unused supplies will be dismantled, if required, removed from the site, and disposed according to provincial and municipal regulations. Rehabilitation of any disturbed sites will be undertaken as required. All cleanup and rehabilitation activity will be subject to the requirements of the environmental protection program (see Chapter 17.0).

Generally, demobilization is ongoing throughout the construction phase as different types of equipment are required for specific activities such as clearing, tower construction and conductor stringing. Cleanup will occur throughout the construction of the transmission line.

Waste disposal

Disposal of waste materials will rely on the use of locally available services and will also be determined by conditions of the Environment Act Licence. Temporary waste disposal will be undertaken in accordance with provincial and municipal regulations, and by-laws.

Once the transmission line is constructed, all excess materials and equipment including debris, and unused supplies will be dismantled, if required, removed from the site, and disposed of according to provincial and municipal regulations. Rehabilitation of sites such as marshalling yards will be undertaken as required.

2.3.4 Transmission line operation and maintenance

The R44H transmission line will be designed to operate continuously, though the actual flow of electricity will vary with electrical load requirements. Maintaining R44H in a safe and reliable operating condition will require regular inspection and maintenance. This will include inspections of the right-of-way as well as structures, conductors, and related hardware.

The inspections of the transmission line will include air patrols, ground patrols and non-scheduled maintenance by air or ground if unexpected repairs are required. Ground travel can include snowmobile, flex-track, or road vehicles. Regular inspections will typically occur once per year by ground and can occur up to three times per year by air.

2.3.4.1 Vegetation management

Vegetation management within the right-of-way is required for public and employee safety, as well as the reliable operation of the line. The right-of-way will be maintained on an ongoing basis throughout the operational phase of the transmission line.

An integrated vegetation management approach will be undertaken to address non-desirable and non-compatible vegetation issues within the right-of-way. To achieve this, a variety of possible vegetation management methods are available, including mechanical, chemical, and biological control techniques within reasonable costs and to minimize environmental impacts.

Options for vegetation management in the right-of-way include but are not limited to:

- Hand cutting: Where local conditions and factors permit, hand-cut deciduous trees might be stump treated with an approved herbicide to prevent re-growth. Hand cut trees (using chainsaws, brush saws, axes, and brush hooks) that do not receive stump treatment will require follow-up maintenance to address regrowth.

- Mechanical Cutting: where dense tree growth reoccurs on the right-of-way, mechanical cutting is generally undertaken. This type of right-of-way maintenance typically requires follow-up maintenance within two to three years to manage suckering of deciduous trees.
- Winter Shearing: This type of right-of-way maintenance is used in frozen ground conditions where a tracked vehicle equipped with "V" or "KG" blade is used to clear tree growth more than 2.5 cm in diameter. The tree growth is sheared just above ground level (frost line) to try to minimize environmental damage and disturbance to the organic soil layer.
- Herbicide Treatment: This method is used to control and reduce tree growth problems on a long-term basis and as a follow-up action to previous vegetation management work. All herbicide applications will be completed and supervised by licensed applicators and in accordance with a Pesticide Use Permit. Herbicide application rates will be determined by qualified and licensed staff, condition-based assessments, labelling, and subject matter expert consultation in accordance with product label instructions. Only herbicides identified in the Herbicide Use Permit will be used.

Broadcast stem application equipment such as machine applicators, and hose and handgun applicators are used for controlled droplet applications for vegetation heights of 2.5 m or less. Selective stem applicators such as hose and gun sprayers are the preferred method of application for trees under 2.5 m.

Basal treatment applications are used for a direct spray onto the tree stem or root collar. This can be completed in any season and is generally used for tree growth over 2.5 m in tree height. Stump treatment is used following hand cutting, where practical, to provide selective control of suckering for deciduous tree species and to minimize effects on desirable species. Tree injection methods might also be used on trees over 2.5 m in height, subject to aesthetic impact and resource considerations.

Biological control is a method of encouraging competing plant species, planting, and maintaining desirable plant species, encouraging specific wildlife use or secondary use of the right-of-way to control the spread of unwanted species.

Manitoba Hydro will follow the Provincial Document PTN-15-00116 entitled Guideline for Manitoba Hydro Brushing or Clearing Projects on Existing Transmission Line Rights-of-Way. The Manitoba Hydro Forestry Section is also responsible for obtaining the necessary Pesticide Use Permits and submitting Post Season Control Reports as required by the Manitoba Regulation 94-88R under *The Environment Act* (Manitoba).

The operations and maintenance phase of the project will be compliant with Manitoba Hydro's operation phase environmental protection plan.

2.4 Station components and activities

2.4.1 Existing infrastructure

The Radisson converter station is the northern end point of Bipole I and first transmitted energy in March 1971. The site includes components for the AC switchyard and filters, converter building and transformers and the DC switchyard (Figure 2-5).

Figure 2-5: Existing Radisson converter station.

The Henday converter station is the northern end point of Bipole II and first transmitted energy in October 1978 as part of Bipole II. The site includes components for the AC switchyard and filters, converter building and transformers and the DC switchyard (Figure 2-6).

Figure 2-6: Existing Henday converter station.

2.4.2 Radisson converter station

R44H will be terminated at the Radisson Converter Station (Figure 2-7). There are currently three 138-230 kV power transformer banks along the northwest side of the station. The R44H project includes the addition of a fourth power transformer bank.

All new components required for the R44H project will be placed within the existing station footprint.

Equipment for the Radisson converter station will accommodate the termination of R44H. The major equipment components will include:

- One 333MVA 230-138kV power transformer
- One 230kV disconnect switch
- One 138kV disconnect switch
- Other associated components

Figure 2-7: Radisson Converter Station and R44H termination location.

2.4.2.1 Station structures

Associated with the required station equipment installations will be foundations needed to support the equipment and to allow the equipment to be connected to the existing 138-kV/230-kV transmission system.

The associated structures will be steel lattice and/or welded steel structures of hollow structural steel construction. These will be supported on concrete foundations located inside the station site.

2.4.2.2 Site security

The station site is enclosed within a continuous perimeter chain link fence. The height of the fence is approximately 1.8 m, with a top guard of at least three strands of barbed wire extending the fence to an overall height of approximately 2.1 m. The station is operated by Manitoba Hydro personnel during the day and remotely controlled during the night.

2.4.2.3 Grounding

Stations incorporate a subsurface ground grid required to equalize electrical ground gradients that develop in the event of electrical faults, which conforms to Manitoba Hydro specifications for station design. The ground grid will be adjusted to ensure safety criteria are met with the new fault levels while ensuring a bond to all the new equipment. A grounding system study will be performed as part of this project and the ground grid will be expanded to accommodate the new equipment.

2.4.2.4 Oil

Oils and gases are typically required to provide an insulating medium for equipment within substations. These are required for the safe operation of the station's equipment. The new power transformer will increase the number of oil containing equipment at the station. The new power transformer will be connected into the existing oil containment system and the deluge system under this project. The project is currently assessing the existing deluge building that the power transformer will be connected to and may require the building to be relocated within the station site to accommodate the new power transformer.

2.4.2.5 Station access

Radisson converter station is presently accessible by a permanent all-weather road access from PR 280. Equipment access is still to be determined but options being considered are the existing access road or the existing rail spur into the station.

2.4.2.6 Marshalling yard

The station construction will require approximately 0.5 hectare of previously disturbed land for storage of equipment and materials.

2.4.2.7 Workforce requirements

The anticipated construction workforce for the Radisson converter station works will range from six people to a maximum of approximately 30 people when civil, overhead line and/or electrical construction crews are overlapping on site.

2.4.3 Henday converter station

The R44H transmission line will be terminated at Henday converter station (Figure 2-8). In addition to the line, several buses will be upgraded and one of the station service transformers will be relocated within the existing station.

All new components required for this project will be placed within the existing station footprint.

Equipment for the Henday converter station will accommodate the termination of R44H. The major equipment components will include:

- One 230-kV breaker
- One 10MVA 230-12.47kV power transformer relocation
- Various 230-kV switches
- Other associated components

Figure 2-8: Henday Converter Station and R44H termination location.

2.4.3.1 Station structures

Associated with the required station equipment installations will be foundations needed to support the equipment and to allow the equipment to be connected to the existing 230-kV transmission system.

The associated structures will be steel lattice and/or welded steel structures of hollow structural steel construction. These will be supported on concrete foundations located inside the station site.

2.4.3.2 Site security

The station yards are currently contained within a continuous, chain link fence enclosure. The fence has several barbed wire strands at the top of the fence for additional security. All new equipment additions will be located within the existing fenced area. All gates and other access points to the station will be locked. The station is operated by Manitoba Hydro personnel during the day and remotely controlled by during the night.

2.4.3.3 Grounding

Stations incorporate a subsurface ground grid required to equalize electrical ground gradients that develop in the event of electrical faults, which conforms to Manitoba Hydro specifications for station design. The ground grid will be adjusted to ensure safety criteria are met with the new fault levels while ensuring a bond to all the new equipment. A grounding system study will be performed as part of this project and the ground grid will be expanded to accommodate the new equipment.

2.4.3.4 Oil

Oils and gases are typically required to provide an insulating medium for equipment within substations. These are required for the safe operation of the station's equipment. This project will not increase the number of oil containing equipment at the station.

2.4.3.5 Site access

Henday converter station is presently accessible by permanent all-weather road access from PR 280 and 290. Equipment access is still to be determined but options being considered are the existing access road or the existing rail spur into the station.

2.4.3.6 Marshalling yard

The station construction will require approximately 0.5 hectare of previously disturbed land for storage of equipment and materials.

2.4.3.7 Workforce requirements

The anticipated construction workforce for Henday converter station works will range from six people to a maximum of approximately 30 people when civil, overhead line and/or electrical construction crews are overlapping on site.

2.5 Project decommissioning

When an asset has reached end of life or is no longer required, it will be decommissioned. The following sections describe the decommissioning process for the transmission line. Station work would be similar.

2.5.1 Preparation activities

The transmission line will be disconnected from the grid to allow for the safe dismantling of the project. To disconnect, Manitoba Hydro will:

- Trip the breaker(s) at Radisson and Henday Stations
- Open the 115-kV disconnects
- Disconnect the conductors at the substations

2.5.2 Removal of facilities

The disassembly and removal of the equipment will be the same as the installation described above, but in reverse order.

Salvage will involve removing and salvaging the conductor onto spools under tension to be removed from site. The towers will be disassembled and lowered using a crane onto flat bed trucks for transport.

Soil will be excavated surrounding the tower foundations allowing them to be cut off 1.5 meters below grade, in consultation with the landowner and in accordance with the land agreements. Surrounding soil will be used to backfill the excavation and graded to allow for re-vegetation.

2.5.3 Salvage and disposal

After dismantling the project, high value components will be removed for re-use or recycling. The remaining materials will be reduced to transportable size and removed from the site for disposal. Waste handling and disposal will be subject to conventional Manitoba Hydro codes of practice and relevant provincial and federal legislation.

2.5.4 Restoration

Following removal of the line, the right-of-way will be restored to the surrounding land use. Disturbed areas will be graded to original contours and the soils will be restored to a condition consistent with intended land use.

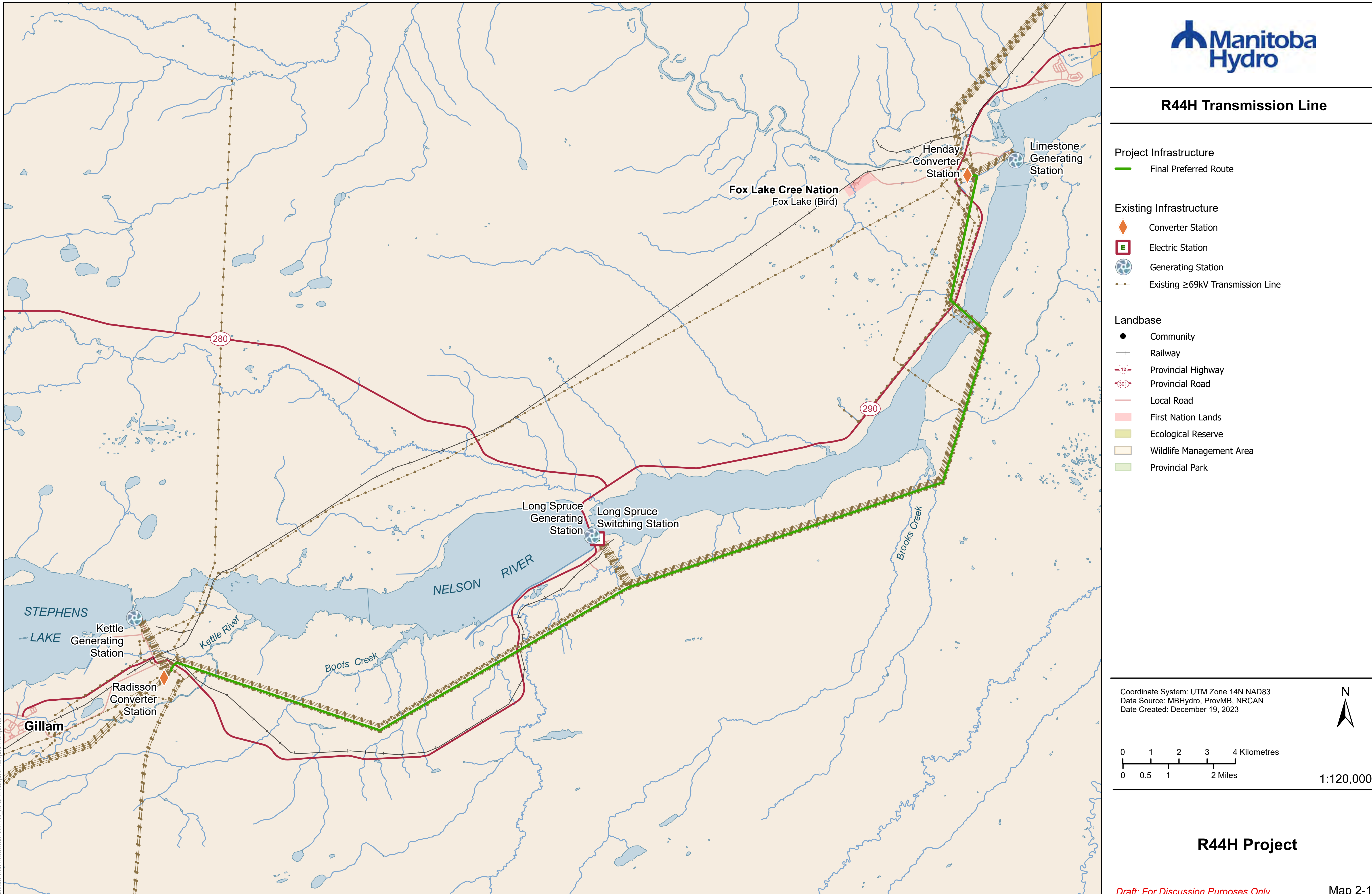
Disturbed areas will be rehabilitated consistent with the rehabilitation and invasive species management plan developed for the project. This will include the restoration of any access areas along the right-of-way.

If seed is applied, any erosion and sediment control measures required on-site would be left in place until seed is fully established, as determined by an environmental officer.

If project components are sited on industrial properties or those that are no longer under agricultural production or in a natural state, different methods would be used.

2.6 Project funding

The project will be funded by Manitoba Hydro.



Manitoba Hydro
R44H Transmission Line
Project Infrastructure
Final Preferred Route
Existing Infrastructure
Converter Station
Electric Station
Generating Station
Existing ≥69kV Transmission Line
Landbase
Community
Railway
Provincial Highway
Provincial Road
Local Road
First Nation Lands
Ecological Reserve
Wildlife Management Area
Provincial Park
Henday Converter Station
Limestone Generating Station
Fox Lake Cree Nation
Fox Lake (Bird)
280
290
Long Spruce Generating Station
Long Spruce Switching Station
NELSON RIVER
STEPHENS LAKE
Kettle Generating Station
Kettle River
Boots Creek
Brooks Creek
Radisson Converter Station
Gillam
Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023
N
0 1 2 3 4 Kilometres
0 0.5 1 2 Miles
1:120,000
R44H Project
Draft: For Discussion Purposes Only
Map 2-1

3.0 Project engagement

This chapter provides an overview of the project engagement process that Manitoba Hydro undertook for the Radisson to Henday (R44H) transmission project and includes sections about the following topics:

- Goal and objectives of engagement
- Approach to engagement
- Engagement feedback
- Engagement results
- Ongoing engagement

We would like to thank everyone who has participated in project engagement to date. Your participation has helped inform this environmental assessment report and project decisions with your feedback and perspectives.

3.1 Goal and objectives of engagement

Our goal for engagement on the project was to work directly with First Nations, the Manitoba Métis Federation, and interested parties to understand and consider concerns and interests in project decisions.

To achieve the engagement goal, we identified the following engagement objectives:

- To engage early and often to foster relationship building and keep engaged audiences informed with transparent information throughout the engagement process
- To tailor the engagement process to the preferences of each engaged audience
- To provide opportunities for engaged audiences to provide feedback throughout the transmission line lifecycle and to participate in activities that will inform the environmental assessment process
- To incorporate feedback and available Indigenous (First Nation and Métis) Knowledge in the environmental assessment
- To work to resolve concerns and share how feedback and knowledge influenced decision making
- To provide information to individuals and engaged audiences on training, employment and business opportunities related to the project

The following sections outline the engagement methods and activities we undertook to work towards achieving the engagement objectives and meaningful engagement on the project.

3.2 Approach to engagement

Prior to initiating engagement, we developed an engagement plan that would remain adaptive and responsive to the feedback and preferences we learned from engaged audiences.

Our engagement approach was influenced by several legislative Acts, guidelines, principles, standards, and beneficial practices. Examples include, but are not limited to: Manitoba's *The Environment Act*; Canada's Principles and Guidelines for Public Engagement; Canada's Principles respecting the Government of Canada's relationship with Indigenous peoples; Articles of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP); Manitoba's *The Path to Reconciliation Act*; International Association for Public Participation (IAP2)'s core values and the public participation spectrum; as well as Indigenous laws, tenets and guides relevant to the nations and organizations potentially interested in or affected by the project.

Our engagement process is separate from any section 35 Crown consultation process that may be initiated by the Province of Manitoba about the project. We understand that the Crown may rely on the engagement activities and feedback generated through our engagement process to inform their consultation process. We sought to undertake a meaningful engagement process with the understanding that it may support the Province of Manitoba in fulfillment of their duty.

We sought to implement a timely engagement process of seeking, discussing, and carefully considering the views of others, in a manner that is cognizant of the cultural values of engaged audiences, and founded on working together in good faith.

We recognize that what is considered meaningful may vary by engagement audience. In the pursuit of meaningful engagement, we prioritized the following principles:

- Reaching out early and often to foster relationship building
- Working to provide information in a manner that supports informed decision making and the assessment of potential project impacts on First Nation and Red River Métis interests and rights-based activities
- Encouraging First Nations and the Manitoba Métis Federation to determine how they prefer to engage in the environmental assessment process by offering funding and opportunities to design nation-specific engagement processes

- Incorporating available First Nation and Métis knowledge in the environmental assessment
- Providing formal opportunities to provide feedback at key points throughout the environmental assessment process to support the assessment of potential project impacts on all engaged audiences and specifically on First Nation and Red River Métis interests and rights-based activities

The following sections provide details about each step of the engagement process as it has occurred to date.

3.3 Identification of engagement audiences

3.3.1 Project area considerations

Manitoba Hydro acknowledges that the Radisson to Henday transmission line is located on Treaty Five territory and on the traditional territories of the Cree peoples and the Red River Métis. We acknowledge the longstanding cultural and spiritual connections with the land and water throughout the territory and acknowledge the impacts of our projects and operations.

The project area falls entirely within the Local Government District of Gillam. The nation most proximal to the project is Fox Lake Cree Nation, which has home reserves in Gillam, Manitoba, approximately 6 km from the project footprint, and in Bird, Manitoba, less than 4 km from the project footprint. Fox Lake Cree Nation also has nearby treaty land entitlement lands near the Town of Gillam and at Sundance, Manitoba (approximately 4 – 6 km from the project footprint).

The project area is also located within the Split Lake Resource Management Area (RMA), which is managed by the Split Lake Resource Management Board (RMB). The Split Lake RMB includes representation from Tataskweyak Cree Nation and the Province of Manitoba. As per Schedule 5.1 of the 1992 Split Lake Implementation Agreement, the municipal boundaries of Gillam (Local Government District of Gillam) are excluded from the RMA, and from being under the purview of the Split Lake RMB.

Licensed trapping also occurs within the Split Lake RMA through the Registered Trapline (RTL) system in Manitoba. Under the RTL system, registered trapline holders have the exclusive opportunity to trap fur bearing animals within a certain defined RTL area. Manitoba Hydro's Trapper Compensation Policy for New Transmission Line Development outlines a process of engaging registered trapline holders that may be affected by the project.

The Red River Métis, as governed by the Manitoba Métis Federation has asserted Red River Métis rights throughout the entire province, including the project area.

We have heard through engagement on this project and past projects that treaty areas and other types of boundaries were imposed by government and do not acknowledge the breadth of the territories used traditionally and contemporarily by different nations nor do they show the overlapping nature of territories.

3.3.2 Identification

To achieve our engagement objectives, it is important that our engagement efforts reach those who may be affected by or interested in the project. We developed criteria to help guide the identification of audiences that may be affected by or interested in the project.

Recognizing the enduring relationships between Indigenous peoples and the land and the fundamental Aboriginal and Treaty rights that set Indigenous nations and peoples apart from the broader public, we applied two sets of criteria to scope in engagement audiences.

To identify Indigenous audiences, we considered:

1. Known historical and/or contemporary use of the project area
2. Interest in the project based on previous projects
3. Anticipated inclusion in Crown consultation
4. Traverses or is close to their Resource Management Area

To identify interested parties, we considered:

1. May be affected by the project
2. May have interest in the project

To determine how these criteria applied to potentially affected audiences, we reviewed and considered information from a variety of sources.

To identify Indigenous audiences, we undertook a traditional territory assessment that involved gathering and reviewing the following types of information:

- Treaty territories
- Indigenous Knowledge studies and feedback from past projects
- Aboriginal & Treaty Rights Information System searches
- Existing agreements relevant to the project area such as Implementation Agreements, Impact Settlement Agreements and Past Adverse Effects Agreements
- Past and ongoing engagement and partnerships with communities in the vicinity of the project on other Manitoba Hydro projects

- Indigenous laws relevant to the area
- Outstanding claims and assertions
- Other existing literature

We also reached out to the Province of Manitoba's Environmental Approvals Branch to gather feedback about who they anticipate including in their section 35 Crown consultation process.

To identify interested parties, we gathered information about the project area and the public groups that reside, work, and undertake activities in the area. We considered groups that were likely to be interested in or affected by the project based on involvement in previous projects in the area.

Through this process, we identified five Indigenous audiences that are Section 35 rights-bearing nations to engage with, namely Fox Lake Cree Nation, Tataskweyak Cree Nation, War Lake First Nation, York Factory First Nation, and the Manitoba Métis Federation. We also identified the Split Lake Resource Management Board, the Northern Affairs Community of Ilford, the Town of Gillam, other interested parties and five registered trapline holders as interested parties to engage with.

Table 3-1 lists each audience we engaged and the rationale for identifying each audience including the applicable criteria described above.

Table 3-1: Audiences engaged on the project and the rationale for their inclusion in project engagement

Audience	Rationale for inclusion (criteria that apply):
Indigenous audiences:	
Fox Lake Cree Nation	Known historical and/or contemporary use of the project area Interest in the project based on previous projects Anticipated inclusion in Crown consultation Located in close proximity to their RMA
Tataskweyak Cree Nation	Known historical and/or contemporary use of the project area Interest in the project based on previous projects Anticipated inclusion in Crown consultation Traverses their RMA

Table 3-1: Audiences engaged on the project and the rationale for their inclusion in project engagement

Audience	Rationale for inclusion (criteria that apply):
War Lake First Nation	Known historical and/or contemporary use of the project area Interest in the project based on previous projects Anticipated inclusion in Crown consultation
York Factory First Nation	Known historical and/or contemporary use of the project area Interest in the project based on previous projects Anticipated inclusion in Crown consultation
Manitoba Métis Federation	Anticipated inclusion in Crown consultation Interest in the project based on previous projects
Community of Ilford (Northern Affairs Community)	Anticipated inclusion in Crown consultation
Interested parties:	
Town of Gillam, the local government district	May be affected by the project May have interest in the project
Split Lake Resource Management Board	May be affected by the project May have interest in the project
Registered Trapline Holders whose trapline areas are transected by, or near to, the proposed line	May be affected by the project May have interest in the project
Regional wildlife manager	May have interest in the project

The list of engaged audiences above was developed as a starting point, intended to remain adaptive if we learn of additional audiences that may be affected by or interested in the project.

3.4 Level of engagement

We determine the appropriate level (i.e., depth) of engagement based on the extent to which the project can be influenced though engagement and the anticipated severity of potential impacts that may result from the project.

On this project, there are fewer options for feedback to influence project decisions in comparison to most other Manitoba Hydro transmission projects. The proposed project area does not provide multiple options for routing the transmission line as an existing right-of-way corridor is being used. Therefore, certain engagement activities and opportunities for feedback that are typically possible during the transmission line routing process have been limited.

As a result, our anticipated level of engagement rested near the consult level of the International Association for Public Participation (IAP2) public participation spectrum (Figure 3-1), which involves keeping interested parties informed, listening to and acknowledging feedback, and communicating about how feedback influenced the project. The consult level of the IAP2 spectrum is not to be confused with Section 35 Crown consultation with rights-bearing nations.

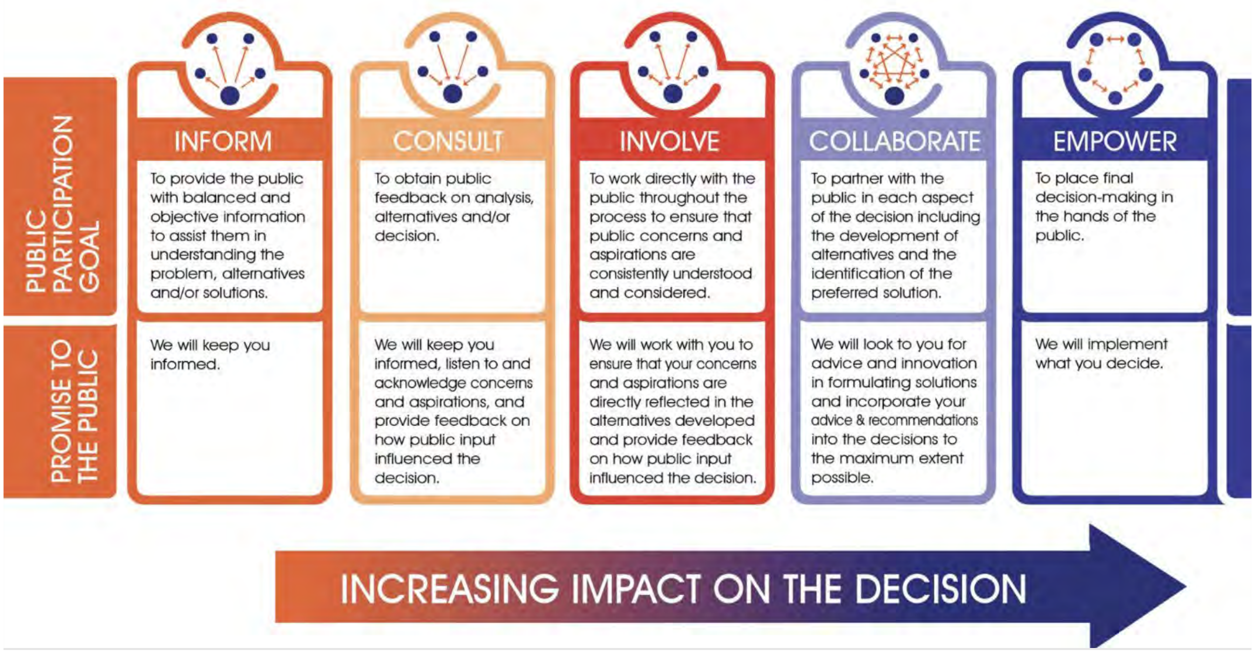


Figure 3-1: IAP2 Spectrum of Public Participation

It is our understanding that certain Indigenous audiences have the potential to experience greater project effects, including impacts to constitutionally protected rights and associated activities. Based on this understanding, we identified two tiers of engagement for section 35 rights-bearing nations:

1. Deep engagement
2. Share and listen

Although still expected to fall within the consult level of the IAP2 spectrum, we expected a deeper level of engagement with two nations: Fox Lake Cree Nation and Tataskweyak Cree Nation.

Deeper engagement was anticipated to include more targeted engagement in a manner preferred by the nation, support for gathering Indigenous Knowledge from the community in the form of interviews or an Indigenous Knowledge study, and other items or activities that may reasonably support meaningful participation in the engagement process. We also planned to leverage existing forums with Fox Lake Cree Nation and Tataskweyak Cree Nation related to other projects, programs, and initiatives to share information and collect feedback.

This tiered approach to engagement aligns with the approach used by Canada and Manitoba in their section 35 Crown consultation processes. Canada and Manitoba tier their consultation so the depth of consultation is proportionate to the strength of claim a nation may have to the area and the seriousness of potential adverse effect to that claim.

As with the list of engaged audiences, the level of engagement was intended to remain adaptive. We anticipated that the level of engagement for a particular audience may change based on what we learn about the magnitude of potential project effects they may experience and based on engagement preferences.

Additional information about specific audiences is included in Section 3.9 alongside the feedback heard from each audience through project engagement to date.

3.5 Communication methods

To reach the identified audiences that may be affected by the project, our communication methods included the following:

- Letters, emails, and phone calls
- Project webpage, phoneline, and email address
- Project information sheets

Materials used during engagement can be found in Appendix A

3.6 Rounds of engagement and engagement activities

Our engagement process has involved two rounds of engagement to date, each aligned with different engagement objectives and points in the environmental assessment process. The following sections highlight the engagement activities that took place during each round of the engagement process.

3.6.1 Round 1 pre-engagement

The purpose of Round 1 engagement was to share information about the upcoming project and to begin discussions about engagement preferences and interests.

We began pre-engagement in May 2023 by reaching out through email, followed by a hardcopy letter sent by mail, to engaged audiences. These initial reach-outs took place in two batches as our list of engagement audiences evolved based on feedback from the Province of Manitoba's Environmental Approvals Branch about their anticipated section 35 Crown consultation process.

On May 2, 2023, Round 1 letters were sent to Fox Lake Cree Nation, Tataskweyak Cree Nation, the Split Lake Resource Management Board, five registered trapline holders, and the Town of Gillam.

On May 17, 2023, Round 1 letters were sent to War Lake First Nation, York Factory First Nation, the Manitoba Métis Federation, and the Community of Ilford.

As part of Round 1 pre-engagement, we met with the groups outlined in Table 3-2.

Table 3-2: Round 1 engagement meetings

Date	Engaged audience/event	Location
June 6, 2023	Split Lake Resource Management Board meeting	Mystery Lake Hotel, Thompson, MB
June 19, 2023	Manitoba Métis Federation meeting	Virtual (Microsoft Teams)
July 17, 2023	Tataskweyak Cree Nation meeting	Tataskweyak Cree Nation Heritage Building
July 24, 2023	Fox Lake Cree Nation meeting	Virtual (Microsoft Teams)

3.6.2 Round 2 engagement

On August 15, 2023, we reached out to engaged audiences to initiate Round 2 engagement by email and hardcopy letter by mail.

The purpose of Round 2 engagement was to gather feedback about the project and project area, including potential effects and mitigation recommendations, to inform the environmental assessment process and other project decisions.

We met and/or hosted events (Table 3-3) with the following engaged audiences as part of Round 2 engagement, which concluded on October 31, 2023.

Table 3-3: Round 2 engagement meetings and events

Date	Engaged audience/event	Location
September 5, 2023	York Factory First Nation community open house	York Landing, MB (no attendees)
September 6, 2023	Town of Gillam meeting	Gillam Recreation Centre Council Chambers, Gillam, MB
October 18, 2023	Fox Lake Cree Nation meeting	Virtual (Microsoft Teams)
October 23, 2023	Fox Lake Cree Nation community open house	Fox Lake Cree Nation Gillam Office, Gillam, MB
October 24, 2023	Fox Lake Cree Nation community open house	Fox Lake Cree Nation Office, Bird, MB
October 24, 2023	Tataskweyak Cree Nation meeting	Split Lake, MB
October 26, 2023	Regional wildlife manager	Email, voicemail, and incidental in-person meeting in November

3.7 Training, employment, and business opportunity engagement

In addition to the project engagement meetings and events, we have engaged in discussions related to training, employment, and business opportunities specific to the project.

Through the meetings listed in Table 3-4, we shared information on project-specific training and employment opportunities. Potential pre-project training opportunities shared included tower assembly training and work readiness workshops and we gathered feedback at engagement events on what types of work readiness workshops would be useful to individuals. Part of this feedback also included understanding what barriers to employment people face when seeking employment on projects, as well as sharing bursary opportunities offered by Manitoba Hydro specifically for Indigenous community members. We also shared that on similar projects, there have been on-the-job training and employment opportunities including powerline technicians, heavy equipment operators, safety and environmental monitors, survey assistants, tower assembly, and administrative assistants. We received questions regarding the procurement opportunities for the project. Procurement opportunities associated with the R44H project will include Indigenous related provisions regarding training, employment, and business opportunities, and Indigenous content will be included as a tender evaluation criterion. Specifics around the various contracts and Indigenous-related provisions and opportunities are currently under review but based on our previous experience it is anticipated that this approach to Indigenous procurement will provide opportunities for Indigenous contractors to participate in the work as prime or sub-contractors.

Table 3-4: Meetings related to training, employment, and business opportunities

Date	Engaged audience/event	Location
October 6, 2023	Fox Lake Cree Nation / Joint Employment & Business Opportunities Working Group	Manitoba Hydro Office, Gillam, MB
October 23, 2023	Fox Lake Cree Nation	Fox Lake Cree Nation Gillam Office, Gillam, MB
October 24, 2023	Fox Lake Cree Nation	Fox Lake Cree Nation Office, Bird, MB
December 6, 2023	Fox Lake Cree Nation / Joint Employment & Business Opportunities Working Group	Manitoba Hydro Office, Gillam, MB

3.8 Field tours and field activities

In the summer of 2023, we undertook field tours by helicopter and vehicle so that representatives of engaged audiences could closely observe the proposed project route in person and share their observations, feedback, and concerns.

We had a total of 14 individuals participate in field tours. Table 3-5 summarizes the field tours that took place and who participated in each.

Table 3-5: Field tours

Date	Tour type	Participants
August 30, 2023	Helicopter field tours	Representatives from Fox Lake Cree Nation (4), Split Lake Resource Management Board (2), York Factory First Nation (2), War Lake First Nation (2), one (1) registered trapline holder and one (1) helper
August 30, 2023	Field tour by vehicle	One registered trapline holder
September 7, 2023	Field tour by vehicle	One registered trapline holder

We provided a summary report to engaged audiences about the helicopter tours summarizing the activities that took place and the feedback shared.

3.8.1 Online survey

We developed a survey to provide another opportunity for participants from engaged audiences to provide project feedback, which went live on the project webpage on July 26, 2023

The survey asked participants whether they had any concerns with the proposed project route, and if they had any recommendations or suggestions for how these concerns could be addressed. Participants also had the option to provide their contact information to receive project updates.

Three (3) participants filled out the survey. Of the respondents, one (1) participant did not have concerns and two (2) were unsure. Of the unsure responses, one (1) participant shared that they trap in the area so wanted to understand impacts to access and harvesting because of the project.

3.9 Engagement feedback

Through project engagement, we heard concerns related to a variety of topics and themes. Some of the most common themes shared were:

<u>Economic opportunities and employment</u>: Participants shared feedback about interests in business opportunities, preferred types of employment and training opportunities, and barriers to participating in project employment.

<u>Wildlife and vegetation</u>: Participants generally shared a preference to avoid the clearing of new areas of intact forest. Concerns about potential impacts to vegetation included the use of herbicides for vegetation management. Concerns about potential effects to wildlife were focused mainly on impacts to birds, caribou, moose, and impacts to trapping.

<u>Culture</u>: Participants shared that it is important that a ceremony take place prior to project activities, including any type of vegetation removal, and that Indigenous cultural awareness training be provided to project workers to show respect for cultural values and the ancestors and promote community safety and well-being.

<u>Cumulative effects</u>: Participants shared concerns with the project potentially adding to ongoing issues and legacy impacts in an area that has been heavily impacted by past hydroelectric development over time.

<u>Engagement</u>: Different engaged audiences shared preferences about how they like to be engaged to help shape project engagement on this project and future projects.

The following sections include brief profiles about each engaged audience and summaries of the feedback they have shared during project engagement to date.

3.9.1.1 Fox Lake Cree Nation

Fox Lake Cree Nation has inhabited Northern Manitoba for centuries and is located 750 km northeast of Winnipeg, Manitoba. There are approximately 1300 members, of which approximately 200 live on Fox Lake Cree Nation's reserve land in Bird and a small piece of reserve land in Gillam. Approximately one thousand members live away from the reserve, including about 300 in the Town of Gillam, with remaining members living primarily in Winnipeg, Thompson, and Churchill, Manitoba. (Fox Lake Cree Nation website, October 2023).

To this day, to the people of Fox Lake Cree Nation, "The Land and The People are One": *Using our skills in living a holistic, healthy, and rich life off the land and all it* *provided, we adapted to the arrival of the fur trade and settlers to Canada. For centuries, we found ways to take advantage of the opportunities that these changes brought to our territory while maintaining our connection to land and culture.* (Fox Lake Cree Nation website, October 2023).

Fox Lake Cree Nation's vision is "a thriving, healthy, and self-reliant community where all ages share in our language, traditions, and growing opportunity in the region". Their main values are teamwork, respect and support, and follow-through. (Fox Lake Cree Nation website, October 2023).

Through project engagement correspondence, phone calls, and meetings with Fox Lake Cree Nation, we understand Fox Lake Cree Nation's key feedback about the project to include, but not be limited to, the following:

- Concerns about the procurement process and specifics around the various contracts and Indigenous-related provisions, noting that the project is happening in Fox Lake Cree Nation's back yard and Fox Lake Cree Nation is capable of doing much of the work.
- Interest in training, employment, and business opportunities during planning, construction, and operations including joint ventures with other potential vendors, clearing opportunities, small realistic direct negotiated contracts, use of local businesses for project goods and services.
- The need to train local people early on for upcoming work on the project; specific training interests included, but are not limited to, environmental assessment and long-term monitoring processes.
- The importance of Indigenous Cultural Awareness training to increase understanding, respect and appreciation of culture and cultural differences, and past and contemporary issues that affect Indigenous peoples in an area to prepare employers and workers for working in culturally diverse areas.
- Potential barriers to employment for community members including housing, job readiness (e.g., safety training, radio training, high wind training, environmental monitor training), lack of childcare services, requirement for a driver's license.
- Importance of having the opportunity to include Traditional Knowledge in the environmental assessment process to understand and mitigate project impacts, and interest in building capacity in the environmental assessment process, which could involve employment with consultants or completing Traditional Knowledge studies.
- Concerns related to health and community safety including increased traffic, increased access to alcohol for youth resulting from the increase of workers in the community, EMF, noise, and stress.

- Concerns about potential cumulative effects related to having multiple lines in one area including noise, EMF, chemicals that have been applied to the land for vegetation management over time, and prolonged exposure to these effects.
- Discussing new projects that will require vegetation disturbance, while Fox Lake Cree Nation members are working on rehabilitation and revegetation projects to offset impacts at previously disturbed sites, can make these offset efforts feel like they are not accomplishing what they are setting out to achieve.
- Concern about the potential for unmarked graves in the area, potentially from York Factory First Nation's relocation.
- Concerns about project effects on wildlife including being scared off due to project activities, drawn in due to curiosity into situations of higher risk, or passing through areas of habitat that have been sprayed with chemicals.
- Concerns with the presence of transmission lines impacting birds, in particular diverting travel routes or migration paths.
- Eagles are a key species of concern due to their cultural significance and that the area near Long Spruce is visited by community members to collect eagle feathers.
- Concerns about the potential impacts to trappers.
- Importance of transparency about future projects, noting that Fox Lake Cree Nation would like to know what can be expected in terms of Manitoba Hydro related development in the next 10 years.

Fox Lake Cree Nation also shared mitigation recommendations including:

- That a ceremony must take place before any project work occurs (i.e., before any tree is cut or land disturbed);
- The necessity to have cultural awareness training provided by the community to all staff that will work on the project; and
- Revegetating cleared areas, transplanting shrubs and berries, and avoiding work during sensitive timing windows for moose

At the community open houses that took place on October 23, 2023, in Gillam and October 24, 2023, in Bird, Fox Lake Cree Nation members shared feedback specific to most of the valued components assessed in this report as well as their preferences and interests related to engagement, the inclusion of ceremony in projects, and training, employment, and business opportunities.

Representatives from Fox Lake Cree Nation also participated in a helicopter field tour on August 30, 2023. Feedback and concerns shared during the helicopter tour were attributed to the collective group of attendees the event and are described in Section .

3.9.1.2 Tataskweyak Cree Nation

Tataskweyak Cree Nation's main reserve is located at Split Lake, Manitoba, approximately 169 km west of Gillam, Manitoba, and 143 km east of Thompson, Manitoba on Provincial Road 280. Its registered population is approximately 4,143 people of which approximately 2,335 live on reserve (CIRNAC, October 2023).

Tataskweyak Cree Nation's ancestors were hunters and gatherers living off of the lands and waters around Split Lake, which, in Cree, is called Tataskweyak, meaning 'the place of tall trees'. (TCN website, October 2023)

As shared on Tataskweyak Cree Nation's website, "The vision of the Tataskweyak Cree is to be a self governing First Nation within Canada. We strive to secure social, economic, and cultural benefits sufficient to sustain our people, through the shared use of resources within the Tataskweyak Resource Management Area. We do this while sustaining the natural environment through careful management based on the understanding of the interrelatedness of all things." (TCN website, October 2023)

Tataskweyak Cree Nation has stated hydroelectric development as the most profound agent of change to the nation's traditional ways of life since European contact though major physical impacts to Tataskweyak Cree Nation's traditional lands and waters. (TCN website, October 2023)

Further, Tataskweyak Cree Nation states that the nation continues "…to modernize and evolve, but traditional pursuits and respect for cultural practices and customs are not forgotten; they are growing, and are forming part of an exciting new synthesis of the traditional and the modern." (TCN website, October 2023)

Tataskweyak Cree Nation carries out extensive land and resource use activities throughout the Split Lake Resource Management Area (RMA), which surrounds the project area.

Through project engagement correspondence, phone calls, and meetings, we understand Tataskweyak Cree Nation's key feedback about the project to include, but not be limited to, the following:

- Interest in employment opportunities, sharing that with the construction of Keeyask being complete that there are now no jobs available.
- Interest in having the opportunity to construct the line and concerns with Manitoba Hydro bringing in out-of-province companies to build the line.

- Concerns with whether Manitoba Hydro is being transparent about the project purpose. In particular, concern was shared that the proposed line may be part of a bigger plan with longer-term impacts that are not being disclosed, specifically that it may be needed to support the proposed Kivalliq Hydro-Fibre Link to Nunavut.
- That people in the south are under the impression that northern Manitoba is pristine land and waters and don't see the contamination that has occurred and how livelihoods of community members are affected negatively. There is also nowhere for children in Tataskweyak Cree Nation to swim.
- The Nelson River system is one of the most contaminated in the world and that Tataskweyak Cree Nation is still under a boil water advisory despite Keeyask being presented as an opportunity with the potential to improve living conditions in the community.
- Concern that work camps being developed to accommodate workers on Manitoba Hydro projects does not help provide more suitable housing in the community.
- That the community views about Manitoba Hydro are informed and still influenced by the history and harm that has resulted from Manitoba Hydro development in the area over time which has led to serious distrust.
- Engagement preferences including interest in discussing the project with higher level Manitoba Hydro staff, a nation-to-nation approach, the importance of capturing the United Nations Declaration on the Rights of Indigenous Peoples and reconciliation in the engagement process.
- Concerns that the government asks Manitoba Hydro to do renewal processes without consultation and that many projects being renewed did not originally have environmental assessment reports developed, which Tataskweyak Cree Nation, who is still living the impacts, would like to see as part of the renewal processes.
- Jurisdictional concerns about the Local Government District of Gillam boundary which was imposed on top of Tataskweyak Cree Nation's traditional territory.
- That the Split Lake Resource Management Board needs to make decisions related to the project.

Tataskweyak Cree Nation representatives have expressed interest in holding a community open house to discuss the project. We remain available to participate in a community meeting at a time that works for Tataskweyak Cree Nation if interest remains.

3.9.1.3 War Lake First Nation

War Lake First Nation is in Ilford, Manitoba. Ilford is located along the Bay Line railway (Hudson Bay Railway), now owned, and operated by Arctic Gateway Group, 144 km northeast of Thompson, 60 km west of Gillam and 688 km north of Winnipeg. The community started as a construction and service hub during the construction of the Hudson Bay Railway. After that, it served as an organizing point for prospectors during the Island Lake gold rush, and then for the net of winter freight roads going east from Ilford. (War Lake First Nation, October 2023). According to Crown-Indigenous Relations and Northern Affairs Canada – CIRNAC (2016) War Lake First Nation has a population of approximately 105.

As at the date of this report, we did not receive feedback about the project from War Lake First Nation.

Representatives from War Lake First Nation did participate in a helicopter field tour on August 30, 2023. Feedback and concerns shared during the helicopter tour were attributed to the collective group of attendees the event and are described in Section .

War Lake First Nation representatives have expressed interest in meeting to discuss the project and a meeting has not been able to be coordinated. We have continued to share information about project milestones, informing about opportunities to provide feedback, and remain open to further engagement if War Lake First Nation is interested in participating later.

3.9.1.4 York Factory First Nation

York Factory First Nation's reserve is along the eastern side of the Nelson River, approximately halfway between Lake Winnipeg and Hudson Bay, and it is located 116 km from Thompson, Manitoba. The community has a population of 464 and it contains 118 dwellings. This community was initially located at what is now known as York Factory, Manitoba, a community that was placed on the north shoreline of the Hayes River, around six miles from the coast of Hudson Bay. (York Factory First Nation website, October 2023).

As at the date of this report we did not receive feedback about the project from York Factory First Nation. A project open house was scheduled in September 2023 and Manitoba Hydro project engagement team representatives travelled to York Landing to share information and gather feedback about the project. Unfortunately, nobody attended the event.

Representatives from York Factory First Nation did participate in a helicopter field tour on August 30, 2023. Feedback and concerns shared during the helicopter tour were attributed to the collective group of attendees the event and are described in Section 3.8.

We have continued to share information about project milestones, informing about opportunities to provide feedback, and remain open to further engagement if York Factory First Nation is interested in participating later.

3.9.1.5 Manitoba Métis Federation

"The MMF is the democratically elected government of the Red River Métis. The MMF is duly authorized by the Citizens of the Red River Métis to deal with their collective Métis rights, claims, and interests, including conducting consultations and negotiating accommodations (as per MMF Resolution No. 8). While the MMF was initially formed in 1967, its origins lie in the 18th century with the birth of the Red River Métis and in the legal and political structures that developed with it. Since the birth of the Métis people in the Red River Valley, the Red River Métis asserted and exercised its inherent right of self-government. For the last 50 years, the MMF has represented the Red River Métis at the provincial and national levels.

During this same period, the MMF has built a sophisticated, democratic, and effective Métis governance structure that represents the Red River Métis internationally. The MMF was created to be the self-government representative of the Red River Métis—as reflected in the Preamble of the MMF's Constitution (also known as the MMF Bylaws):

"WHEREAS, the Manitoba Métis Federation has been created to be the democratic and self-governing representative body of the Manitoba Métis Community;"

In addition, the following is embedded within the MMF's objectives, as set out in the MMF Constitution as follows:

"1. To promote the history and culture of the Manitoba Métis, also known as the Red River Métis, and otherwise to promote the cultural pride of its Citizenship.

2. To promote the education of its Citizens respecting their legal, political, social, and other rights.

3. To promote the participation of its Citizens in community, municipal, provincial, federal, Aboriginal, and other organizations.

4. To promote the political, social, and economic interests of its Citizens.

5. To provide responsible and accountable governance for the Manitoba Métis, also known as the Red River Métis, using the constitutional authorities delegated by its Citizens."

The MMF has created an effective governance structure to represent the Red River Métis. It is important to bear in mind that there is only one large, geographically dispersed, Red River Métis. Red River Métis Citizens live, work, and exercise their rights throughout and beyond the province of Manitoba."

During project engagement, on August 1st, the Manitoba Métis Federation and Manitoba Hydro signed the Revitalization Agreement, which establishes processes for parties to work together on any future Manitoba Hydro developments. Although the agreement was signed during project engagement, Manitoba Hydro continued to provide the MMF with opportunities to engage beyond the scope of the agreement.

Through project engagement correspondence, phone calls, and a meeting with the Manitoba Métis Federation, we understand their key feedback about the project to include the following:

- Interest in a partnership with Manitoba Hydro
- Concerns with Manitoba Hydro's Indigenous employment targets in project contracts, shared the perspective that at least 10% of the employees hired should be Red River Métis and that self-identification by employees is not enough
- Interest in the MMF being invited to participate in monitoring
- Interest in learning from the work of the archaeologists and being kept informed about what the archaeologists find
- Along the Nelson River would have been a major travel area that Métis citizens would have used and that there is potential heritage in the area
- Interest in whether biologists have been asked about the narrow strip of trees that could remain in the corridor after a right-of-way has been cleared and whether there will be a study to look at the effect of keeping the trees
- Interest in conducting Traditional Knowledge work to determine whether the MMF has interest in the area and determine recommended mitigations

We remain open to receiving a proposal from the Manitoba Métis Federation about their interest in conducting a Métis-specific Knowledge study.

3.9.1.6 Split Lake Resource Management Board

The Split Lake Resource Management Board (RMB) was established as per Article 5 of the 1992 Split Lake Implementation Agreement signed by Canada, Manitoba, the Federal Government, the Province of Manitoba, the Split Lake Cree First Nation, and

Manitoba Hydro. The RMB includes five members of the community and five other representatives. The Split Lake RMB undertakes activities such as annual planning and budgeting, resource use monitoring, developing land and resource plans, wildlife population and habitat assessments, and reviewing land use and management proposals (Thompson 1996).

Through correspondence and a Round 1 meeting, the Split Lake Resource Management Board's feedback about the project included:

- Interest in project monitoring and monitor training.
- That the proposed route is already in a disturbed area.
- That the portions of uncleared vegetation in the existing corridor were left as buffers for caribou and asked if these buffers will be maintained.
- Interest in understanding project impacts to caribou and how they will be considered.
- Interest in business opportunities and whether the project being in the Split Lake RMA would provide Tataskweyak Cree Nation an advantage.

Representatives from the Split Lake Resource Management Board also participated in a helicopter field tour on August 30, 2023. Feedback and concerns shared during the helicopter tour were attributed to the collective group of attendees the event and are described in Section .

3.9.1.7 Community of Ilford

We did not receive any feedback from the Community of Ilford. Prior to Round 2 engagement, we followed up with Manitoba Indigenous Reconciliation about engagement with the Community of Ilford. We were advised that the Community of Ilford only has one resident and will be merging with War Lake First Nation. As a result, we did not continue separate engagement efforts with the Community of Ilford.

3.9.1.8 Town of Gillam

Gillam is in northern Manitoba, Canada. It's found north of the 56th parallel having the same latitude as Aberdeen, Ft. McMurray, and the Aleutian Islands. Gillam currently has a population of approximately 1,200 people. The town was named after Captain Zachary Gillam and his son, Benjamin. They were 17^{th}-century fur traders on the Hudson's Bay who stayed in the area from 1668 to 1670 for the fur trade and to acquire land rights. This operation was sponsored by the Royal Society of England and resulted in the incorporation of the Hudson's Bay Company on May 2, 1670. (Town of Gillam 2023).

The first European settlement in the Gillam area was founded in 1912-13, four miles east from the present town site. It had a population of around 350 people, comprising of railway workers and families. When the railroad reached the Kettle Rapids on the Nelson River, they began the construction of a bridge across it. However, its construction was interrupted by World War One. Still today, the foundations of shacks where the surveyors lived can be seen in the bush 100 yards downstream from the railway bridge on the south bank. (Town of Gillam website, October 2023).

Around 1966, it was decided that the north of Manitoba held great potential for hydroelectric power. The start of the Kettle Generating Station expanded the population of Gillam to approximately 3,000. Gillam turned into an updated "suburban" town with a shopping mall, housing, schools, a recreational center, a hospital, water treatment plants, staff houses, an airport, churches, and bus and train stations. Likewise, after the full construction of the Kettle Dam, Long Spruce and Limestone Generator Stations were constructed. (Town of Gillam website, October 2023).

The economy of the Town of Gillam is strengthened by resource development, mostly on the Nelson River. There are mineral resources in the area, nevertheless, no notable mines have been developed. When drafting the Town of Gillam Development Plan in 2014, the public related key concerns affecting future development: *the lack of choice in housing; the lack of land for development; and the lack of a sense of community for all citizens*. (Town of Gillam Development Plan, 2014).

The vision stated in the 2014 Town of Gillam Development Plan is that *Gillam is a safe, family-orientated, close-knit community where residents and visitors enjoy a vibrant historic full-service town, unique natural beauty, and outdoor adventure*. Moreover, the Development Plan (2014) includes the Town of Gillam guiding directions: *Guiding directions expand on the community vision and address the main themes relating to issues raised during the planning process:*

> *<u>We need places to live:</u>*
>
> *Affordable housing, housing options for everyone.*
>
> *<u>We need community services and amenities:</u>*
>
> *Shopping, support services, town beautification, recreation.*
>
> *<u>We need a healthy Gillam culture:</u>*
>
> *Respect, spirit, responsibility*

Through correspondence, phone calls, and an in-person meeting, we understand the Town of Gillam's key interest about the project is to be informed about accommodations for potential project workforce and whether there will be opportunities for local businesses.

3.9.1.9 Registered trapline holders

Manitoba has a registered trapline (RTL) system for managing commercial fur harvest through which registered trapline holders have the exclusive opportunity to trap fur bearing animals within a certain defined RTL area. "The system ensures sustainable fur bearing animal populations by controlling the number of trappers in that area and recognizes the lineholder as the steward of the resource." (Province of Manitoba 2023).

Through Manitoba Hydro's Trapper Compensation Policy for New Transmission Line Development, Manitoba Hydro has developed a process of engaging potentially impacted registered trapline holders as part of the project engagement process. This process includes sharing project information, gathering feedback from trappers about potential affects, working to reduce project related effects, including the provision of compensation to trappers affected by the construction of transmission facilities that are 115 kilovolts or greater once regulatory approval is received.

Under the Policy, once a Final Preferred Route has been identified, Manitoba Hydro will provide further notification to Registered Trapline Holders whose RTLs are traversed by the Final Preferred Route or within 5 kilometers of either side of centre line of the right of way of the Final Preferred Route. Through continued communication information to be shared at this stage may include, but is not limited to:

- Reviewing project plans and routing information
- Gathering and recording trapping-related information from the Registered Trapline Holder (e.g., location of cabins, trails)
- Discussing the approach to calculating compensation, including compensation for lost income and compensation for damages to trapper property or infrastructure, if applicable
- Discussing any potential additional opportunities, as applicable (e.g., trapline improvements, cutting trail), and
- Explaining the timing of the project activities on the trapline.

Through project engagement correspondence, phone calls, conversations, and field tours (by helicopter and vehicle) we understand key feedback about the project from trapline holders to include the following:

- Interest in understanding the trapper compensation policy.
- Interest in jobs that the project may create.
- Positive feedback regarding the line being placed within the existing corridor beside other transmission lines, minimizing land disturbance.

We have continued to share information about project milestones, informing about opportunities to provide feedback, and remain open to further engagement with any of the registered trapline holders later.

3.9.1.10 Province of Manitoba's Regional wildlife manager

Email and voicemails were used to engage with the regional wildlife manager. An incidental in-person meeting in Thompson, November 2023 offered an additional opportunity to discuss concerns regarding the project. From a wildlife perspective no major concerns were identified by the regional wildlife manager. The routing of the project within an existing corridor, and the employment of mitigation techniques as applied in other recent transmission line projects were noted in this discussion.

3.9.1.11 Field tour participants

Field tours of the project area, by helicopter and vehicle, involved participation from most of the engaged audiences.

Key feedback topics heard during field tours include:

- A preference to stick to pre-disturbed areas as much as possible and to avoid clearing new treed areas for project activities such as storage.
- Interest in employment opportunities for community members and economic opportunities; interests included machine operator jobs and providing equipment rentals for brush cutting.
- Concerns related to impacts to trappers.

Feedback about wildlife and harvesting in the area including:

- Disruptions to wildlife during construction due to noise
- Use of the area for hunting caribou
- Concern for eagles, pelicans, swans, and other birds, near the Long Spruce Dam
- Use of the existing corridor near Limestone, where foxes are present

During the tour, participants made observations related to various species including sandhill cranes and potential nest sites, beaver lodges in the treed area, lichen, caribou habitat, creeks and fish habitat along the corridor, trails used by wildlife, and possibly moose.

A common sentiment shared was that the selection of a route within the existing corridor beside other lines was preferrable to creating a new right-of-way through an undisturbed area.

3.10 Engagement results

Through our engagement process, we received feedback covering many topics, which has informed many aspects of this environmental assessment report as well as developing the approach for training, employment, and business opportunities, and preferences to help support the continual improvement of Manitoba Hydro's engagement efforts on future projects.

3.10.1 Environmental assessment

Through project engagement, we heard feedback about most of the valued components discussed in this assessment as well as information that helped inform our understanding of the project setting as described in Chapter 5.0.

3.10.2 Training, employment, and business opportunities

The Joint Employment and Business Opportunities (JEBO) Working Group is a bi-lateral working group to promote the effective coordination of training, employment, and business opportunities available to FLCN members with Manitoba Hydro in the Gillam area. JEBO is also forum to discuss mechanisms to enhance the recruitment and retention of FLCN members working at Manitoba Hydro, with focus on the Gillam area.

Feedback we heard about training, employment and business opportunities for the project include a need for pre-project training. Pre-project training opportunities will be executed through the JEBO Working Group. Barriers to employment such as a driver's license and tower assembly experience can be mitigated by offering pre-project training opportunities. These training opportunities will be executed jointly by Manitoba Hydro and Fox Lake Cree Nation through the JEBO working group.

The JEBO working group also includes Fox Lake community employment coordinators. Employment recruitment and retention plans will also be enhanced by using this working group to review and monitor contractor plans.

In addition, keeping Fox Lake informed about any business opportunities such as subcontracts, and supplier needs arising from the project can also be done through the JEBO working group. As these opportunities arise Manitoba Hydro will inform Fox Lake Cree Nation through this working group.

3.10.3 Engagement process and preferences

Feedback we heard about engagement preferences and concerns helped shape and inform the project engagement process itself. Based on feedback, we planned activities that responded to the interests that engaged audiences shared with us such as the helicopter tours of the proposed transmission line route that took place on August 30, 2023, and the community open houses and youth trapping activities that took place with Fox Lake Cree Nation.

Concerns and interests about the engagement process also helped us identify areas for improvement for ongoing engagement on the project and other future projects.

3.11 Ongoing engagement

Following Manitoba Environment and Climate Change's decision regarding the project, Manitoba Hydro will notify the engaged audiences of the outcome of the decision and if we are granted a licence, we will keep them informed of construction schedules and activities.

We will continue to meet with business and employment contacts for the engaged First Nations and the Manitoba Métis Federation about anticipated opportunities for training, employment, and business opportunities as additional information about project-related procurement opportunities becomes available. Through these discussions, we will gather feedback about potential barriers to employment on the project and work to help address these issues as identified.

We plan to also engage in further discussions about culture and heritage monitoring and other project monitoring options.

Manitoba Hydro will also reach out to engaged audiences to arrange a ceremony or ceremonies at identified project milestones and at times that work for those who are interested in leading and/or participating.

Other potential opportunities for engagement may include the development and implementation of Indigenous Cultural Awareness Training for the project.

We will remain open and responsive to any questions or concerns that may arise through construction and operation of the project. There are a few existing committees and forums that originated from previous projects in the area with representation from Manitoba Hydro and certain nations engaged on this project. These committees continue to provide a mechanism for concerns to be raised to Manitoba Hydro, including concerns associated with specific Manitoba Hydro projects.

In addition, the project webpage will continue to be updated as the project progresses and the toll-free phone number (1-877-343-1631) and project engagement email address (projects@hydro.mb.ca) will remain active. Any feedback about the engagement process will help support the continual improvement of Manitoba Hydro's engagement efforts on future projects.

We will consider any additional feedback about the project received after filing of this environmental assessment report. If new information is learned about specific locations of concern or topics of concern that were not known at the time of filing, we can consider incorporating additional mitigation measures into the environmental protection plan.

4.0 Environmental assessment methods

This chapter describes the methods used for assessing the project's potential effects. Effects are changes to the environment or to health, social or economic conditions and the positive and negative consequences of these changes.

The methods described herein were informed by past and ongoing Manitoba Hydro assessments and initiatives, as well as regulatory requirements. The environmental assessment approach was structured to meet the requirements of the *Environment Act* (Manitoba)'s Licensing Procedures Regulation, M.R. 163/88.

The environmental assessment approach outlined in this chapter considered engagement feedback and incorporates the following key elements:

- Identifying project components and activities that could interact with components of the existing surrounding environment
- Predicting and evaluating potential changes to the environment and the likely effects on the identified valued components (VCs)
  - Valued components are biophysical, social, cultural, and economic elements that, if altered by the project, may be of concern to regulatory agencies, Indigenous peoples, resource managers, scientists, other interested parties and/or the public
- Proposing measures to mitigate the predicted adverse environmental effects
- Evaluating residual effects and determining whether these residual adverse effects could be significant
  - A residual effect is the effect of a project that is predicted to remain following the implementation of mitigation measures
- Developing follow-up and monitoring programs if environmental inspections identify unexpected effects. Monitoring and follow-up would be undertaken in pursuit of appropriate rehabilitation per the environmental protection program.

4.1 Scope of the assessment

Scoping the assessment enables the assessment to focus on important aspects of the project and the environment.

4.1.1 Project scope

As described in Chapter 0, the proposed project consists of the following primary components:

1. Construction of approximately 42 km of a 230-kV transmission line terminating at Radisson and Henday converter stations and the installation of associated equipment at the two converter stations.
2. Operation of the transmission line.
3. Decommissioning of the transmission line.

4.1.2 Selection of valued components

The assessment of effects presented in this report focuses on the identification and assessment of project-related environmental effects on VCs. As previously defined, VCs are elements of the biophysical, cultural, socio-economic environment that, if altered by the project, may be of concern.

Project-related environmental effects and cumulative environmental effects are assessed using a standard framework for each VC with standard tables and matrices that facilitate the detailed documentation of the evaluation.

Residual effects due to the project are characterized using specific criteria defined for each VC.

The following factors influenced the selection of VCs for this assessment:

- VCs adopted for previous environmental assessments and the feedback received for those assessments
- Engagement feedback from regulators, First Nations, and their members, the Manitoba Métis Federation and Red River Métis citizens, landowners, interested parties and the public
- The professional judgment of the environmental assessment team considering the project's anticipated components and activities, and location, as well as the surrounding environment, and regulatory requirements

Based on the above factors, the following VCs were selected for this assessment:

- Vegetation (Chapter 6)
- Wildlife and wildlife habitat (Chapter 7)
- Fish and fish habitat (Chapter 8)
- Harvesting and recreation (Chapter 9)
- Important sites (Chapter 10)
- Infrastructure and community services (Chapter 11)
- Economic opportunities (Chapter 12)
- Health and safety (Chapter 13)

4.1.3 Regulatory and policy setting

The assessment section for each VC includes a description of the federal and provincial regulations and policies specific to that VC, that apply to the project.

4.1.4 Project engagement input

The assessment section for each VC summarizes engagement feedback specific to that VC, as applicable, and outlines how the feedback influenced the scope of the assessment.

4.1.5 Spatial boundaries

Three spatial boundaries for the assessment of potential project effects were selected based on the geographic extent over which project activities and their effects on individual VC are anticipated to occur.

4.1.5.1 Project development area

The project development area (PDA) encompasses the anticipated area of physical disturbance associated with the construction, operation, and decommissioning of the project. As such, the PDA represents the physical project footprint and includes the area of physical disturbance associated with the transmission line right-of-way, marshalling and fly yards, station components and structures as described in the project description (Chapter 0). The PDA is the same across all VCs.

4.1.5.2 Local assessment area

The local assessment area (LAA) encompasses the area where immediate or direct effects from a project's activities and components are predicted to occur. The definition of the LAA may vary by VC and is provided in the assessment section for each VC.

4.1.5.3 Regional assessment area

The regional assessment area (RAA) is the area where residual environmental effects from project activities and components may interact cumulatively with the residual environmental effects of other past, present, and known, certain, or reasonably foreseeable future projects/physical activities. The definition of the RAA may vary by VC and is provided in the assessment section for each VC.

4.1.6 Temporal boundaries

Three temporal boundaries were adopted to identify when environmental effects may occur due to specific project activities. The temporal boundaries are based on the timing and duration of project activities and the nature of the interactions with each VC.

4.1.6.1 Construction

Project construction is anticipated to span the period from December 2024 to July 2026. Transmission line construction will be restricted to frozen ground conditions Should while converter station construction will occur year-round.

4.1.6.2 Operation

The in-service date for the project is planned for summer 2026. Once operational, the project is anticipated to last a minimum of approximately 75 years with maintenance.

4.1.6.3 Decommissioning

Decommissioning would occur during a two-year period at the end of the life of the project (75 years or more into the future).

4.2 Existing conditions

The existing conditions relevant to the assessment of potential project effects are based on data collected during desktop analysis, field studies, engagement, and the spatial assessment boundaries, and are described in each VC-chapter (i.e., Chapters 6 to 14).

In many cases, existing conditions expressly or implicitly include those environmental effects that may be or may have been caused by other present or past projects or activities that are or have been carried out. In focusing the assessment on VCs, the description of existing conditions is at a level of detail and scope that supports the assessment of environmental effects attributable to the project.

Other, non-VC specific, existing conditions relevant for the assessment (e.g., climate, physiography and drainage, geology, soils, and historical and cultural setting) are described in Chapter .0 (Environmental setting).

4.3 Assessment of project effects

The assessment of potential project effects is presented by VC, in Chapters 6 to 13. Each VC section follows a standard format, covering each of the topics discussed in Sections 4.1 to 4.6, namely:

- Scope of the assessment
- Existing conditions
- Assessment of project effects
- Assessment of cumulative effects,
- Determination of significance of project and cumulative effects
- Prediction confidence, and
- Follow-up and monitoring

4.3.1 Interactions between the project and valued components

The potential for interaction between project activities and each valued component was considered for the construction, operation, and decommissioning phases of the project. The potential interactions between project activities and individual VCs are described and assessed for each valued component (see Chapters 6 to 13).

Table 4-1: Project valued components and project activity interactions matrix

Project activity	Valued components							
	Vegetation	Wildlife and wildlife habitat	Fish and fish habitat	Harvesting and recreation	Important sites	Infrastructure and community services	Economic opportunities	Health and safety
Transmission line construction								
Mobilization and staff presence	-	✓	-	✓	✓	✓	✓	✓
Vehicle and equipment use	✓	✓	✓	✓	✓	✓	✓	✓
Access development	✓	✓	-	✓	✓	-	✓	✓
Right-of-way clearing	✓	✓	✓	✓	✓	-	✓	✓
Borrowing sites (assumed to be previously disturbed sites)	-	✓	-	✓	-	-	-	✓
Watercourse crossings	✓	✓	✓	✓	✓	-	-	✓
Marshalling / fly yards	✓	✓	-	✓	✓	-	-	✓
Transmission tower construction	✓	✓	-	✓	✓	-	✓	✓
Implosive connectors	-	✓	-	✓	✓	-	-	✓
Helicopter use	-	✓	-	✓	✓	-	✓	✓
Clean-up and demobilization	✓	✓	-	✓	✓	✓	✓	✓
Station modifications								
Mobilization and staff presence	-	✓	-	✓	✓	✓	✓	✓
Vehicle and equipment use	✓	✓	-	✓	✓	✓	✓	✓
Marshalling/ fly yard	✓	✓	-	✓	✓	-	-	✓
Installation of electrical equipment	-	-	-	-	-	-	-	✓

Project activity	**Valued components**							
	Vegetation	Wildlife and wildlife habitat	Fish and fish habitat	Harvesting and recreation	Important sites	Infrastructure and community services	Economic opportunities	Health and safety
Clean-up and demobilization	✓	✓	-	✓	✓	-	✓	✓
Transmission line and station operation and maintenance								
Transmission line and station presence	-	✓	-	✓	✓		-	✓
Vehicle and equipment use	✓	✓	-	✓	✓	-	✓	✓
Inspection and maintenance	✓	✓	-	✓	✓	-	✓	✓
Vegetation management	✓	✓	✓	✓	✓	-	✓	✓
Decommissioning								
Mobilization and staff presence	-	✓	-	✓	✓	✓	✓	✓
Vehicle and equipment use	✓	✓	✓	✓	✓	✓	✓	✓
Removal of transformers, disassembled towers, foundations, conductors, and associated equipment	✓	✓	-	✓	✓	-	-	✓
Rehabilitation	✓	✓	-	✓	✓	-	✓	✓
Clean-up and demobilization	✓	✓	-	✓	✓	-	✓	✓

Key: Interaction = x No interaction = -

4.3.2 Effects pathways

The assessment of each VC begins with a description of the mechanisms through which specific project activities could interact with the existing environment and result in an environmental effect (i.e., the effect pathways).

For each VC, the project's potential effects are identified and assessed in the context of the VC's existing conditions, as well as its biophysical or socio-economic characteristics, regulatory context, and input received through project engagement.

Once effect pathways are identified, one or more parameter(s) are selected to facilitate quantitative and qualitative assessment of residual project effects and residual cumulative effects.

Measurable parameters provide defensible and acceptable means to characterize change in a VC attributable to the project and contribute to the determination of significance for those effects.

Where practical, these parameters are measurable and quantifiable (e.g., direct habitat loss). However, some effects lack defined parameters to measure effects and are therefore predicted qualitatively using the scientific literature, professional judgement, engagement input and past project experience.

4.3.3 Mitigation of project effects

Mitigation measures are identified to reduce or eliminate potential adverse effects and/or enhance potential positive effects of the project on each VC. These measures include site-specific and established general protection measures and practices, compliance with legislation, regulations, and guidelines, and planning considerations applicable to the project.

Mitigation measures are identified in the VC-specific effects assessment chapters.

4.3.4 Characterizing residual effects

Residual effects are predicted remnant effects that would occur after the application of mitigation measures. Residual effects are characterized for each VC, considering how the proposed mitigation will avoid or reduce the effect. The residual effects are characterized using the following terms:

Direction: the long-term trend of the residual effect (i.e., positive, adverse, neutral).

Magnitude: the amount of change in a residual effect for a VC relative to its existing conditions (e.g., low, moderate, high).

Geographic Extent: the geographic area in which a residual effect occurs (i.e., PDA, LAA, RAA).

Duration: the time until the residual effect can no longer be measured or otherwise perceived (i.e., short-term, medium-term, long-term).

Frequency: how often the residual effect occurs and how often during the project or in a specific phase (i.e., single event, irregular events, multiple regular events, or continuous).

Reversibility: refers to whether the residual effect on a VC can be reversed once the physical work or activity causing it ceases (i.e., reversible, irreversible).

A summary of the characterization of residual environmental effects is provided in each VC chapter.

4.4 Assessment of cumulative effects

Cumulative effects are incremental effects resulting from residual project effects combined with effects from past, existing, and other reasonably foreseeable future projects and activities.

This assessment considers cumulative environmental effects that could result from the project's adverse residual effects in combination with other past, present, and reasonably foreseeable future projects or physical activities. Past, present, and reasonably foreseeable projects that may overlap spatially and temporally with those of the project are identified. The project's contribution to the cumulative effect is then evaluated.

The effects of past and current projects inherently contribute to baseline conditions upon which project effects are assessed. Two conditions must be met to initiate an assessment of cumulative effects on a VC:

- There are predicted adverse residual project effects on the VC.
- The adverse residual project effects on a VC could act cumulatively with the residual effects of other past, present, and reasonably foreseeable future projects or physical activities on the same VC.

If neither of the two above-mentioned conditions is met, there is no expectation that the project will contribute cumulatively to residual effects, and further assessment is not warranted.

If both conditions are met, then the assessment of cumulative effects is undertaken and documented within the effects assessment chapter of a VC, following the assessment of project residual effects.

Where a cumulative effects assessment is completed for a VC, the focus is on those other projects and physical activities that could result in similar residual effects to those being considered for the project.

4.4.1 Project/activity inclusion list

The project/activity inclusion list (Table 4-2; Figure 4-1) identifies known past, present and reasonably foreseeable future projects and physical activities with potential residual environmental effects that could overlap spatially and temporally with the project's residual environmental effects.

Reasonably foreseeable future projects are those that are publicly announced (with adequate descriptive detail), currently in a regulatory approval process, or under construction.

Table 4-2: Project/activity inclusion list			
Type of Project/Activity	Select specific activities/projects	Activity/Project Timeline	Timeline for construction, if applicable/documented
The Project			
R44H	Proposed project	-	December 2024 to July 2026
Existing/Ongoing Projects and Activities			
Domestic Resource Use	Includes Hunting, Fishing, Trapping	Ongoing since before 1610	-
Recreational Activities	Includes canoeing, snowmobiling, hiking	Ongoing since before 1610	-
Commercial resource use	Includes fishery and forestry	Ongoing since 1900	-
Infrastructure	Includes existing rail lines, provincial trunk highways, provincial roads, pipelines, water treatment facilities, wastewater treatment facilities	Ongoing since 1920	-
Hydroelectric power generating and converter stations	Kelsey Generating Station	Ongoing since 1960	1957 to 1961
	Keeyask Generating Station	Ongoing since 2022	2014 to 2022
	Kettle Generating Station	Ongoing since 1972	1966 to 1974
	Long Spruce Generating Station	Ongoing since 1977	1971 to 1979
	Limestone Generating Station	Ongoing since 1990	1976 to 1992
	Radisson Converter Station	Ongoing since 1971	1967 to 1977
	Henday Converter Station	Ongoing since 1978	1970 to 1977
	Keewatinohk Converter Station	Ongoing since 2018	2013 to 2018
Hydroelectricity transmission lines	Kettle Generating Station to Radisson 138-kV transmission line		1970 to 1973
	Kelsey to Radisson 138-kV transmission line and associated Tap transmission lines		1966 to 1989
	Keeyask to Radisson 138-kV transmission lines		2016 to 2019
	Kelsey to Oxford House transmission line		1997
	Kelsey to Thompson (Inco) 138-kV transmission line		1960
	Radisson to Kelsey 230-kV transmission line		1973
	Radisson to Churchill 138-kV transmission line		1987
	Thom to Laurie 138-kV transmission line		1970

Table 4-2: Project/activity inclusion list			
Type of Project/Activity	Select specific activities/projects	Activity/Project Timeline	Timeline for construction, if applicable/documented
	Long Spruce to Radisson 230-kV transmission lines		1973 to 1977
	Long Spruce to Henday 230-kV transmission line		1975 to 1977
	Keewatinohk to Henday 230-kV transmission line		2018
	Long Spruce to Keewatinohk 230-kV transmission line		2018
	Bipole I (Henday to Radisson and Radisson to Dorsey 500-kV transmission lines)		1968 to 1971
	Bipole II (Henday to Radisson and Radisson to Dorsey 500-kV transmission lines)		1968 to 1985
	Bipole III (Keewatinohk to Riel) 500-kV transmission lines		2014 to 2018
Mining	Vale nickel mine	Ongoing since 1961	-
Potential future projects and activities			
Kivalliq Hydro-Fibre Link (KHFL)	A 1,200 km hydroelectric transmission line (also carrying fibre optics) initiating near Gillam and extending northwards into and terminating in the Kivalliq Region of Nunavut.	-	Construction anticipated to span 2026 to 2030
Project 6 – All-season road linking Manto Sipi Cree Nation, Bunibonibee Cree Nation, and God's Lake First Nation (Project 6)	A 141-km two-lane gravel all-season road linking Manto Sipi Cree Nation, Bunibonibee Cree Nation, and God's Lake First Nation.	-	Construction anticipated to span 2030-2038

✓ = Other projects and physical activities whose residual effects are likely to interact cumulatively with project residual environmental effects.

– = Interactions between the residual effects of other projects and those of the project residual effects are not expected.

As shown in Table 4-2, two reasonably foreseeable future projects have been identified within the RAA, namely the KHFL and Project 6.

The KHFL is a potential new, 1,200-km long hydroelectric transmission line (also carrying fibre optics) that would initiate near Gillam and extend northwards into and terminate in the Kivalliq Region of Nunavut. The proponent for the KHFL is Nukik Corporation and according to Nukik Corporation (2023), timelines for the project indicate that KHFL construction would span 2026 to 2030. While no environmental regulatory application for the KHFL's construction and operation has been filed yet, questions relating to this project have been brought up during the ongoing project engagement for the R44H transmission line. The proximity of the KHFL footprint to the R44H transmission line footprint makes it a project of interest for communities in the Gillam area. The media coverage of the project, federal funding that the KHFL has received to date (e.g., Crown-Indigenous Relations and Northern Affairs Canada 2022), and the proposed completion of geological information surveys by Natural Resources Canada in 2023 along the proposed hydro-fibre link corridor in Nunavut (Nunavut Impact Review Board 2023), add to the public interest in the KHFL. Details of the KHFL, including, project footprint, project design and technical aspects, specific point of initiation in the Gillam area, and construction schedule of the Manitoba segment were unknown to Manitoba Hydro at the time of filing this EA report. While the project proposes to connect to Manitoba's transmission grid, Manitoba Hydro is currently not involved in the project.

Project 6 is a project proposed by Manitoba Infrastructure. It consists of the construction and operation of a 141-km two-lane gravel all-season road to be located on provincial Crown land and linking Manto Sipi Cree Nation, Bunibonibee Cree Nation, and God's Lake First Nation. Project 6's footprint would be located outside the LAA but within the RAA as its footprint is approximately 160 km south of the R44H transmission line at its closest point. An environmental impact statement (EIS) for Project 6 was submitted to both federal and provincial environmental regulators in April 2019 and the EIS indicates that road construction will start in 2030 and end in 2038 (Manitoba Infrastructure 2019). Construction would be during the winter and at peak construction, a workforce of up to 120 workers is anticipated.

4.4.2 Pathways for cumulative effects

The assessment of each cumulative environmental effect begins with a description of the residual adverse project environmental effects and an analysis of the pathways through which such effects could interact with the residual effects from other projects and activities.

4.4.3 Mitigation of cumulative effects

Mitigation measures that can reduce the project cumulative environmental effects are described, with an emphasis on those measures that are under Manitoba Hydro's control and would help to reduce the interaction of the project effect with the effects from other projects and activities.

Manitoba Hydro will share information and knowledge with other proponents through its environmental assessment. In developing mitigation measures for adverse cumulative effects, it is typically not feasible (or appropriate) for one proponent to manage effects in an area developed by several other proponents. It is the primary responsibility of a given proponent to manage their own projects.

4.5 Determination of significance of project and cumulative effects

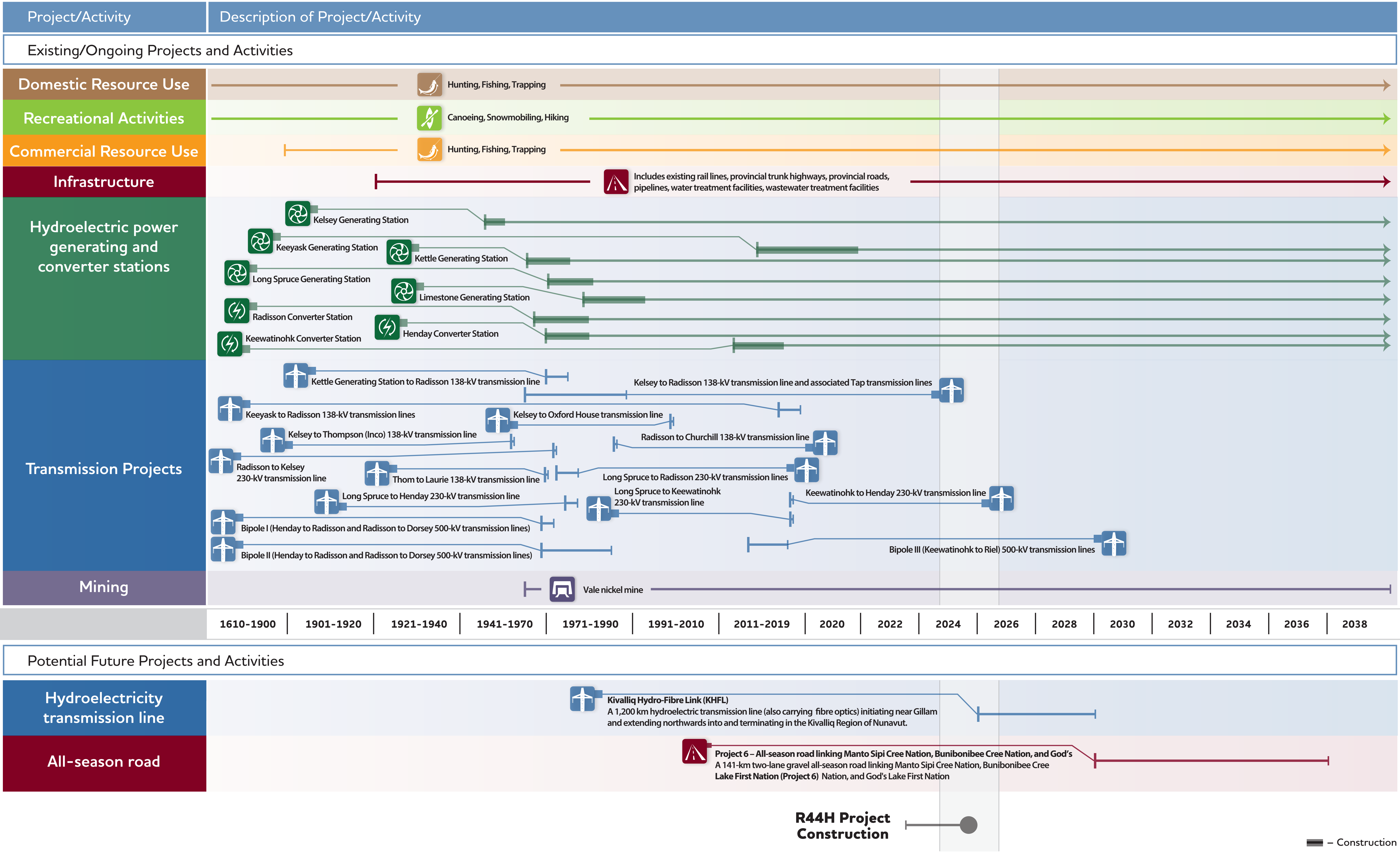
The determination of significance involves assessing the predicted residual and cumulative VC effects against established threshold criteria. Where residual and cumulative VC effects exceed threshold criteria, the associated effects are considered significant.

The thresholds are defined in consideration of regulatory requirements, standards, objectives, or guidelines as applicable to individual VCs. Where thresholds are not set by guidelines or regulations, a threshold is developed using the measurable parameters established for the VC, along with professional judgement and previous experience assessing project effects on the VC.

The significance determination focuses on residual and cumulative adverse effects; therefore, if positive or neutral residual or cumulative effects are identified, they are not assessed further.

The assessment also provides a determination of significance for the project's overall residual effects and cumulative effects after the implementation of mitigation measures.

Figure 4-1: Past, present, and potential future projects and activities in the R44H regional assessment area



4.6 Prediction confidence

The determination of significance of residual project environmental effects and residual cumulative environmental effects includes a discussion of the level of confidence in the prediction. Confidence in the prediction is based on certainty relative to:

- The quality and quantity of data used for the assessment, data limitations, and the understanding of the effect pathways.
- The anticipated effectiveness of the proposed mitigation measures.

4.7 Follow-up and monitoring

Manitoba Hydro's environmental protection program (Chapter 17.0) provides the framework for implementation, management, monitoring and follow-up of environmental protection measures.

Environmental protection, management, and monitoring plans (as required) will be prepared and implemented under the environmental protection framework to address environmental protection requirements in a responsible manner.

Follow-up and monitoring are intended to verify the accuracy of the environmental assessment, assess the implementation and effectiveness of mitigation and the nature of the residual effects, and to manage adaptively if required.

Follow-up and monitoring will be implemented through inspection, management, and auditing actions.

4.7.1 Inspection

Inspection is the organized and routine examination or evaluation, including observations, measurements and sometimes tests, of a construction project or activity. Inspection results are compared to pre-defined requirements or standards to determine whether an activity conforms to these requirements. Inspection provides an essential function in environmental protection and implementation of mitigation measures. Much of the success in environmental protection will be attributable to how well environmental inspections are carried out during the construction phase of a project.

Manitoba Hydro has established a comprehensive and integrated environmental inspection program to ensure effective implementation of environmental protection measures, compliance with regulatory approvals and fulfillment of corporate environmental objectives.

Trained inspectors visit work sites and inspect for compliance with license terms and conditions, and adherence to environmental protection measures.

4.7.2 Monitoring

Monitoring refers to the continued observation, measurement, or assessment of environmental conditions at and surrounding a construction project or activity. Two main types of monitoring are typically undertaken for environmental assessments:

1) Environmental monitoring to verify the accuracy of the predictions made and the effectiveness of the mitigation measures implemented.

2) Compliance monitoring to verify whether a practice or procedure meets legislated requirements.

Monitoring determines if environmental effects occur as predicted, residual effects remain within acceptable limits, regulatory limits, criteria, or objectives are not exceeded, and mitigation measures are as effective as predicted. Monitoring also allows for adaptive management where monitoring results show there is a need for additional environmental protection or enhancement.

4.7.3 Management

Management is the control of pre-defined environmental effects, issues, and concerns through the implementation of reasoned and approved courses of action. Management plans will be prepared to address important management issues, regulatory requirements and corporate commitments identified in the environmental assessment report. Such management plans will describe the management actions, roles and responsibilities, evaluation mechanisms, updating requirements and reporting schedules. The following management plans have been prepared for the construction of the project (detailed in Chapter 17.0):

- Access management plan
- Erosion and sediment control management plan
- Rehabilitation and invasive species management plan
- Waste and recycling management plan

The above plans have been prepared by Manitoba Hydro. They will be adjusted based on continued engagement and regulatory feedback.

5.0 Environmental setting

The project footprint spans two ecozones (Map 5-1; (Smith, et al. 1998)). The Town of Gillam and the Radisson converter station are in the Knee Lake Ecodistrict of the Hayes River Upland Ecoregion which is part of the broader Boreal Shield Ecozone. The Henday converter station is in the Winisk River Lowland Ecodistrict of the Hudson Bay Lowland Ecoregion which is part of the broader Hudson Plains Ecozone.

5.1 Climate

This section characterizes historic climate conditions. Projections of how climate in the area may change in the future are presented in Chapter 15 (Greenhouse gases and climate change).

5.1.1 Historic climate

The Knee Lake and Winisk River Lowland Ecodistricts have similar climate, which is generally characterized by short, cool summers and long, very cold winters, subhumid to humid, with mean annual precipitation that varies considerably from year-to-year with approximately one-third falling as snow (Smith, et al. 1998).

Data from five meteorological stations operated by Environment and Climate Change Canada (ECCC) in the regional area (i.e., Gillam stations), as well as six complementary stations near Thompson were reviewed.

Most stations show a relatively short temporal coverage which limits the suitability of these records for long term climate studies, such as the calculation of 30-year climate normals. One station in Gillam (i.e., Gillam A; 5061001) has climate normals published for the 1981-2010 period (Environment and Climate Change Canada 2023).

5.1.1.1 Climate normals

Monthly climate normals (Environment and Climate Change Canada 2023) are illustrated in Figure 5-1 for temperature, precipitation, and wind speed. Also shown are period-of-record extremes at each station which may extend beyond the 1981-2010 period.

Among all stations in the immediate area (i.e., within 15 km of the proposed transmission line), only Gillam A reports climate normals in the 1981-2010 period.

Climate normals from Thompson A are provided as a comparison station, but it should be noted that Thompson A is approximately 210 km southwest of the

Radisson converter station, and therefore Gillam A is expected to be more indicative of historic climate conditions in the area.

Normals available for Thompson A include temperature, precipitation, and wind. As shown in Figure 5-1, conditions and seasonal patterns are similar between the two stations.

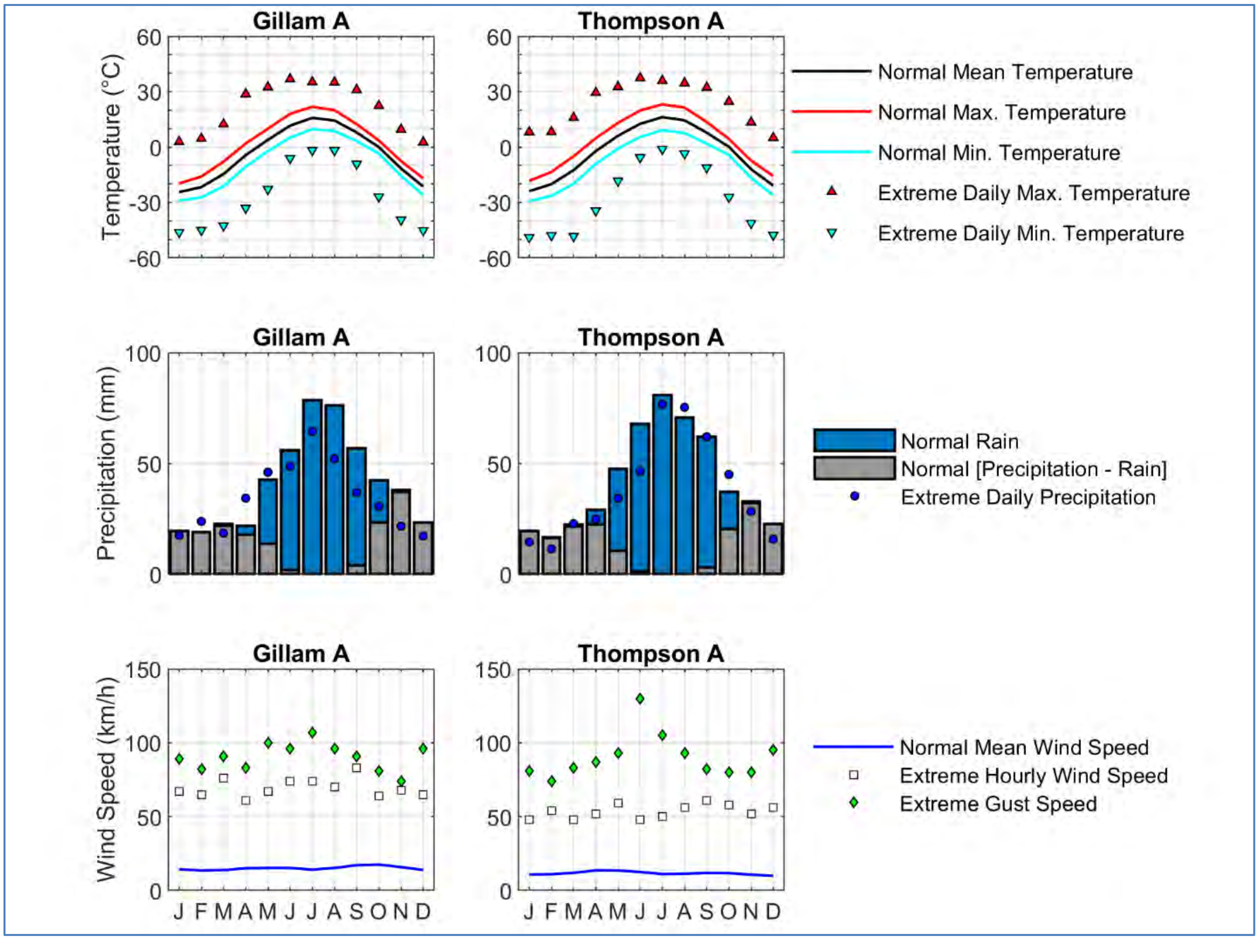


Figure 5-1: 1981-2010 monthly climate normals (ECCC 2023).

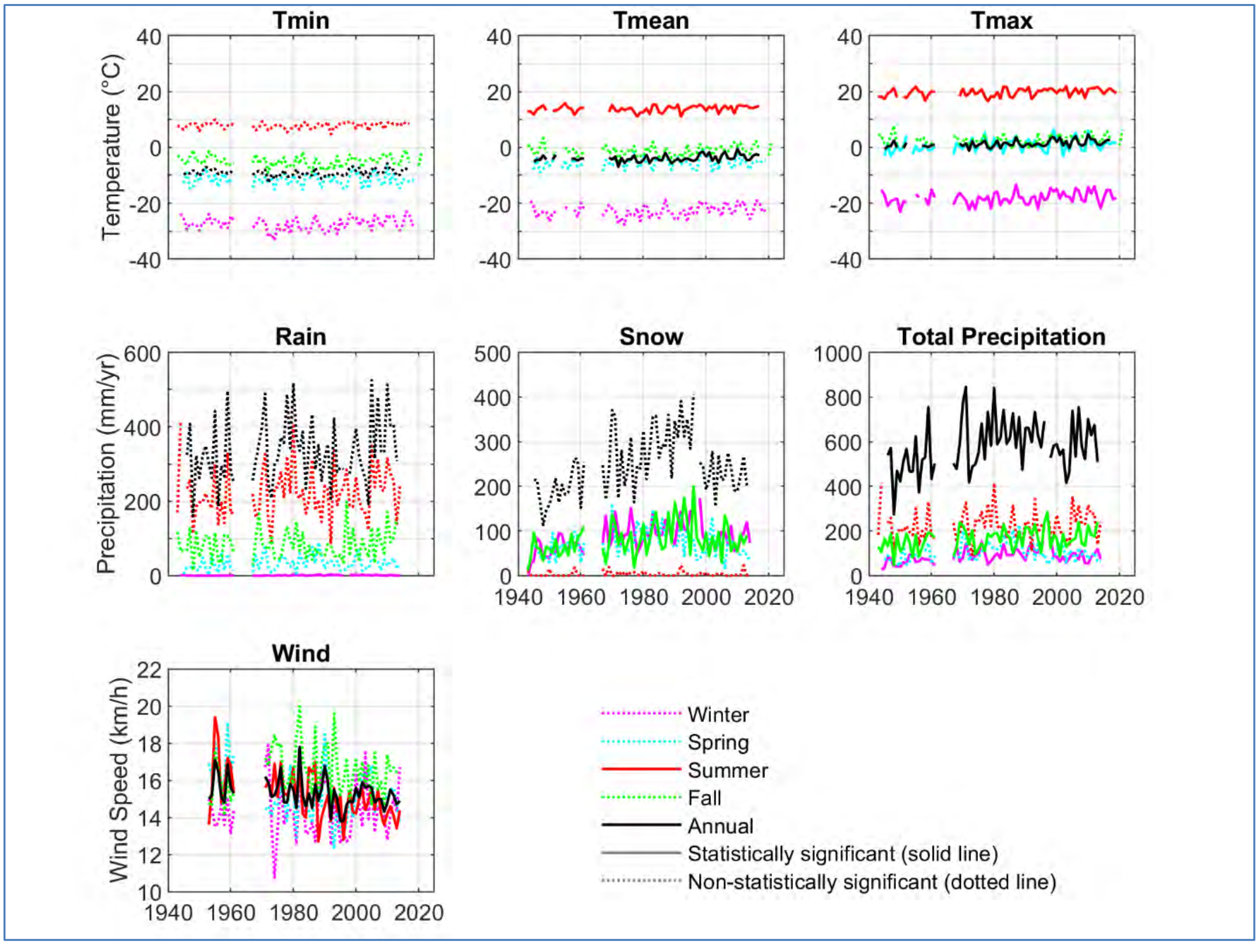


Figure 5-2: Time series of seasonal and annual temperature, precipitation, and wind speed

5.1.2 Trends

Adjusted and homogenized Canadian climate data (AHCCD) from ECCC are developed specifically for purposes of understanding long-term trends in climate (Vincent, Hartwell and Wang 2020); (Mekis and Vincent 2011); (Wan, Wang and Swail 2010).

Seasonal and annual time series from AHCCD at Gillam are plotted in Figure 5-2. Since methods involved in generating AHCCD typically include the joining of multiple nearby stations (i.e., to reduce missing data and increase time series length), the sites presented in Figure 5-2 may incorporate data from multiple stations.

Trends of note include:

- Annual temperatures increased by 0.019°C/yr for mean temperature and 0.029°C/yr for maximum temperature

- In winter, maximum temperature increased by 0.031°C/yr
- In spring, maximum temperature increased by 0.034°C/yr
- In summer, mean temperature increased by 0.014°C/yr and maximum temperature increased by 0.019°C/yr
- The only statistically significant trend for rain was increasing winter rain (0.013mm/yr), which may be in response to warmer winter temperatures resulting in more precipitation falling as rain instead of snow.
- Seasonally, snow increased for winter (0.498mm/yr) and fall (0.511mm/yr)
- Annual total precipitation increased by 1.937mm/yr; seasonally, total precipitation increased for winter (0.486mm/yr) and fall (0.726mm/yr)
- Annual wind speeds decreased by -0.013km/h/yr; the only seasonal trend occurred in summer with decreasing wind speeds of -0.039km/h/yr

Historic trends provide an indication of how the climate has changed in the past but may not be an accurate representation of continued longer-term changes in the climatic system (e.g., through extrapolation of trends). Projected changes to the climate system based on future greenhouse gas scenarios, developed using climate models, are presented in Chapter 15.

5.2 Physiography and drainage

The project falls within the Boreal Shield and Hudson Plains ecozones (Map 5-1), traversing the Knee Lake Ecodistrict of the Hayes River Upland Ecoregion and the Winisk River Lowland Ecodistrict of the Hudson Bay Lowland Ecoregion, respectively.

As described by Smith et al. (Smith, et al. 1998):

- The Knee Lake Ecodistrict is an undulating to ridged, (drumlins) loamy morainal plain, extending from Knee Lake in the south to Stephens Lake in the north. Elevations in the Knee Lake area are about 213 metres above sea level (masl) and approximately 150 masl near Stevenson Lake. Drainage is northeastward through the Hayes, Stupart and Nelson rivers, and a dendritic drainage system consists of many secondary streams. The terrain slopes very gently at about 0.6 m per km.
- The Winisk River Lowland Ecodistrict ranges in elevation from about 150 masl along its southern margin to about 30 masl near the coastal lowland to the north. Permafrost is widespread and is generally associated with bog peatlands. The Nelson, Hayes and Gods rivers are the primary drainage ways that traverse the ecodistrict, but most of it is drained by the many creeks and small rivers flowing through and originating in the ecodistrict.

5.3 Geology

The project's regional area lies within the Canadian Shield near the boundary between the Churchill and Superior geological provinces in which the overburden thickness is estimated to be up to 30 m over the Precambrian bedrock (Betcher and Pupp 1995). This bedrock generally consists of greywacke gneisses, granite gneisses and granites. The overburden stratigraphy reflects the last glacial retreat eastward and the resulting inundation of much of Manitoba by glacial Lake Agassiz. Some pre-glacial and silty sands are found immediately above the bedrock formation, but generally the overburden consists of a thick layer of deposited glacial material (till) overlain by post-glacial deposits in the form of alluvium (cobbles and boulders overlying sands and gravels) and Lake Agassiz silts and clays.

5.4 Soils

As reported by Smith et al. (Smith, et al. 1998), the dominant soils in the Knee Lake Ecodistrict are organic soils including Organic Cryosols which are associated with widespread permafrost in peatlands such as veneer and peat plateau bogs. The non-frozen organic soils are deep and shallow Fibrisols and Mesisols, which are associated with veneer bogs (shallow), and flat bogs and patterned fens (deep). Woody, forest peat and sedge peat are the primary sources of the organic materials.

Within the Knee Lake Ecodistrict, appreciable areas of mineral soils ranging from imperfectly drained Eluviated Eutric Brunisols on loamy to sandy calcareous till and sandy to gravelly fluvioglacial deposits, occur (Smith, et al. 1998). Areas of Gray Luvisols can be found on well to imperfectly drained clayey deposits. Soil profiles on clayey sediments often exhibit uneven horizon development, while the surface shows a pattern of low relic earth hummock, attributes that are indicative of the effect of past and present permafrost conditions on soil development.

The dominant soils in the Winisk River Lowland Ecodistrict are Organic Cryosols and deep Mesisols and Fibrisols overlying clayey and silty glaciolacustrine and marine sediments (Smith, et al. 1998). The Organic Cryosols are found on peat plateau bogs and are comprised mainly of fibric sphagnum peat overlying mesic fen and forest peat. The Mesisolic and Fibrisolic Organic soils are associated with horizontal fens and northern ribbed fens and string bogs. Local areas of mineral soils are dominantly well to imperfectly drained Eluviated Eutric Brunisols which are commonly found on raised marine beaches and fluvioglacial deposits.

Severe climatic conditions, poor natural drainage and slow heat conductance of organic soils, and the lack of rooting depth to dense subsoils, permafrost, and excessive stoniness, preclude use of the Knee Lake and Winisk River Lowland ecodistricts for arable agriculture and forestry.

5.5 Historical and cultural setting

Based on engagement on this project and past transmission line projects, Manitoba Hydro understands that it is important to acknowledge and recognize the history and cultural importance of the land and people connected to the land in order to develop an understanding of the geographic context of the project and determine present-day conditions. The intent of this section is to support understanding of the historical and cultural setting of the project.

5.5.1 Indigenous lands

The project is proposed on lands that have been occupied and cared for by Indigenous people for generations.

Manitoba Hydro acknowledges that the Radisson to Henday transmission line is located on Treaty Five territory and on the traditional territories of the Cree peoples and the Red River Métis. We acknowledge the longstanding cultural and spiritual connections with the land and water throughout the territory and acknowledge the impacts of our projects and operations. The legacy of the past remains a strong influence on our relationships with Indigenous communities today. We are committed to having meaningful and mutually beneficial relationships, and to honour agreement commitments arising from Manitoba Hydro projects and operations. Let us reaffirm our relationship with one another. This is important as we move forward together in a spirit of truth and reconciliation.

Tataskweyak Cree Nation and War Lake First Nation's Keeyask Environmental Evaluation Report (2012) shares that: "Prior to first contact with Europeans our homeland ecosystem provided food, shelter, clothing and medicine. For the most part, tools were derived from local materials, and exports and imports of materials were limited. Mother Earth provided waterways so we could travel in all seasons. The geographical structure of our homeland ecosystem was the same for thousands of years. The rivers, lakes, wetlands, eskers and moraines, hills and valleys determined where uncounted generations of our ancestors and other beings could live. The waterways remained essentially unchanged as travel routes and sources for food. The resulting physical, emotional, historical and spiritual relationships were at the heart of our ancestors' cultural identity. Our ecosystem was able to sustain our ancestors because our vital relationships were intact. As a result, the state of harmony and balance in our homeland ecosystem was mostly unchanged from the time of its inception." (Cree Nation Partners 2012)

Treaty Land Entitlements (TLE) agreements, negotiated between certain First Nations and the federal government, aim to fulfill outstanding land-related treaty obligations. Engaged First Nations that have active TLE agreements and outstanding TLE entitlements include Fox Lake Cree Nation, War Lake First Nation, and York Factory First Nation (Government of Canada 2017). During the routing process, Manitoba Hydro reviews TLE selections and Additions to Reserve selections through mapping provided by the Province of Manitoba. Any TLE selections within the project area are identified as areas of least preference during the transmission line routing process. No part of the right-of-way crosses reserve lands, any TLE selections, or Additions to Reserve selections.

5.5.2 Disruptions to traditional lands and cultural activities over time

Manitoba Hydro understands that past developments, activities, and policies that have affected and shaped the experiences of Indigenous peoples in northern Manitoba shape perspectives about new hydroelectric development projects today. Further, Manitoba Hydro understands that truth-telling about our colonial histories is an initial step to support reconciliation.

This section includes an overview of events that have caused change or disruption to First Nation and Métis experiences and connections to the land in the project region over time. This section is intended to help readers better understand the project setting and effects that may result from this project through understanding history of the area.

Figure 5-3 provides a non-exhaustive summary of major events or periods of change to the project area, which have ultimately affected the landscape and the relationships Indigenous peoples have with land in the project area.

While many of the events and activities described in Figure 5-3 have been immensely harmful to and impactful to First Nations peoples, Métis citizens, and their traditional lands, it is important to note that the land upon which the project is proposed is not singularly defined by the inflicted damage. Indigenous peoples' resilience in the face of change persists and continues to grow with a renewal and resurgence of Indigenous identity, self-determination, and sovereignty. Globally and within Canada there are increasing efforts to protect Indigenous rights (UNDRIP, calls for reconciliation nationally, and renewed interest in protecting language, culture, and constitutionally protected rights).

Even though the physical landscape has changed over time, First Nations people and Red River Métis citizens continue to practice traditional and cultural activities in the regional assessment area. Contemporary land use by First Nations people and Métis citizens within the project area is described in Chapters 9.0 (Harvesting and recreation) and 10 (Important sites).

5.5.2.1 Summary of regional cumulative effects assessment

Over the last 70 years, hydroelectric development in northern Manitoba has physically and culturally shaped the landscape and relationships between Indigenous peoples and the land.

As part of the Clean Environment Commission review of the Bipole III transmission project (2013), the Commission recommended that the Government of Manitoba and Manitoba Hydro jointly undertake a regional cumulative effects assessment of existing hydroelectric developments in the Nelson River sub-watershed up to and including Bipole III. The regional cumulative effects assessment documents the development of hydroelectricity generation in northern Manitoba, beginning with a station that powered a mine site in Thompson. Hydroelectric development in northern Manitoba now includes several generating stations, converter stations and transmission lines, which together provide over 70% of the electricity produced in the province.

Manitoba Hydro's system in the north has had profound impacts to the waterways and ways of life of First Nations that have been stewards of the lands for generations. Beginning with the Kelsey Generating Station on the Nelson River in the late 1950s, the generating stations and control structures along the Churchill, Nelson and Burntwood Rivers have impacted aquatic and shoreline environments, fish community, shoreline wildlife, and have had direct effects on resource harvesting. In addition to impacts to aquatic and shoreline environments, the legacy of hydroelectric operations has also influenced terrestrial environments and wildlife (e.g., waterfowl, beaver, moose, caribou, and polar bear), as well as impacts to individuals, communities and nations. Hydroelectric development has impacted navigation, transportation, and public safety, influenced land and resource use, often led to the relocation of homes and communities, resulted in adverse interactions between community members and non-local workforces, and adversely impacted health and well-being. Culture and ways of life for Indigenous peoples were fundamentally altered by developments in the project region, and the impacts of previous developments are still experienced by individuals and communities today.

Although the regional cumulative effects assessment is focused on the impacts from hydroelectric development, the assessment notes that it is not always possible to separate the impacts of other developments, events, and policies from hydroelectric development. For example, communities in the region have been affected by non-hydro development activities such as commercial and domestic resource use, industrial development (i.e., mining and forestry) and the development of infrastructure such as roads, railways, and airstrips. Colonial government policies and programs such as the residential school system, the welfare system and the Registered Trapline System mentioned in Figure 5-3, have had substantive impacts on the communities, families, and individuals in the project area.

The regional cumulative effects assessment discussed the concept of wellness "as a multidimensional, holistic, and active process to achieve balance and one's full potential" (Government of Manitoba and Manitoba Hydro 2015). Central to the discussion of wellness is the Cree concept of *mino pimatsiwin*, which translates to 'living the good life' and is achieved through cultivating relationships with other beings rooted in respect, caring, honesty, faith and sharing (Government of Manitoba and Manitoba Hydro 2015).

5.5.2.2 Feedback received through engagement about the project setting

During engagement on the project, Tataskweyak Cree Nation shared that community member views about Manitoba Hydro are informed and still influenced by the history and harm that has resulted from Manitoba Hydro development, which has led to serious distrust with what Manitoba Hydro shares. Similarly, Fox Lake Cree Nation members shared that participation in engagement about the project may also be affected by de-sensitization to hydroelectric projects due to the extent of hydroelectric development in the area. Fox Lake Cree Nation also shared that talking about new projects can be discouraging to community members who are working on rehabilitation and revegetation projects intended to offset impacts of previous developments.

Chapter 13 (Health and safety) assesses project affects on psychological safety which considers distrust of Manitoba Hydro originating from the legacy of hydroelectric development in northern Manitoba as well as ongoing challenges (e.g., water contamination, housing quality) faced by Indigenous peoples and communities that may also be affected by the project.

Figure 5-3: Timeline of events contributing to changes to the landscape and to the relationships that First Nations peoples and Métis citizens have with land in the project area

15th century

The Doctrine of Discovery is a historical legal concept original from a series of Papal Bulls (formal statements from the Pope) during the 15th and 16th centuries. It provided a legal rationale for European explorers and colonizers to claim lands they "discovered" that were not inhabited by Christians, despite Indigenous peoples having lived on these lands since time immemorial. The principles of this doctrine made its way into Canadian law in the 1880s through various legal instruments, including royal charters and proclamations. The Doctrine of Discovery supported colonization and the dispossession of sovereign Indigenous nations to British and Canadian colonial governments.

Past and ongoing colonial and assimilative strategies that have served to disconnect, relocate, and displace First Nation and Métis peoples from the land can be traced back to this early doctrine.

Pope Francis during a visit to Canada where the Vatican apologized for the Church's role in the residential school system, Maskwacis, Alberta, July 2022

1876 to present: The Indian Act

The Indian Act, first introduced in 1876, is a Canadian federal law that governs matters pertaining to Indian status, bands, and Indian reserves. A new version of the Act was passed in 1951, and since then, has been amended several times, with changes mainly focusing on the removal of discriminatory sections. It is an evolving, paradoxical document that has enabled trauma, human rights violations and social and cultural disruption for generations of First Nations peoples. The Indian Act has also enabled the government to determine the land base for nations in the form of reserves and defines who qualifies as 'Indian' in the form of Indian status. The Act outlawed traditional governance systems in favour of Band Chief and Councils with governing authority limited to Indian Reserve land. The Act also restricted First Nations peoples from voting in federal elections until 1960, continued to govern and designate First Nations land, and enfranchised those (especially women) who the government deemed to no longer have "status" (Assembly of First Nations 2021a).

17th to mid-19th centuries: The fur trade

Beginning in the 1600s and extending for 250 years, the fur trade brought significant changes to the way of life of many Indigenous peoples and communities as people adapted to new tools and a more commercially driven way of life (Canada 1996).

Hudson's Bay Company set up fur trade posts across northern Manitoba, including at Split Lake (Tataskweyak Cree Nation), York Factory, and Gillam. York Factory, also known as Kischewaskaheegan, was notably one of the first fur-trading posts established by Hudson's Bay Company, built in 1684 where the Hayes and Nelson rivers empty into Hudson Bay. York Factory also served as the headquarters for Hudson's Bay Company's Northern Department from 1810 until the 1870s (Pannekoek and Scott 2023).

The fur trade era marked the earliest contact between Europeans and First Nations peoples in the project region. With the fur trade came small-pox, measles, influenza and other communicable diseases, trade goods, a money-based economy, and other factors that were disruptive to the culture and economies of the region's First Nations peoples (Heagerty 1928). The intermingling of cultures eventually led to the emergence of a culturally distinct, diverse group of Métis people who later played a large role in the fur trade (Kloos 2016).

HBC's York Factory, 1950. Photo from Hudson Bay Company Archives (https://www.hbcheritage.ca/places/forts-posts/york-factory)

1875 to 1876 - Signing of Treaty Five (overlapping the regional assessment area)

The signing of the numbered treaties is when the formal relationship between the Crown and First Nations began, establishing a nation-to-nation relationship. Even though they are formal agreements, the parties to a treaty had different understanding of the meaning of treaties and different intentions when the treaties were negotiated. The Government of Canada has generally adopted a narrow view of treaty terms, originally considering the numbered treaties to be primarily a land conveyance agreement, intended to extinguish Indigenous title and open the region for settlement and development. The First Nation signatories to the numbered treaties, on the other hand, understood the treaties in the context of Indigenous peace and friendship treaties, which had long been used to mediate disputes and regulate external relations. From this perspective, the numbered treaties were an acknowledgement that First Nations peoples would share the land with the newcomers, and in return, would receive material support and assistance, a recognition of their primacy of occupation of the land, and an assurance that Indigenous economies and freedom of movement would not be affected (Daugherty 1983).

The interpretation and implementation of the numbered treaties remain a contested issue, but recent court decisions have supported the view that the honour of the Crown demands a liberal interpretation of the treaties.

The project area is on Treaty Five lands. This Treaty was signed in 1875-76 by the federal government, the Swampy Cree of Lake Winnipeg and the Ojibwa peoples. Treaty Five covers part of today's central and northern Manitoba, as well as parts of Saskatchewan and Ontario. The conditions of Treaty Five have had constant legal and socioeconomic effects on the signatory First Nations. The First Nations that are in the project area were added to Treaty 5 as part of the Treaty 5 adhesion between 1908 and 1910 (Filice 2016).

19th century to 1996: Residential school system

Residential schools were created by the federal government in the 1800s under the Indian Act as a tool of assimilation. Indigenous children were forcefully sent to institutions, often far from their home communities, where they would "have their hair cut, their language killed, their relationships with family and community severed, their sense of belonging destroyed, and their physical, emotional, mental and spiritual health compromised" (Assembly of First Nations, 2021c). Many of these students never returned. Residential schools were characterized by the Truth and Reconciliation Commission as a cultural genocide and "*a systematic, government- sponsored attempt to destroy Aboriginal cultures and languages and to assimilate Aboriginal peoples so that they no longer existed as distinct peoples.*"

1900 onwards: Resource development

The first major resource development in the region was a lake sturgeon commercial fishery, which was first set up on the upper Nelson River in the early 1900s (MacDonnell 1997). Lake sturgeon fisheries were the only known commercial fisheries to exist in the region prior to hydroelectric development (Government of Manitoba and Manitoba Hydro 2015). The commercial fishery of lake sturgeon continued until 1992, when it was closed to address overharvesting and depleted populations (MacDonnell 1997).

Sturgeon fishing, 1909. Credit: Library and Archives Canada/PA-060742

The emergence of a commercial fishery was followed up by mining and forestry developments in the 1920s, and the completion of the Canadian National Railway line from the Pas to Churchill, and road networks beginning in the 1950s. Although these activities had impacts on individuals and communities in the region, many companies developed social and economic relationships with communities that were based on a certain level of trust (Fox Lake Cree Nation 2012).

1908 to 1910: Métis Scrip in northern Manitoba

Beginning in 1885, as part of the *Manitoba Act*, the federal government offered Métis families 'scrip', which issued either money or land in exchange for their land title (Robinson 2019). In northern Manitoba, scrip was offered from 1908 to 1910, and some Métis people surrendered their claims to land as a result of scrip. The federal government placed restrictions on which lands Métis people could homestead, primarily only in the southern and western parts of the province, meaning some families from the north were forced to relocate hundreds of kilometres from their home communities (Filice 2016).

Métis scrip for purchase of dominion lands from 1905. Photo from Library and Archives Canada / The Canadian Encyclopedia (https://www.thecanadiancyclopedia.ca/en/article/dominion-lands-policy)

1930: Natural Resources Transfer Act

In 1930, the Natural Resources Transfer Act was passed by the federal government, transferring the jurisdiction of natural resources to the Province of Manitoba (Elias et al. 1997; Hall 2006). This provided provincial authority to exploit natural resources within the provincial boundary, including increased management over trapping, fishing, and hunting (Elias et al. 1997).

1940s: Registered Trapline System in Manitoba

In the 1940, as a new wave of settlers came into Manitoba and began to trap in areas already trapped by mostly First Nations peoples, Manitoba developed the Registered Trapline (RTL) system. As a means to counter the impact of overharvesting on the northern fur industry, the RTL system designated specific areas as "registered traplines" and allowed only one trapper exclusive use of that area. As one of the earliest wildlife management policies in Manitoba, trappers were consulted by the province and the RTL boundaries were determined by the trappers themselves (Berezanski 2004). The RTL system initially only allocated registered traplines to local non-Treaty northern residents. However, soon after the development of the RTL system the province realized that most northern trappers with Treaty individuals. The province consulted with northern Chiefs and Councils to further develop the system based on an understanding that furs held a greater significance for First Nations harvesters. The RTL process has been seen as a similar process to the Treaty making process by First Nations, where lands were set aside for the exclusive use of First Nations people.

Late 1950s to early 1960s: RCAF Station Bird

In the 1950s, the federal government unilaterally established Sector Control Station Bird, a Cold War station of the Royal Canadian Air Force (RCAF). It was one of eight posts in the Mid-Canada Radar Defence System (MCL) that spanned the country (Manitoba Historical Society 2023). The station accommodated one hundred men and consisted of a runway, buildings, storage tanks, and steel towers. The station was closed in 1964 and was abandoned without being properly decommissioned. As a result, there are the concrete structures and some roads still visible from the station. Today, the former Bird site is home, in part, to Fox Lake Cree Nation.

Aerial view of RCAF Station Bird (circa 1962). Source: Stan Summerhill

1950s to present: Hydroelectric development in the North

Due to increasing demands for electric power in Manitoba from the mid-1950s, interest grew in the hydroelectric generating capacity of the Nelson and Churchill river systems. The first major project was the Kelsey Generating Station, which was completed in 1961. In 1965, Phase 1 of the development of the Nelson River began, involving the Kettle Generating Station (1966 to 1974), Bipole I (1968 to 1971), Lake Winnipeg Regulation (1970 to 1976) and the Churchill River Diversion (1973 to 1976). Bipole I is part of the larger High Voltage Direct Current Transmission System to move power from northern Manitoba to the rest of the province, which includes the Radisson and Dorsey converter stations and Bipole I and II transmission lines. Manitoba Hydro now operates five generating stations on the Lower Nelson River: Kelsey, Kettle, Long Spruce (completed in 1979), Limestone (completed in 1992) and Keeyask (2021) (Government of Manitoba and Manitoba Hydro 2015).

Construction of Limestone Generating Station, 1987. Source: Government of Manitoba and Manitoba Hydro 2015

Hydroelectric development has caused collective trauma and profound changes to ways of life for communities in northern Manitoba, including Fox Lake Cree Nation (Fox Lake Cree Nation 2012), and Tataskweyak Cree Nation (Tataskweyak Cree Nation n.d.). In some cases, these impacts undermined the essence of Aboriginal practices and customs (Tataskweyak Cree Nation n.d.).

1977: The Northern Flood Agreement

Five First Nations affected by the ongoing hydroelectrical projects formed the Northern Flood Committee to undertake joint discussions with Manitoba Hydro and the federal and provincial governments about the effects of hydroelectric projects. The five communities represented by the Northern Flood Committee were Split Lake First Nation (now Tataskweyak Cree Nation), Nelson House First Nation (now Nisichawayasihk Cree Nation), York Factory First Nation, Norway House Cree Nation and Cross Lake First Nation. The Northern Flood Committee, funded by the federal government, negotiated the Northern Flood Agreement in 1977.

The agreement was designed to address effects on First Nations lands, pursuits, activities, and lifestyles arising from the construction and operation of the Churchill River Diversion, Lake Winnipeg Regulation and all existing and planned generating stations on the Nelson and Burntwood rivers. (Government of Manitoba and Manitoba Hydro 2015).

Signing the Northern Flood Agreement, 1977. Source: Government of Manitoba and Manitoba Hydro 2015

1982: The Constitution Act

The Constitution Act, 1982 enshrined the Charter of Rights and Freedoms into Canada's Constitution. Section 35 of the Act protects Aboriginal and Treaty rights and requires the Crown to act honourably in all its dealings with Indigenous peoples. Canadian courts, including the Supreme Court of Canada have made judgments clarifying the meaning of Section 35. One element of these judgments is the recognition that the Crown has a legal duty to consult with Aboriginal peoples about any decision or action that might adversely affect the exercise of an Aboriginal or Treaty right, before taking that action or making that decision.

The duty to consult is generally triggered in relation to decisions or actions that have the potential to adversely affect lands and resources used to exercise Aboriginal or Treaty rights such as hunting, fishing and trapping for food.

1986 to late 1990s: Comprehensive implementation agreements

To assist the signatories in the implementation of the1977 Northern Flood Agreement (NFA), implementation agreements were negotiated to reach a mutually agreed upon way to implement the NFA. Implementation agreements have been reached with four of the five NFA First Nations; Split Lake First Nation (now Tataskweyak Cree Nation) in 1992, York Factory First Nation in 1995, Nelson House First Nation (now Nisichawayasihk Cree Nation) in 1996, Norway House Cree Nation in 1997.

While each implementation agreement is unique, they all include common elements relating back to the NFA. The agreements all include compensation, trust indentures for the protection of funds, land exchange, the establishment of Resource Management Areas (RMAs) and Boards, consultation processes for any proposed future developments and environmental monitoring (Government of Manitoba and Manitoba Hydro 2015)

1988: The Environment Act

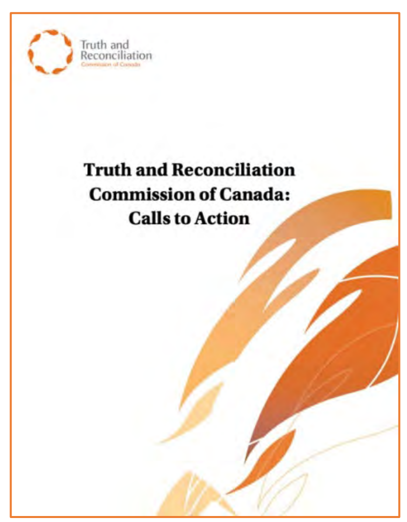
With the enactment of The Manitoba Environment Act in 1988, environmental assessment became a legislated requirement for certain types of development in Manitoba. The consideration of cumulative effects is central to environmental assessment as a tool for sustainability, particularly in areas where multiple large-scale projects operate or are planned. It is acknowledged as a best practice, but cumulative effects assessment is methodologically complex and there are challenges to its effective implementation. Manitoba's Environment Act and regulations do not include a requirement to include cumulative effects assessment at either the development or strategic level; however, it is not uncommon for proponents to address cumulative effects in their applications, such as this one.

1992: Split Lake Resource Management Board

The Split Lake Resource Management Board was established as per Article 5 of the 1992 Split Lake Implementation Agreement signed by Canada, Manitoba, the Federal Government, the Province of Manitoba, the Split Lake Cree First Nation and Manitoba Hydro. The Board includes community and government representatives and develops activities including annual planning and budgeting, resource usage monitoring, land and resources planning, wildlife and habitat assessments, and the assessment of land use and management plans proposed by external parties (Thompson 1996).

2007 – 2015: Truth and Reconciliation Commission

Between 2007 and 2015, the Truth and Reconciliation Commission provided those directly or indirectly affected by the legacy of the Indian Residential School system with an opportunity to share their stories and experiences. The Truth and Reconciliation Commission spent 6 years travelling to all parts of Canada and heard from more than 6,500 witnesses.



The Truth and Reconciliation Commission developed a guiding set of ten principles for truth and reconciliation and made 94 calls to action to advance the process of reconciliation in Canada.

2015: Regional cumulative effects assessment

As part of the Clean Environment Commission hearing for the Bipole III Transmission Project, the commission recommended that Manitoba Hydro and the Manitoba Government "conduct a Regional Cumulative Effects Assessment for all Manitoba Hydro projects and associated infrastructure in the Nelson River sub-watershed". This recommendation was based on feedback from communities expressing that hydroelectric development in Northern Manitoba had profound impacts.

The assessment retroactively assessed and described the cumulative impacts of hydroelectric development on the people, the water, and the land in the regional cumulative effects assessment region of interest (Government of Manitoba and Manitoba Hydro 2015).

2016: The Path to Reconciliation Act

In 2016, the Government of Manitoba passed The Path to Reconciliation Act, which sets out the government's commitment to advancing reconciliation that is informed by, but not limited to the Truth and Reconciliation Commission Calls to Action. The Act recognizes that reconciliation of Indigenous and non-Indigenous peoples is to be guided by the principles of respect, engagement, understanding and action.

2021: Unmarked graves

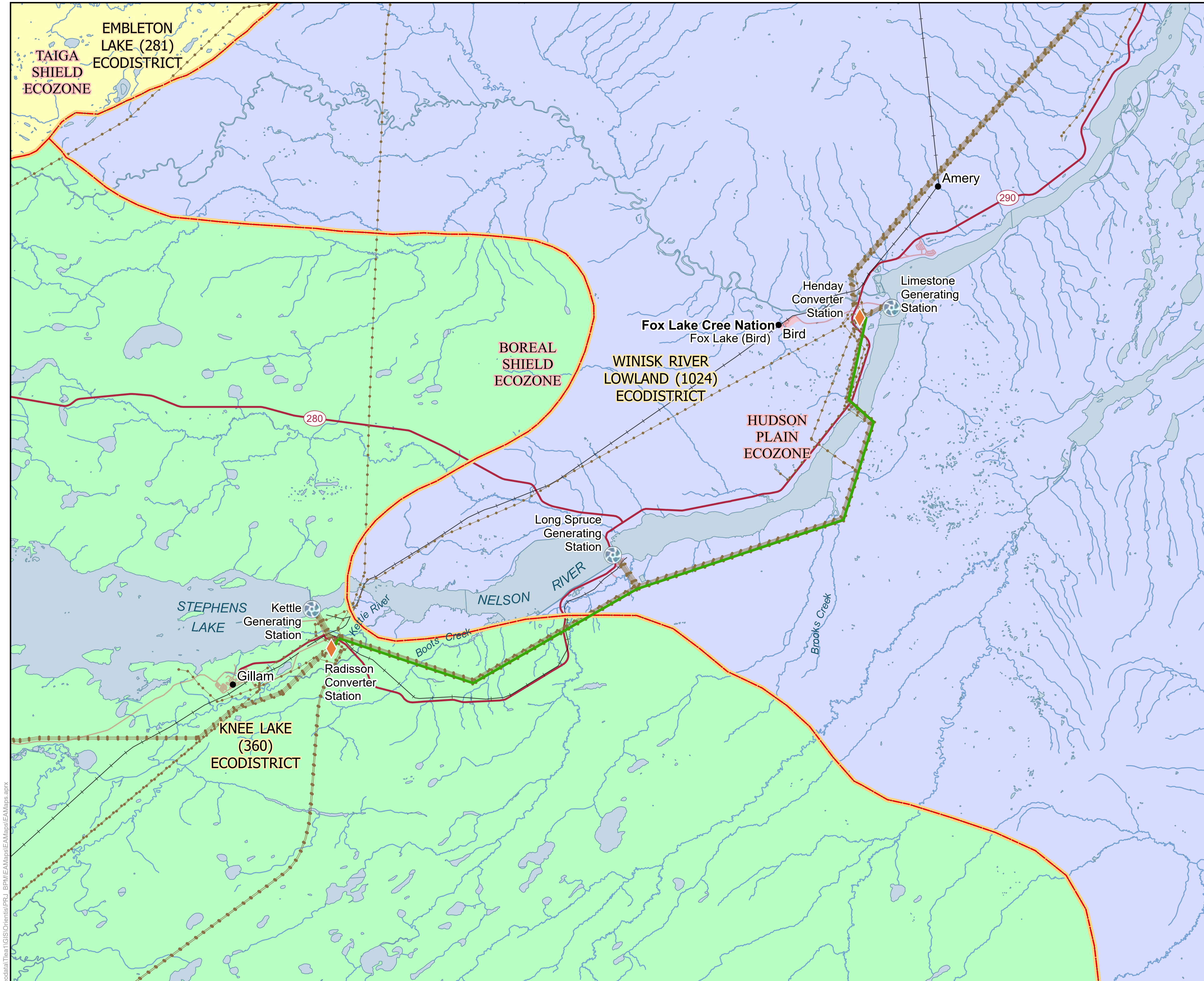
Since the Tk'emlups te Secwepemc announced in May of 2021 that the remains of as many as 215 children were found using ground-penetrating radar around the former Kamloops Indian Residential School in British Columbia, heritage concerns on Manitoba Hydro projects heard through engagement increased dramatically. Manitoba Hydro is learning new ways to better include First Nation and Red River Métis input in all aspects of understanding heritage concerns and values, including former residential schools sites and surrounding areas.

2021: UNDRIP Act

On June 21st, 2021, the United Nations Declaration on the Rights of Indigenous Peoples Act received Royal Assent and came into force. This Act provides a roadmap for the Government of Canada and Indigenous peoples to work together to implement United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) based on lasting reconciliation, healing, and cooperative relations. Through 24 preambular provisions and 46 articles, UNDRIP affirms and sets out a broad range of collective and individual rights that constitute the minimum standards to protect the rights of Indigenous peoples and to contribute to their survival, dignity and well-being. Article 32 (2) of UNDRIP provides that "states shall consult and cooperate in good faith with the Indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources."

2021: MMF-Canada Agreement

On July 6, 2021 the Manitoba Métis Federation (MMF) signed the Manitoba Métis Self-Government Recognition and Implementation Agreement with Canada at Upper Fort Garry. The agreement provided immediate recognition of the MMF as the democratically elected Métis Government for the Red River Métis. Prior to this agreement, Métis citizens had been displaced across their homelands since the passing of the Manitoba Act established the Province of Manitoba in 1870.



Manitoba Hydro

R44H Transmission Line

Project Infrastructure
- Final Preferred Route

Ecoregions and Ecodistricts
- Hayes River Upland
- Hudson Bay Lowland
- Selwyn Lake Upland
- Ecodistrict
- Ecozone

Existing Infrastructure
- Converter Station
- Generating Station
- Existing ≥69kV Transmission Line

Landbase
- Community
- Railway
- Provincial Highway
- Provincial Road
- Local Road
- First Nation Lands

Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023

N

0 1 2 3 4 5 6 Kilometres
0 0.5 1 2 3 4 Miles

1:200,000

Ecozones, Ecoregions, and Ecodistricts

Draft: For Discussion Purposes Only

Map 5-1

6.0 Vegetation

Vegetation refers to the characteristics of an area's plant cover. Vegetation provides ecological, aesthetic, recreational, and economic value, supports wildlife, and is important to traditional and cultural practices of Indigenous nations. With these important functions in mind, vegetation was selected as a valued component (VC) because there is potential for project activities to interact with and affect vegetation. Potential effects to vegetation were also raised as areas of concern and interest during project engagement.

This chapter assesses the potential effects and cumulative effects of project construction, operation, and decommissioning activities on vegetation in accordance with requirements described in the provincial guidance document related to Environment Act proposals.

6.1 Scope of the assessment

This chapter assesses the effects of project activities during construction, operation and decommissioning on vegetation from project activities. An assessment of cumulative effects on vegetation is also presented. This section assesses potential project effects on both upland and wetland vegetation.

To assess potential effects on vegetation, field surveys were undertaken on both developed and undeveloped areas along the proposed project right-of-way. This assessment was also informed by engagement feedback and Manitoba Hydro's experience with the regional cumulative effects assessment (Manitoba Hydro 2016), and other recent transmission line projects in northern Manitoba (e.g., the Bipole III Transmission Project (2011) and the Keeyask Transmission Project (2012)). The assessment considers the following:

- Technical reports from the vegetation monitoring surveys undertaken in 2022 and 2023 by Szwaluk Environmental Consulting to inform the Radisson to Henday transmission project (Appendix B)
- Desktop review of provincial and federal databases, including the forest resource inventory and land cover classification databases
- Feedback heard through project engagement (Chapter .0)
- Bipole III Transmission Project (2011) environmental impact statement and monitoring reports
- Keeyask Transmission Project (2012) environmental assessment and monitoring reports
- Regional Cumulative Effects Assessment (2015) reports

6.1.1 The project

The scope of the project consists of the construction, operation, and decommissioning of a new and approximately 42-km long, 230-kV transmission line that would terminate at the Radisson and Henday converter stations, within an existing transmission line corridor.

A new transformer associated with the project would be added at Radisson converter station. There will not be footprint expansions at either converter station as modifications will be done within existing station properties.

6.1.2 Regulatory and policy setting

Effects to vegetation are provincially and federally regulated. The following laws, and associated regulations, policies, and guidelines, as well as Manitoba Hydro's policies were considered for assessing project effects to vegetation.

6.1.2.1 Species at Risk Act (Canada)

The federal *Species at Risk Act* (2002) protects species at risk and their critical habitat in Canada. The purpose of the *Species at Risk Act* (SARA) is to prevent the extinction or extirpation of species, provide for the recovery of endangered or threatened species, and prevent other species from becoming at risk through proper management.

Under SARA, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the status of species at risk.[1] COSEWIC designates species at risk by listing them under Schedule 1 of SARA under the following classifications:

- Extirpated – a species that no longer exists in the wild in Canada, but exists elsewhere in the wild

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1 Under SARA and in relation to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), wildlife species include both animal and plant species, defining wildlife species as "a species, subspecies, variety or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and (a) is native to Canada; or (b) has extended its range into Canada without human intervention and has been present in Canada for at least 50 years (Government of Canada 2002).

- Endangered – a species that is facing imminent extirpation or extinction
- Threatened – a species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction
- Special concern - a species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats (Government of Canada 2021)

6.1.2.2 The Endangered Species and Ecosystems Act (Manitoba)

Provincially, at risk plant and animal species native to Manitoba are designated as endangered, threatened, extirpated (no longer present in Manitoba), or special concern and protected under *The Endangered Species and Ecosystems Act* (2018) and its regulations (Province of Manitoba n.d.).

The purposes of *The Endangered Species and Ecosystems Act* (ESEA) are:

- to ensure the protection and to enhance the survival of endangered and threatened species in the province
- to enable the reintroduction of extirpated species into the province
- to designate species as 'Endangered', 'Threatened', 'Extinct' or 'Extirpated' or 'Special Concern' at the provincial level

Activities that would kill, disturb, or interfere with any listed species, or damage, destroy, or remove habitat and natural resources on which a listed species depends, are prohibited by Manitoba's *The Endangered Species and Ecosystems Act*.

In 2013, an amendment to the act enabled the designation of, and protections for, at risk ecosystems. Two ecosystems, alvars and native grass prairie, are currently designated as endangered (Province of Manitoba 2023). Neither of these endangered ecosystem types intersect the project area.

6.1.2.3 The Noxious Weeds Act (Manitoba)

Non-native invasive plants are regulated under *The Noxious Weeds Act*, which categorizes noxious weed species into three tiers as follows:

- Tier 1: Species considered to have the most potential for negative effects though they may not yet be present in Manitoba
- Tier 2: Species already established in Manitoba and observed to spread easily
- Tier 3: All other designated species

Tier 1 species must be destroyed or eradicated immediately upon discovery. For Tier 2 species, infestations under five acres must be eradicated, while infestations larger than five acres must be controlled and kept from spreading. Tier 3 species do not require immediate control unless the spread of the occurrence poses a threat to the economy, environment, or the well-being of residents.

6.1.2.4 The Water Rights Act (Manitoba)

The provincial *The Water Rights Act* and its regulations, regulate the alteration and drainage of water in waterbodies, including wetlands, and alteration of wetland condition and wetland extent. The Act and *The Water Rights Regulation* distinguishes between five classes of wetlands and includes requirements for proponents to offset for proposed loss of wetland benefits in Class 3 wetlands (seasonal wetlands). Water rights licences are only issued for projects proposing to impact Class 4 (semi-permanent) and Class 5 (permanent) under exceptional circumstances in which case offset compensation is also required.

6.1.2.5 Federal Policy on Wetland Conservation

The purpose of Canada's Federal Policy on Wetland Conservation (Lynch-Stewart, et al. 1996) is to conserve wetlands to sustain ecological and socio-economic functions. Conservation and sustainment of wetland functions is targeted through enhancement and rehabilitation, securement, maintenance, and utilization. The federal Policy on Wetland Conservation applies to wetlands on federal lands and waters, for projects that receive federal funding, and when permits under other federal regulations are required for effects to environmental resources dependent on wetlands (e.g., disturbance of nests, disturbance of fish).

6.1.2.6 Other legislation

Other pieces of legislation that may be relevant to the project's interactions with vegetation include:

- *The Forest Health Protection Act* (Manitoba) as it relates to forest threats including insects, diseases, and organisms, and invasive forest threats
- *The Environment Act* (Manitoba) as it relates to the requirement for a pesticide use permit prior to implementation of a herbicide program for vegetation management
- *The Forest Act* (Manitoba)
- *The Wildfires Act* (Manitoba)
- *The Ecological Reserves Act (Manitoba)*

6.1.3 Consideration of feedback from project engagement

Project engagement (Chapter .0) actively sought to provide opportunities to provide vegetation related feedback about the project.

Feedback raised during project engagement primarily related to a preference to minimize clearing existing forested areas to the extent possible, including the use of pre-disturbed areas for staging areas, tower assembly, and storage.

Concerns were also shared about potential direct effects to traditional plants and indirect effects that vegetation disturbance may have on wildlife populations, trapping, and harvesting activities. Concerns were also shared about the use of herbicides, including an interest in understanding how the use of herbicides has evolved since hydroelectric development first occurred in the project area and whether there may be long-term effects resulting from chemicals that have absorbed into the land through past herbicide use.

Mitigation recommendations shared by Fox Lake Cree Nation included revegetation of cleared areas and transplanting shrubs and berries.

Through experience engaging on past transmission line projects, Manitoba Hydro understands that general concerns related to the potential effects of transmission lines on vegetation include concerns about disrupting existing intact forested areas, development through wetlands, disruption of plants used for traditional purposes, the spread of invasive plants, and the use of herbicides.

6.1.4 Potential effects, pathways, and measurable parameters

To consider how the project may affect vegetation, the following potential effects were identified for assessment:

- Change in landscape intactness
- Change in vegetation community diversity
- Change in vegetation species diversity, including changes to priority plant species (species of conservation concern and traditional use plants)

The potential project effects on vegetation, along with effects pathways and measurable parameters used to assess potential effects on vegetation are outlined in Table 6-1.

Table 6-1: Potential effects, effects pathways, and measurable parameters for vegetation

Potential Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in landscape intactness	Direct loss or fragmentation of intact areas of native vegetation from vegetation clearing and ground disturbance	Qualitative assessment of loss of intact areas of native vegetation Density of linear features
Change in vegetation community diversity	Direct loss or alteration of native upland and wetland vegetation communities arising from vegetation clearing, ground disturbance, and vegetation maintenance activities Indirect alteration of upland and wetland native vegetation communities from the introduction or establishment of regulated weeds, non-native invasive species, or plant diseases and pests	Area (ha) and spatial distribution of native vegetation community types lost or altered Qualitative assessment of potential for regulated weeds or non-native invasive species introduction and spread in upland vegetation communities Qualitative assessment of altered wetland hydrology and or wetland water quality (i.e., wetland benefit)
Change in vegetation species diversity	Direct loss or alteration of plant species of conservation concern and traditional use plants from vegetation clearing, ground disturbance, and vegetation maintenance Indirect loss of plant species of conservation concern and traditional use plants from the introduction or establishment of regulated weeds and non-native invasive species	Number, abundance, and spatial distribution of species of conservation concern and traditional use plants Area (ha) of species at risk critical habitat loss or altered Qualitative assessment of potential for regulated weeds and non-native invasive species to alter the abundance and spatial distribution of species of conservation concern and traditional use plants

6.1.5 Spatial boundaries

Three spatial boundaries are used to assess residual and cumulative environmental effects of the project on vegetation:

Project development area (PDA): the project footprint and anticipated area of physical disturbance during construction, operation, and decommissioning of the project. The PDA is described in detail in Chapter 2.0 (Project description).

Local assessment area (LAA): includes all components of the PDA plus a 1 km buffer around the PDA, which is used to evaluate measurable effects on vegetation. The total area of the LAA is 8,938 hectares (ha).

Regional assessment area (RAA): includes the PDA and LAA and consists of a 15 km buffer around the PDA. This area is where there is the potential for cumulative and socio-economic effects, and that will be relevant to the assessment of any wider-spread effects of the project. The total area of the RAA is 192,442 ha.

The LAA and RAA used for the assessment of project effects on vegetation are consistent with the LAA and RAA boundaries being used to assess effects on wildlife and wildlife habitat and harvesting and recreation. The LAA and RAA boundaries are also consistent with those that have been used to assess effects on vegetation on other recent transmission line projects in Manitoba.

Map 6-1 illustrates the spatial boundaries for the assessment of project effects on vegetation.

6.1.6 Temporal boundaries

The primary temporal boundaries for the assessment of project effects on vegetation are based on the timing and duration of project activities as follows:

- Construction – Anticipated to start in December 2024 and be completed by July 2026. Station work to occur year-round, transmission line construction to occur under frozen conditions.
- Operations and maintenance – for the life of the project, estimated to be a 75-year design life.
- Decommissioning – estimated to be two years once the project has reached the end of its serviceable life.

6.1.7 Residual effects characterization

Table 6-2 provides the definitions used to characterize the residual effects on vegetation.

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Positive –** a residual effect that moves measurable parameters in a direction beneficial to vegetation relative to baseline. **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to vegetation relative to baseline. **Neutral –** no net change in measurable parameters for vegetation relative to baseline.
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**No Measurable Change –** no measurable change in the effect is predicted. **Low** – a measurable change in native plant communities is predicted but is unlikely to affect sustainability in the LAA and there are no predicted effects on listed species **Moderate –** a measurable change affecting the sustainability of native plant communities, plant species of conservation concern, or traditional plants in the LAA is predicted but is unlikely to affect sustainability in the RAA **High –** a measurable change affecting the sustainability of native plant communities, plant species of conservation concern, or traditional plants in the RAA is predicted
Geographic Extent	The geographic area in which a residual effect occurs	**PDA –** residual effects are restricted to the PDA **LAA –** residual effects extend into the LAA

Table 6-2: Characterization of residual effects on vegetation

Table 6-2: Characterization of residual effects on vegetation

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
		RAA – residual effects extend into the RAA
Duration	The time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Short-term –** the residual effect is restricted to the construction phase **Medium-term –** the residual effect extends through to completion of post-construction reclamation **Long-term -** the residual effect extends for the life of the project
Frequency	Identifies how often the residual effect occurs and how often during the project or in a specific phase	**Single event** **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and reclamation **Irreversible –** the residual effect is unlikely to be reversed

6.1.8 Significance definition

For this assessment, adverse residual effects on vegetation are considered significant if, following the application of mitigation measures, the proposed project threatens the long-term persistence or viability of plant communities or specific plant species.

6.2 Project interactions with vegetation

Table 6-3 identifies, for each potential effect, the physical activities that might interact with vegetation and result in the identified effect.

Table 6-3: Project interactions with vegetation

Project activity	Change in landscape intactness	Change in vegetation community diversity	Change in vegetation species diversity
Transmission Line Construction			

Table 6-3: Project interactions with vegetation

Project activity	Change in landscape intactness	Change in vegetation community diversity	Change in vegetation species diversity
Vehicle and equipment use	-	✓	✓
Access development	✓	✓	✓
Right-of-way clearing	✓	✓	✓
Watercourse crossings		✓	✓
Marshalling / fly yards	✓	✓	✓
Transmission tower construction	-	✓	✓
Clean-up and demobilization	-	✓	✓
Station Modification			
Vehicle and equipment use	-	✓	✓
Marshalling / fly yard	-	✓	✓
Site preparation	-	✓	✓
Clean-up and demobilization	-	✓	✓
Transmission Line and Station Operation and Maintenance			
Vehicle and equipment use	-	✓	✓
Inspection and maintenance	-	✓	✓
Vegetation management	✓	✓	✓
Decommissioning			
Vehicle and equipment use	-	✓	✓
Removal of transformers, disassembled towers, foundations, conductors, and associated equipment	-	✓	✓
Rehabilitation	✓	✓	✓
Clean-up and demobilization	-	✓	✓

✓ = Potential interaction
– = No interaction

Project activities not expected to interact with, or cause an effect to, vegetation include mobilization and the presence of staff, the use of previously disturbed borrowing sites, the use of implosive connectors or helicopters, the installation of electrical equipment at the station, and the presence of the transmission line itself following construction. All other project activities have potential pathways of effect that may result in changes to landscape intactness, vegetation community diversity, and/or vegetation species diversity. These effects will each be assessed in Section 6.4.

6.3 Existing conditions

To gather baseline information for this assessment, vegetation monitoring field surveys took place in 2022 and 2023 to gain understanding about existing vegetation communities and botanical resources on both developed and undeveloped portions of the existing corridor in which the project will be located. For more detailed information about the field surveys that took place and their findings, refer to the technical report included in Appendix B.

Baseline information was also gathered through a detailed review of available desktop data, including published literature and vegetation databases. Information sources reviewed included:

- Terrestrial ecozones, ecoregions, and ecodistricts of Manitoba book (Smith, et al. 1998)
- Government databases that included information on provincially listed species of conservation concern (Manitoba Conservation Data Center 2023) and federally listed species at risk (Government of Canada 2021)
- Manitoba's Forest Resource Inventory (Government of Manitoba 2021)
- Reports related to previous vegetation studies overlapping the project area, in particular reports from the Bipole III Transmission Project, the Keeyask Transmission Project, and Regional Cumulative Effects Assessment.

Valuable knowledge regarding vegetation was also gained through project engagement on this project and past projects.

The existing conditions described in this section focus on:

- Ecological land classification
- Land cover classification
- Vegetation community types
- Botanical resources including species of conservation concern, traditional use plants, and non-native invasive species or noxious weeds

6.3.1 Ecological land classification

Canada has a hierarchal framework to classify ecologically distinct areas of land based on interrelationships of geology, landform, soil, water, vegetation, and human factors. The ecozone is the most generalized level of classification. Each ecozone is broken down into ecoregions and then into smaller ecodistricts. The ecodistrict is the most detailed level of ecological land classification.

The PDA is in two ecozones, two ecoregions, and two ecodistricts. Map 6-1 and Table 6-4 illustrate how the PDA, LAA, and RAA intersect the Canada land classification ecozones, ecoregions, and ecodistricts.

Most of the PDA (63.5%), LAA, and RAA are in the Hudson Plains ecozone, the Hudson Bay Lowland ecoregion, and the Winisk River Lowland ecodistrict.

The Winisk River Lowland Ecodistrict is a flat, wetland-dominated plain with widespread permafrost. Organic soils characterized as Cryosols, Mesisols and Fibrisols are the dominant soils found in this ecodistrict, occurring over glaciolacustrine and marine sediments. The Organic Cryosols are typically associated with peat plateau bogs, while Mesisols and Fibrisols are found in horizontal and ribbed fens and string bogs. Areas of dominant minerals soils, composed of well to imperfectly drained Eluviated Eutric Brunisols, are found on marine beaches and fluvioglacial deposits.

The vegetation in the Winisk River Lowland ecodistrict is characterized by the open stunted black spruce forest found on the bogs. Associated vegetation consists of Labrador tea (*Rhododendron groenlandicum*), other ericaceous shrubs, mosses and lichens found on peatlands. The fens have vegetation dominated by sedges and brown mosses with varying amounts of bog birch (*Betula pumila*), willows (*Salix* spp.), and stunted tamarack. Mineral soils support denser and taller black spruce stands with an understory of alder (*Alnus* spp.) or willow and a ground cover of ericaceous shrubs, mosses, and lichens (Smith, et al. 1998).

The remaining westerly portion of the PDA (36.5%), LAA, and RAA are within the Boreal Shield ecozone, the Hayes River Upland ecoregion, and the Knee Lake ecodistrict.

The Knee Lake Ecodistrict is an undulating to ridged morainal plain. Dominant soils in this ecodistrict are Organic Cryosols that are found in peatlands with permafrost. Non-frozen organic soils such as shallow and deep Fibrosols and Mesisols can also be found in veneer bogs, flat bogs, and patterned fens. There are also significant areas of mineral soils comprised of Eluviated Eutric Brunisols on imperfectly loamy to sandy calcarious till and sandy to gravelly fluvioglacial deposits and Gray Luvisols on well to imperfectly drained sites.

Table 6-4: Ecodistrict cover in the PDA, LAA, and RAA for vegetation

Ecoregion	Ecozone	Ecodistrict	PDA		LAA		RAA	
			Area (ha)	% cover	Area (ha)	% cover	Area (ha)	% cover
Hudson Plains	Hudson Bay Lowland	Winisk River Lowland	160.13	63.50%	5683.01	63.58%	108897.02	56.59%
Boreal Shield	Hayes River Upland	Knee Lake	92.05	36.50%	3255.18	36.42%	83545.44	43.41%
Total:			252.18	100%	8938.19	100%	192442.46	100%

The dominant tree species in the Knee Lake Ecodistrict is black spruce (*Picea mariana*) with jack pine (*Pinus banksiana*) occurring as a common component on dry sandy soils and bedrock outcrops due to frequent forest fires. In young regeneration stands jack pine is often the only, or the dominant, tree species. Jack pine may remain dominant for one full rotation on dry, sandy soils, but on finer textured soils, black spruce invades the stands early. Bedrock outcrops also favour the development of jack pine-dominated vegetation. Trembling aspen occurs throughout the ecodistrict but is only locally prominent where soil conditions are favourable. White spruce is largely confined to favourable sites in river valleys and along lakes. Because of the northern location, forest stands are generally less than medium height and often more open than stands farther south (Smith, et al. 1998). Stunted black spruce with ericaceous shrub growth and peat mosses (*Sphagnum* spp.) occupy the bog vegetation. Fens support stunted tamarack (*Larix laricina*), shrubs, sedges (*Carex* spp.) and brown mosses.

6.3.2 Land cover classification

Natural Resources Canada uses remote sensing satellite data to spatially differentiate between the land cover classifications that make up Canada's land surface (Natural Resources Canada 2020). Ten cover classes occur within the study area for vegetation, including coniferous and mixedwood forests, wetlands, and shrublands. The water class includes rivers and creeks, while the exposed land class occurs primarily on the existing transmission line right-of-way.

The distribution of land cover class types is illustrated in Map 6-2 with the area and percent cover in the PDA, LAA, and RAA shown in Table 6-5.

Table 6-5: Land cover class and type coverage for the PDA, LAA, and RAA

Land cover class and type	PDA		LAA		RAA	
	Area (ha)	% cover	Area (ha)	% cover	Area (ha)	% cover
Coniferous - Dense	13.62	5.40%	744.63	8.33%	22,394.71	11.64%
Coniferous - Open	26.28	10.42%	1,051.61	11.77%	35,074.16	18.23%
Coniferous - Sparse	41.38	16.41%	1,076.74	12.05%	28,042.26	14.57%
Exposed Land	14.29	5.67%	974.29	10.90%	4,532.24	2.36%
Mixedwood - Dense	9.40	3.73%	308.81	3.45%	4,266.44	2.22%
Shrub - Tall	25.62	10.16%	852.46	9.54%	10,747.02	5.58%
Water	7.24	2.87%	546.15	6.11%	17,979.36	9.34%
Wetland - Herb	2.29	0.91%	84.09	0.94%	6,139.22	3.19%
Wetland - Shrub	109.33	43.35%	3,060.67	34.24%	54,178.95	28.15%

Table 6-5: Land cover class and type coverage for the PDA, LAA, and RAA

Land cover class and type	PDA		LAA		RAA	
	Area (ha)	% cover	Area (ha)	% cover	Area (ha)	% cover
Wetland - Treed	2.73	1.08%	238.73	2.67%	9,081.23	4.72%
Bryoids	-	-	-	-	6.87	0.00
Total:	252.18		8,938.19		192,442.46	

The dominant land cover type throughout the assessment area for vegetation is wetland shrub, which accounts for 43 % of the PDA, 34% of the LAA, and 28% of the RAA. Wetland herb and tree cover are also small components of the land cover throughout the assessment area. The second most prevalent land cover type throughout the assessment area is sparse coniferous forest, which accounts for 16% of the PDA, 12% of the LAA, and 14.5% of the RAA.

In the PDA, which we will be the area of direct disturbance to vegetation, tall shrub vegetation makes up another 10% of the land cover with minor areas of dense mixedwood forest (3.7%) and exposed land (5.7%).

The exposed land cover class exists as sparse vegetation with a mixture of moss, lichen, and litter ground cover, where upper canopies have been previously removed for transmission line development. This class is most prevalent in the LAA (10.9%), which includes the existing transmission corridor.

Waterbodies occupy 2.9% of the PDA. The waterbody class includes a network of rivers, streams, and creeks in the study area, with the Nelson River being the major drainage system.

6.3.3 Vegetation community types

The 2022 and 2023 field work assessed a combination of sites on developed and undeveloped portions of the right-of-way. Three community types were identified based on species composition, abundance, and structure from four strata where present, i.e., trees, tall shrub canopy, herb and low shrub understory, and non-vascular ground cover.

The three broad vegetation community types in the project area are[2]:

- Forest: Black Spruce Tree / Sparse Black Spruce Sapling / Black Spruce Seedling - Labrador Tea/Feathermoss - Reindeer Lichens
- Fen: Sparse Sapling Tamarack - Bog Birch / Seedling Bog Birch -Tamarack - Herb Rich – Sedges / Non-Sphagnum Mosses
- Bog: Sparse Tamarack - Black Spruce / Sparse Sapling Tamarack - Bog Birch / Bog Birch Seedlings – Leatherleaf - Three-leaved Solomon's-seal / Sphagnum Mosses

The community types identified have the potential to provide habitat for several vegetation species, as well as wildlife species discussed in Section 7.3. Detailed descriptions of each vegetation community type in the project area are included below.

6.3.3.1 Forest

Vegetation within this community is classified as Vegetation Type 30, Black Spruce/ Labrador Tea/ Feathermoss (Zoladeski, et al. 1995). These communities are successionally mature and long-lived with abundant black spruce reproduction. Typical soils in these communities include Organics, while Gleysols, Brunisols or Luvisols may be encountered where conditions are suitable.

In undeveloped locations within the study area, black spruce (*Picea mariana*) along with occasional tamarack (*Larix laricina*) occurred at almost every site surveyed. The mean total cover of black spruce (*Picea mariana*) is sparse, divided among mature trees (14%), saplings (7%) and seedlings (5%).

Within the understory, sites have a relatively well-developed low shrub component, dominated by Labrador tea (*Rhododendron groenlandicum,* 13%). Mountain cranberry (*Vaccinium vitis-idaea*) is sparse (1.4%) but occurs in every surveyed site, while bog whortleberry (*V. uliginosum*) and small cranberry (*V. oxycoccos*) are sparse and occur in most sites.

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[2] Names of the community types are based on their structure and species dominance by stratum. Species separated by a slash (/) indicates a change in stratum, while co-dominant species are separated by a dash (-) indicating similar abundance within the stratum. Stand cover followed categories identified in The Canadian Vegetation Classification System (Strong, Oswald and Downing 1990) and included closed (>60%), open (>25-60%), and sparse (≤25%).

In the understory, seedlings of tall shrubs are absent or sparse (0.7% cover) and consist of bog birch (*Betula pumila*). Occasional and sparse (<2% cover) willows (*Salix* spp), soapberry (*Shepherdia canadensis*) or mooseberry (*Viburnum edule*) occur in eight of 19 surveyed sites. The sparse understory is herb-poor, cloudberry (*Rubus chamaemorus*) is frequent, while woodland horsetail (*Equisetum sylvaticum*), fireweed (*Chamaenerion angustifolium*) and three-leaved Solomon's seal (*Maianthemum trifolium*) are common. Sedges and grass are generally absent.

The nearly continuous non-vascular cover consists of lichens (43% cover), primarily green reindeer lichen (*Cladonia arbuscula* ssp. *mitis*) and (*C. rangiferina*), and bryophytes (34% cover). The mosses are primarily red-stemmed feathermoss (*Pleurozium schreberi*, 16%), with peat (*Sphagnum* spp, 8%) and/or other mosses occurring in most sites.

This forest group has relatively moderate woody growth in the mid- and upper-canopies. Though tall shrubs are generally absent, tree saplings (7%) dominate the mid-canopy cover. The tree canopy (17% cover in sites off the developed right-of-way) frequently consists of black spruce (10%) and tamarack (1%), while some sites also contain jack pine (*Pinus banksiana*) or paper birch (*Betula papyrifera*). At some sites, mainly sites on the developed right-of-way, there is no woody growth in the tree canopy.

Of trees aged, black spruce are the oldest, averaging 63 years, to a maximum of 101 years. In forested sites, the average height of black spruce is 11m (15 cm diameter at breast height [dbh]), with a maximum height of 18 m (dbh 27cm). Tamarack were 50 years old on average with a maximum age of 91 years. The less frequently occurring jack pine are 38 years on average. Both the jack pine and tamarack trees tend to be smaller, averaging 8 m in height, with a dbh of 16cm (jack pine) and 11 cm (tamarack). A single paper birch was measured at 38 years of age and 12 m tall (16 cm dbh).

6.3.3.2 Fen

Vegetation within this community can be classified as Horizontal Fen or Collapse Scar Fen (National Wetlands Working Group 1997). Soils in these communities are mainly Mesisols, Humisols or Organic Cryosols.

This wetland group is characterized by an abundant cover of non-sphagnum mosses. The understory is moderately well-developed, with relatively high components of herbs, sedges, and low shrubs. Herbaceous cover is diverse, most frequently occurring are swamp horsetail (*Equisetum fluviatile*), three-leaved Solomon's-seal and marsh cinquefoil (*Comarum palustre*), while bogbean (*Menyanthes trifoliata*) was abundant in half the surveyed sites.

Sedges are diverse, including mud sedge (*Carex limosa*), sparse-flowered sedge (*C. tenuiflora*), prostrate sedge (*C. chordorrhiza*), and boreal bog sedge (*C. magellanica*). Non-vascular brypohyte cover is almost continuous, predominantly non-sphagnum mosses with lichens present in only three surveyed sites (<2% cover).

Woody growth is sparse both in the understory and the upper canopies. Within the understory, low shrub cover (7%) includes the low-growing bog willow (*Salix pedicellaris*), Labrador tea and bog rosemary (*Andromeda polifolia*). Seedlings of tall growing species have very sparse cover in most sites. Tree seedlings (3% cover) are primarily tamarack and black spruce, while tall shrub seedlings (2%) include tall-growing willows (e.g., *Salix planifolia*) or bog birch.

The upper canopies of the fen sites are poorly developed. The sparse mid-canopy (5% cover) consists of tamarack saplings, bog birch and occasional black spruce saplings. The tree canopy in the undeveloped areas is sparse (4%), made up of tamarack and occasional black spruce. The oldest tree measured was a single black spruce at 86 years and 5 m tall (5.6 cm dbh). The oldest tamarack aged in the field was 83 years, while the average age for tamarack was 52 years with an average height of 7 m (9 cm dbh).

6.3.3.3 Bog

Vegetation within this community can be classified as Vegetation Type 33, Black Spruce/Sphagnum (Zoladeski, et al. 1995).

As a result of nutrient-poor and wet site conditions, processes of vegetational development are slow. Soils in these communities are organic and can be classified as Fibrisols, Mesisols or Humisols. Organic Cryosols may be encountered within the discontinuous zone of permafrost.

This bog community type is characterized by abundant cover of Sphagnum mosses with a moderately well-developed understory (33% cover), dominated by low shrubs (13%) such as bog rosemary, leather-leaf (*Chamaedaphne calyculata*) and small cranberry, herbs (11%) such as round-leaved sundew (*Drosera rotundifolia*) and three-leaved Solomon's-seal (*Maianthemum trifolium*). Sedges are very sparse (3%) with boreal bog sedge and prostrate sedge occurring frequently. Woody seedlings are also a minor understory component, including tree seedlings (<3%) of tamarack and black spruce, and tall shrub seedlings (<3%), mainly bog birch. Non-vascular cover is continuous bryophyte (95%), primarily Sphagnum (86%) and other mosses, while lichens (2%) are sparse and infrequent.

The upper woody canopies are sparsely developed. The mid canopy (5%) consists of bog birch, and saplings of tamarack, with black spruce. The tree canopy (4%) is evenly split between tamarack and black spruce. This community type contained the oldest trees measured during the field surveys. A single tamarack was aged in the field at 172 years, and on average tamarack ranged between 3.6 and 7 m tall (3.5-9 cm dbh). Black spruce were aged between 55-144 years (106 year average) with average measurements of 5.9 m tall and 3-8 cm dbh.

6.3.4 Botanical Resources

The vegetation communities in the project area support a wide range of species. In total, 171 plant taxa were observed at 43 surveyed sites along the proposed right-of-way. The observed plants were distributed among the following taxonomic groups:

- 141 angiosperms (flowering plants), accounting for 82% of all species recorded and including 40 taxa of monocotyledons (e.g., graminoids, lilies, orchids) and 101 taxa of dicotyledons (broadleaf herbs and shrubs)
- Six primitive vasculars in the horsetail (Equisetaceae), club-moss (Lycopodiaceae) and adders-tongue (Ophioglossaceae) families
- Four gymnosperms (conifers), all members of the pine (Pinaceae) family
- 20 non-vascular plants (lichens and mosses) within nine families

Vascular plants were distributed among 39 families, 35 of which are angiosperms. The sedge (*Cyperaceae*) family was the best represented with 23 plant taxa, followed by the aster (Asteraceae, 14 taxa), heath (*Ericaceae*, 13 taxa) and willow (Salicaceae, 12 taxa) families. Nine species were observed in each of the grass (*Poaceae*) and rose (*Rosaceae*) families.

The documented vegetation species included species of conservation concern, non-native invasive species or noxious weeds, and traditional use plants. Each of these important groups are discussed in detail below.

6.3.4.1 Species of conservation concern

The Manitoba Conservation Data Centre (MB CDC) assigns conservation status ranks to plant and animal species in Manitoba based on their rarity along a five-point scale (Manitoba Conservation Data Center 2023). MB CDC ranks range from S1 to S5 as defined below:

- S1: Critically imperilled – at a very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors

- S2: Imperilled – at a high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors
- S3: Vulnerable – at moderate risk of extirpation in the jurisdiction due to a restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors
- S4: Apparently secure – at a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors
- S5: Secure – at very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundant populations, or occurrences, with little to no concern from declines or threats (NaturServe Explorer 2023)

Plant species of conservation concern include all provincially (ESEA) and federally (SARA) listed species, as well as species ranked as Critically Imperilled to Vulnerable, by the Manitoba Conservation Data Centre (MB CDC) (i.e., those ranked S1 through S3). Species of conservation concern ranked S1, S2, or S3 (or any combination) by the MB CDC but not listed under the ESEA are not protected by legislation, but they are important contributors to biodiversity in Manitoba and considered rare or uncommon in the province.

According to the MB CDC, there are 24 species of conservation concern that range within the Hayes River Upland Ecoregion and 19 species of conservation concern within the Hudson Bay Lowland Ecoregion (MB CDC search dated August 8, 2023). The results of a MB CDC search of the PDA and 2 km and 5 km buffers around the PDA is presented in Table 6-6.

Table 6-6: Species of conservation concern identified by Manitoba Conservation Data Centre search within 5km of the PDA, as of August 2023

Scientific name	Common name	MB CDC rank		Within PDA	Within 2 km of PDA	Within 5 km of PDA
Askellia elegans	Elegant Hawksbeard	Critically Imperiled	S1		✓	✓
Neottia borealis	Northern Twayblade	Imperiled	S2			✓
Carex maritima	Seaside Sedge	Imperiled	S2?			✓
Carex microglochin	Few-seeded Fen Sedge	Imperiled	S2?		✓	✓

Table 6-6: Species of conservation concern identified by Manitoba Conservation Data Centre search within 5km of the PDA, as of August 2023

Scientific name	Common name	MB CDC rank		Within PDA	Within 2 km of PDA	Within 5 km of PDA
Drosera linearis	Slender-leaved Sundew	Imperiled	S2?			✓
Arabidopsis Arenicola	Arctic Rockcress	Imperiled	S2S3			✓
Astragalus americanus	American Milkvetch	Imperiled	S2S3			✓
Pedicularis parviflora	Small-flowered Lousewort	Imperiled	S2S3		✓	✓
Poa arctica	Arctic Bluegrass	Imperiled	S2S3		✓	✓
Salix arbusculoides	Shrubby Willow	Imperiled	S2S3	✓	✓	✓
Salix vestita	Rock Willow	Vulnerable	S3		✓	✓
Epilobium brachycarpum	Annual Willowherb	Unrankable	SU			✓

The MB CDC search revealed only one imperilled species, shrubby willow (*Salix arbusculoides*) reported within the PDA. Within 2km of the PDA, however, there are five species of conservation concern, including Elegant Hawksbeard (*Askellia elegans*), which is ranked as being critically imperilled by the MB CDC.

During the 2022 and 2023 field surveys, twelve species of conservation concern were observed. Three of the observed species are ranked imperilled: small-flowered lousewort (*Pedicularis parviflora*, S2S3) shrubby willow (*Salix arbusculoides*, S2S3) and floating marsh-marigold (*Caltha natans*, S2S4). The remaining nine species observed are ranked vulnerable (S3 to S3S5). Table 6-7 includes the species of conservation concern observed during these field surveys.

Table 6-7: Species of conservation concern observed during 2022 and 2023 field surveys undertaken along the proposed R44H transmission line route

Scientific name	Common name	MB CDC rank		Family
Caltha natans	Floating Marsh-marigold	Imperillled	S2S4	Ranunculaceae
Pedicularis parviflora	Small-flowered Lousewort	Imperillled	S2S3	Orobanche
Salix arbusculoides	Shrubby Willow	Imperillled	S2S3	Salicaceae

Table 6-7: Species of conservation concern observed during 2022 and 2023 field surveys undertaken along the proposed R44H transmission line route

Scientific name	Common name	MB CDC rank		Family
Antennaria microphylla	Little-leaved Pussytoes	Vulnerable	S3S5	Asteraceae
Botrychium lunaria	Common Moonwort	Vulnerable	S3S4	Ophioglossaceae
Drosera anglica	Oblong-leaved Sundew	Vulnerable	S3S4	Droseraceae
Lonicera oblongifolia	Swamp-fly-honeysuckle	Vulnerable	S3S5	Caprifoliaceae
Pedicularis labradorica	Labrador Lousewort	Vulnerable	S3S4	Orobanche
Pinguicula villosa	Hairy Butterwort	Vulnerable	S3S4	Lentibulariaceae
Rhododendron tomentosum	Dwarf Labrador-tea	Vulnerable	S3S5	Ericaceae
Rhynchospora alba	White Beakrush	Vulnerable	S3	Cyperaceae
Salix vestita	Rock Willow	Vulnerable	S3	Salicaceae

Species of conservation concern were observed from a diversity of habitats, including coniferous forested sites, wetlands, and exposed areas. Species of conservation concern were shown to be slightly more prevalent (counts and frequency) on the developed right-of-way (0.54 species and 0.69 observations per site) than on the undeveloped right-of-way (0.30 species and 0.57 observations per site).

There are currently no species at risk listed with either the *Endangered Species and Ecosystems Act* (ESEA), *Species at Risk Act* (SARA) or by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), observed during field studies.

6.3.4.2 Traditional use plants

Indigenous people have been sustainably gathering and harvesting plants from the boreal forest in Canada for thousands of years (Marles, et al. 2000). Traditional knowledge often centers around plants and their use as food and medicines, for handicrafts and technology. Communities in and around the study area have long histories of living on the land with a deep knowledge and appreciation for the plants growing in their traditional areas.

Several previous self-directed Traditional Knowledge studies completed by Fox Lake Cree Nation (Ross and Fox Lake Cree Nation 2011), Tataskweyak Cree Nation (Tataskweyak Cree Nation 2011) and the Manitoba Métis Federation (Manitoba Métis

Federation 2011) were used as the foundation for identifying traditional use plants in the project area.

During the 2022 and 2023 field surveys, at least 36 plants with traditional value based on past self-directed studies by Fox Lake Cree Nation, Tataskweyak Cree Nation, and the Manitoba Métis Federation, were recorded. Traditional use species observed included seven trees, five tall shrubs and 24 herbs and low shrubs. The most frequent species observed were:

- Trees: black spruce and tamarack
- Low shrubs: Labrador tea, bog cranberry, small cranberry, cloudberry, and bog whortleberry

Additional traditional use species observed included:

- Trees: paper birch, jack pine, white spruce (*Picea glauca*), balsam poplar (*Populus balsamifera*), and trembling aspen (*Populus tremuloides*)
- Tall shrubs: Bebb's willow (*Salix bebbiana*), highbush-cranberry (*Viburnum opulus*), and soapberry
- Low shrubs and herbs: common bearberry, alpine bearberry (*Arctous rubra*), bunchberry (*Cornus canadensis*), black crowberry (*Empetrum nigrum*), smooth wild strawberry (Fragaria virginiana), common mint, one-sided wintergreen (*Orthilia secunda*), pink pyrola (*Pyrola asarifolia*), dwarf Labrador-tea (*Rhododendron tomentosum*), wild red currant (Ribes triste), prickly rose (*Rosa acicularis*), stemless raspberry (Rubus arcticus), red raspberry (Rubus idaeus), pitcher plant (*Sarracenia purpurea*), velvet-leaf blueberry (*Vaccinium myrtilloides*), mooseberry, red osier dogwood (*Cornus sericea*), dewberry (*Rubus pubescens*), and common yarrow (*Achillea millefolium*).

Traditional use plants are found throughout all vegetation community types, with the greatest cover in forested sites.

Within forested areas, the understory has the greatest mean cover of traditional use species (24%), primarily consisting of low growing shrubs (15%; such as Labrador tea, various berries and rose), tree seedlings (5%) and herbs (3%; including cloudberry, bunchberry). Bebb's willow, soapberry, and mooseberry occur sparsely as seedlings or in the upper canopies. All canopy trees in forest sites (17% cover in uncleared sites) are considered traditional use species (generally coniferous trees, but also paper birch and poplars).

In wetland type communities, there is lower abundance of traditional use plants due in part to the lack of trees in all canopy layers and the reduced or absent cover of the low shrub Labroador tea. In fen type areas, traditional use species provide 6% cover in the understory, evenly split between low shrubs (Labrador tea, small cranberry, bog whortleberry) and tree seedlings (black spruce and tamarack). There are few forbs and no tall shrub seedlings. In bog type sites, traditional use species provide 8% cover in the understory, consisting of low shrubs (4%; Labrador tea and small cranberry), tree seedlings (<3%; black spruce and tamarack) and one herb (<2%; cloudberry).

Traditional herbs are a relatively minor component in all plant communities, accounting for <3% mean cover in the forest understory and <2% cover in the bog sites. Fen sites have slightly higher forb diversity, but traditional herbs such as stemless raspberry, pink pyrola and pitcher plant provide only 0.5% cover.

The number of traditional use species per site was similar across developed (1.5 species per site) and undeveloped (1.2 species per site) areas of the right-of-way. However, fewer observations of traditional use plant species were made in developed areas (5.2 observations per site) when compared to undeveloped areas (8.9 observations per site), where there is a higher prevalence of tall shrubs and trees with traditional uses.

6.3.4.3 Non-native, invasive species, or noxious species

Information on invasive and noxious plant species was collected by reviewing relevant legislation and sources identifying these species including *The Noxious Weeds Act* and the Invasive Species Council of Manitoba website.

Several invasive and non-native species may occur along the PDA. While uncommon in undisturbed boreal forest habitats, non-native species can be introduced along roads, rivers, and rights-of-way, often following human activities. Introduced species grow outside of their region of origin, generally thrive on disturbed sites, are often prolific seed producers, and can tolerate poor or disturbed soils (Langor, et al. 2014).

Where established, invasive, and non-native plants can impact ecosystem diversity, structure, and function. Invasive species compete with native species and can form dense patches that may spread to other areas. Displacement of native species changes ecosystem composition in ways that may make the habitat unsuitable for native species. Therefore, invasive species are risk factors for species of concern (Canadian Food Inspection Agency 2008).

Invasive and non-native plants in the boreal forest are commonly perennial herbs and grasses, particularly among the Asteraceae (composites), Fabaceae (legumes), and Poaceae (grasses) families (Langor, et al. 2014).

During vegetation surveys in 2022 and 2023, nine non-native, invasive or noxious species were observed during surveys (Appendix B). These species were mainly found along existing roadways and trails. Table 6- lists non-native, invasive, and noxious species observed.

Table 6-8: Non-native, invasive, and noxious species with status observed during 2022 and 2023 field surveys along the proposed R44H transmission line route

Species	Common Name	Status	Family
Crepis tectorum	Narrow-leaved Hawksbeard	SNA, Tier 3	Asteraceae
Leucanthemum vulgare	Oxeye Daisy	SNA, CFIA, ISCM, Tier 2	Asteraceae
Medicago sativa	Alfalfa	SNA, CFIA	Fabaceae
Melilotus albus	White Sweet Clover	SNA, CFIA	Fabaceae
Melilotus officinalis	Yellow Sweet Clover	SNA, CFIA	Fabaceae
Silene csereii	Smooth catchfly	SNA, CFIA	Caryophyllaceae
Taraxacum officinale	Common Dandelion	SNA, Tier 3	Asteraceae
Trifolium hybridum	Alsike Clover	SNA	Fabaceae
Trifolium repens	White Clover	SNA	Fabaceae

Notes:
SNA – status rank not applicable, MB CDC
CFIA – Invasive status per the Canadian Food Inspection Agency
ISCM – Invasive Species Council of Manitoba
Tier 2 and Tier 3 – *Noxious Weeds Act*

On average, the number of non-native species per site was greater in developed sites of the right-of-way (0.46 species/site) than on the undeveloped sites (0.20 species/site). However, the number of observations, was only slightly higher in developed sites (0.54 observations/site) than in undeveloped sites (0.47 observations/site).

Few invasive, non-native, and noxious species were previously recorded in the vicinity of the R44H transmission project monitoring area (Appendix B). Species recorded in previous monitoring included bladder campion (*Silene vulgaris*), common dandelion (*Taraxacum officinale*), creeping bentgrass (*Agrostis stolonifera*), and pineappleweed (*Matricaria discoidea*). Of these species, only bladder campion (Tier 2) and common dandelion (Tier 3) are listed as noxious plants.

6.4 Assessment of effects

While effects to vegetation could occur during construction, operation, and decommissioning, they are anticipated to be most pronounced during construction due to right-of-way clearing and ground disturbance, and include the following:

- Change in landscape intactness
- Change in vegetation community diversity
- Change in vegetation species diversity, including changes to priority plant species (species of conservation concern and traditional use plants)

As illustrated in the project interactions table (Table 6-3), no effects to vegetation are anticipated to result from certain project activities including mobilization and the presence of staff, the use of previously disturbed borrowing sites, the use of implosive connectors or helicopters, the installation of electrical equipment at the station, and the presence of the transmission line itself following construction.

Mobilization and the mere increased presence of staff does not impact vegetation. Helicopters will not affect vegetation because landing locations will be in existing airfields or areas already cleared for marshalling / fly yards and the right-of-way. Using borrow sites that are existing and already disturbed also negates the possibility that activities at borrow sites will affect vegetation. Implosive connectors, used for conductor splicing, result in the creation of noise which does not have an impact on vegetation. Finally, the installation of electrical equipment at the station is not anticipated to affect vegetation because the work will take place within the existing developed station footprints.

All other project activities have potential pathways of effect that may result in changes to landscape intactness, vegetation community diversity, and/or vegetation species diversity. The follow sections assess these pathways of effect, set out mitigation, and characterize residual effects.

6.4.1 Change in landscape intactness

Intactness refers to the degree to which an ecosystem has not been altered by human development and activities that remove habitat and increase fragmentation. Landscape intactness is an indicator for human effects on vegetation, wetlands, wildlife, species of conservation concern, and traditional use plants important to Indigenous nations.

The effect pathway through which the project has the potential to change landscape intactness is through the direct loss or fragmentation of intact areas of native vegetation from vegetation clearing and ground disturbance.

During project engagement, feedback was shared that locating the project within an existing highly developed corridor is preferable to creating a new corridor elsewhere through areas of native vegetation that are more intact. Manitoba Hydro was encouraged to avoid clearing intact forested areas for project activities, such as tower assembly yards and access, to the extent possible.

Although the PDA is within a corridor highly developed with other transmission line infrastructure, the intactness of native vegetation will be altered during construction. There are patches of native vegetation that will be intersected by the PDA. Vegetation will be removed to establish a clear 60 m right-of-way for the transmission line.

Clearing of forested areas will have the greatest effect on intactness. In total, (90.7 ha of forest habitat will require clearing within the PDA (Table 7-4). Construction of the project will result in a 2.8% change (252 ha) of vegetation in the LAA (Table 7-4) and a 18% increase in linear disturbance. However, no core areas greater than 200 ha will be changed by the project (Map 6).

Intact patches of native vegetation may also require clearing if new marshalling/ fly yards are required or to establish access to the PDA. Existing developed areas are being used for access and marshalling areas where possible. Clearing for these purposes is anticipated to be minor and restricted to the construction phase.

Another potential effect to native vegetation adjacent to the disturbance zone, which may cause a change in landscape intactness, is windfall, which usually occurs during the first few years after clearing due to trees being susceptible from increased exposure.

Following construction, the right-of-way will be reclaimed. However, vegetation will be maintained in a different state than prior to construction. Vegetation maintenance activities occurring throughout the operations phase will include the periodic removal of taller vegetation regrowth, including trees and taller shrubs. Therefore, maintenance of the right-of-way will sustain the effects of the project on intactness throughout operations.

During decommissioning, landscape intactness will not be adversely affected as no new vegetation clearing will be required. Conversely, effects during decommissioning are expected to be positive in relation to intactness as disturbed areas will be rehabilitated, restoring native vegetation intactness over time.

6.4.2 Change in vegetation community diversity

The effect pathways through which the project has the potential to change vegetation community diversity include:

- Direct loss or alteration of native upland and wetland vegetation communities arising from vegetation clearing, ground disturbance, and vegetation maintenance activities
- Indirect alteration of upland and wetland native vegetation communities from the introduction or establishment of regulated weeds, non-native invasive species, or plant diseases and pests

The three native vegetation community types characterized in the project area have the potential to be affected by project activities.

During construction, vegetation communities will be directly altered through clearing of the right-of-way prior to construction of the transmission line. This process will involve the removal of trees and shrubs along the PDA resulting in direct losses of vegetation, primarily to the upland forested community type. Direct loss of trees and shrubs may also result from the establishment of access and marshalling/fly yards if they cannot be confined entirely to pre-disturbed areas.

The PDA intersects approximately 91 ha of the forested community type and 114 ha of wetland bog and fen communities.

Both upland and wetland vegetation communities may be directly affected by any construction activities that may cause soil disturbance such as the use of vehicles and equipment, transmission line tower construction, watercourse crossing, and any station modification work requiring ground disturbance.

These activities can cause direct loss of plant species that are a part of each community type, altering community composition and ecology. In wetland community types, a change in composition may hinder wetland benefits. Any proposed loss of wetland benefits in Class 3 wetlands require offset under *The Water Rights Act* (Manitoba).

Construction activities may also cause indirect effects on plant community diversity through the introduction or spreading of regulated weeds and non-native invasive species, dust deposition, and edge effects.

The removal of vegetation, during right-of-way clearing, and the creation of new forest edges along a disturbance zone may result in changes to forest vegetation communities adjacent to the right-of-way.

Increased solar radiation exposure and a change in the microclimate along these edges may cause changes in plant community understory composition and structure. Species that prefer shaded and moist conditions may decrease in abundance while species that prefer dry conditions may increase. A reduction in growth or viability of certain plant species adjacent to transmission rights-of-way has been found in past studies. Edge effects can extend on average 20 m and up to 250 m in boreal forest ecosystems ((Harper, Macdonald and Burton, et al. 2005); (Harper, Macdonald and Mayerhofer, et al. 2015)).

Following construction, the right-of-way will be reclaimed or left for natural regeneration. However, activities including inspection and maintenance work, vegetation management, and the associated use of vehicle and equipment will continue to introduce pathways through which project effects on vegetation community diversity can occur through the operations phase.

Throughout operations, native vegetation communities will be maintained with a different community structure. Low vegetation will be allowed to recover, while vegetation management will involve periodic removal of regrown trees and shrubs not conducive to safe and reliable operation of the transmission line.

The composition of retained low shrubs, forbs, graminoids and non-vascular plants may be changed from their natural state due to altered light, moisture, and temperature conditions. Shade tolerant species may decrease in abundance and light tolerant species may increase. Also, ecosystem functions could be altered as there will be fewer larger trees sequestering carbon and intercepting rainfall.

The use of vehicles and equipment for inspection, maintenance, and vegetation management through operations and decommissioning will continue to introduce potential pathways for indirect effects on vegetation community diversity through the potential introduction and spread of regulated weeds and non-native invasive species.

Any increase in use of the right-of-way by recreational vehicles through operations creates a similar pathway. The developed right-of-way is anticipated to show similar results for the occurrence of non-native species and regulated weeds as those observed during the 2022 and 2023 field surveys, which found that on average the number of non-native species was greater on developed areas than on undeveloped areas, but that the number of observations of non-native species was only slightly higher in developed areas.

Post-construction vegetation monitoring between 2016 and 2019 on the Keeyask Transmission Project, southwest of the PDA, on the west side of Radisson Converter Station, found the actual effects of the transmission project on ecosystem diversity to be less than predicted in the environmental assessment (ECOSTEM Ltd. 2020).

During decommissioning, the removal of transmission infrastructure is likely to result in temporary direct loss and alteration of the re-established vegetation community types along the PDA in the vicinity of tower locations because ground disturbance will be necessary to remove the infrastructure. Rehabilitation activities may restore vegetation community diversity back towards the original pre-construction state over time, acknowledging that certain potential effects such as the introduction or spread of non-invasive plant species or regulated weeds may not be reversible if they are to occur.

6.4.3 Change in vegetation species diversity

The effect pathways through which the project has the potential to change vegetation species diversity include:

- Direct loss or alteration of plant species of conservation concern and/or traditional use plants from vegetation clearing, ground disturbance, and vegetation maintenance
- Indirect loss of plant species of conservation concern and/or traditional use plants from the introduction or establishment of regulated weeds and non-native invasive species

The project activities that may affect change in vegetation species diversity are the same as those that may affect change in vegetation community diversity as discussed in Section 6.4.2.

During construction, plant species diversity can be affected through vehicle and equipment use, right-of-way clearing, watercourse crossing, marshalling/fly yard and access development if required, transmission tower construction, any station modification work that may involve ground disturbance, and clean-up and demobilization.

Clearing the right-of-way involves removal of trees and shrubs to ground level. Other vegetation ground cover including low shrubs, forbs, and graminoids, may also be removed or damaged during ground disturbance. As such, clearing the right-of-way may result in the direct loss or alteration to the number and spatial distribution of species of conservation concern and traditional use plants present within the PDA.

Twelve species of conservation concern were observed in a diversity of habitats including coniferous forests, wetlands, and exposed areas along the PDA during the 2022 and 2023 field surveys.

Therefore, species of conservation concern are likely to be affected by development of the right-of-way. These species of conservation concern include three species that are ranked imperilled: small-flowered lousewort (*Pedicularis parviflora*, S2S3) shrubby willow (*Salix arbusculoides*, S2S3) and floating marsh-marigold (*Caltha natans*, S2S4). The remaining nine species observed are ranked vulnerable (S3 to S3S5).

Additional species of conservation concern in the surrounding LAA and RAA could experience indirect effects from construction if there is an introduction or spread of non-native invasive species that may outcompete traditional use species.

No protected species, listed under SARA or ESEA are known to be present in the PDA, LAA, or RAA.

At least 36 plant species with traditional use have been identified in the project area through past self-directed studies by Fox Lake Cree Nation, Tataskweyak Cree Nation, and the Manitoba Métis Federation, field surveys undertaken in 2022 and 2023, and database searches. Therefore, traditional use plants are likely to be affected by construction of the project.

Traditional use plants in the project area include various species of trees, tall shrubs, low shrubs, and herbs across both upland and wetland areas. Being that the greatest cover of traditional use plants has been found in forested areas in the PDA and LAA, clearing the right-of-way is likely to directly affect the abundance of tree (e.g., black spruce, tamarack) and shrub (e.g., Labrador tea) species of traditional use through their removal.

Indirectly, development of the right-of-way may affect understory species of conservation concern and traditional use that favor growth under a forested canopy due to changes in light and moisture conditions that may make less (or more) hospitable to certain species.

The community type that will experience the greatest direct loss or alteration is the forested community type, therefore species of conservation concern and traditional use plants most prevalent in forested areas are anticipated to be most affected by the project.

Other sources of potential direct loss of species of conservation concern and traditional use plants are primarily associated with ground disturbance at tower installation locations, vehicle and equipment use, and access and marshalling/fly yards if not confined entirely to pre-disturbed areas. Vehicle and equipment use may also crush species of conservation concern and traditional use plants.

Indirect loss of plant species of conservation concern and traditional use plants may occur from the introduction or establishment of regulated weeds and non-native invasive species.

Vegetation clearing, ground disturbance and alteration of environmental conditions from the removal of trees and tall shrubs will increase opportunities for weed and non-native invasive species to establish and spread in the PDA and LAA. Competition from weeds and non-native invasive species may change the abundance and distribution of plant species of conservation concern and traditional use plants with effects extending up to 1 km from the area of disturbance.

During operations, low vegetation will be allowed to recover, while regenerating trees and tall shrubs will be controlled through periodic vegetation management activities to maintain a vegetation at a height allowing for safe electrical line operation. This will sustain effects of the project on species of conservation concern and traditional use species that are dependent on forested habitat through the periodic direct removal of trees and shrubs.

The use of vehicles and equipment for inspection, maintenance, and vegetation management through operations and decommissioning will continue to introduce potential pathways for indirect effects on species diversity through the potential introduction and spread of regulated weeds and non-native invasive species. Any increase in use of the right-of-way by recreational vehicles through operations creates a similar pathway.

During operations of the project, it is anticipated that the right-of-way will show similar results for the occurrence of species of conservation concern, traditional use plants, and non-native species as the areas of the existing developed right-of-way monitored during the 2022 and 2023 field surveys, which found that:

- Species of conservation concern were slightly more prevalent (counts and frequency) on the developed right-of-way (0.54 species and 0.69 observations per site) than on the undeveloped right-of-way (0.30 species and 0.57 observations per site).
- The number of traditional use species per site was similar across developed (1.5 species per site) and undeveloped (1.2 species per site) areas of the right-of-way. However, fewer observations of traditional use plant species were made in developed areas (5.2 observations per site) when compared to undeveloped areas (8.9 observations per site), where there is a higher prevalence of tall shrubs and trees with traditional uses.
- On average, the number of non-native species per site was greater in developed sites of the right-of-way (0.46 species/site) than on the undeveloped sites (0.20 species/site). However, the number of observations, was only slightly higher in developed sites (0.54 observations/site) than in undeveloped sites (0.47 observations/site)

During operations, a positive increase may occur in berry abundance. A study following linear disturbance in a corridor used for seismic exploration of oil and gas found an increase in vegetation cover of velvety-leaved blueberry, which was a species observed in the surveyed area for this project (Dawe, Filicetti and Nielsen 2017).

The application of herbicides during vegetation management is an area of concern shared through engagement on this project and past projects. Concerns about perceived negative effects that the use of herbicide may have on the quality of traditional use plants and on other components of the environment including waters and wildlife habitat were shared by Fox Lake Cree Nation during project engagement.

Herbicides used by Manitoba Hydro on rights-of-way are formulated to target woody vegetation and broad-leafed plants while leaving grasses, such as marsh reed grass, largely unaffected.

In addition to the planned limited and infrequent use of herbicides, Manitoba Hydro has established several other herbicide application practices that will limit the potential for herbicides to enter the food chain and alter the quality of traditional foods. These include not treating environmentally sensitive sites with herbicides, such as specific sites identified through engagement or Traditional Knowledge reports as important for harvesting activities.

In addition to the restrictions and mitigation measures outlined on the product labels and the pesticide use permit, the projects operational environmental protection plan (Section .7.4.2) indicates where and when herbicides are applied.

In non-agricultural areas, Manitoba Hydro's vegetation management goal, accomplished through an integrated vegetation management plan which uses both mechanical and herbicide application to obtain this final plant community, is to establish a self-sustaining, low-growing plant community along the right-of-way. This would consist of a well-established plant community of bushes and shrubs that would out-compete tree seedlings for available light, nutrients and water and hinder the growth of trees that could threaten the security and operation of the transmission line.

The use of mechanical equipment or manual clearing for vegetation control is generally non-selective and removes the beneficial low-growing plants in addition to trees. Manitoba Hydro considers that selective herbicide application is a more effective means of controlling fast-growing trees while encouraging bushes and shrubs to re-establish in the right-of-way, than the use of mechanical equipment or manual clearing (Manitoba Clean Environment Commission 2013). Over time, developing healthy communities of bushes and shrubs, coupled with the selective use of herbicides, decreases the number of tall fast-growing trees within the right-of-way. This, in turn, decreases the need for regular application of herbicide and could increase the time between required herbicide treatments to periods of 15 years or more (Manitoba Clean Environment Commission 2013).

Post-construction vegetation monitoring between 2016 and 2019 on the Keeyask Transmission Project, southwest of the PDA on the west side of Radisson Converter Station, found the actual effects of the transmission project on priority plants, which included plants of ecological or social importance, to be low, as predicted in the environmental assessment. It was also found that the project resulted in limited introduction and spreading of non-native plants in the cleared rights-of-way (ECOSTEM Ltd. 2020).

During decommissioning, the removal of transmission infrastructure and associated vehicle and equipment use is likely to result in temporary direct loss and alteration of re-established vegetation along the PDA, particularly in the vicinity of tower locations. Rehabilitation activities may restore species diversity back towards the original pre-construction state over time, acknowledging that certain potential effects such as the introduction or spread of non-invasive plant species or regulated weeds may not be reversible if they are to occur.

6.4.4 Mitigation measures

This section describes the mitigation measures identified to minimize effects on vegetation including landscape intactness, vegetation community diversity, and vegetation species diversity.

6.4.4.1 Mitigation measures related to landscape intactness

Potential project effects on landscape intactness have been reduced by selecting a transmission line route within an existing developed corridor adjacent to existing linear features (transmission lines), avoiding areas of large intact native vegetation.

In addition to where the transmission line was routed, mitigation measures to reduce project-related changes to landscape intactness include:

- The development of an access management plan, which considers the use of existing access routes where possible to further reduce fragmentation effects from the project during construction.
- Contractors will be restricted to established roads, trails, and cleared construction areas in accordance with the access management plan.
- Necessary work permit(s) will be obtained, as required under *The Crown Lands Act* (Manitoba) and *The Wildfires Act* (Manitoba) for work on Crown land.
- Trees will be felled toward the middle of rights-of-way or cleared areas to avoid damaging standing trees.
- Grubbing will be limited within the right-of-way to reduce root damage, except at tower foundation sites and centerline trail.
- Grubbing will not be permitted within 2 m of standing timber to prevent damage to root systems and to limit the occurrence of blow down.
- Windrows of grubbed materials will be piled at least 15 m from standing timber.

- Danger trees will be flagged or marked for removal using methods that do not damage soils and adjacent vegetation.

The mitigation identified above align with recommendations shared through project engagement to prioritize use of areas that have already been disturbed, avoiding clearing new areas of intact native vegetation where possible.

6.4.4.2 Mitigation measures related to vegetation community diversity

Transmission line routing considered and avoided native vegetation communities to the degree possible. The final preferred route is adjacent to existing linear features or within existing utility corridors. Standard industry and project-specific mitigation measures will be used during construction and operation and maintenance to help avoid and manage potential effects to vegetation community diversity.

Many of the mitigation measures identified to minimize potential effects on landscape intactness are also relevant to reducing effects on vegetation community diversity. In addition, mitigation measures to reduce project-related changes to vegetation community diversity include:

- Rights-of-way will be cleared when the ground is frozen or dry to limit rutting and erosion where applicable. In situations where the ground is not dry or completely frozen, alternative methods, such as the use of construction mats, will be employed during right-of-way clearing.
- Only water and approved dust suppression products will be used to control dust on access roads, where required. Oil or petroleum products will not be used.
- Trees will not be felled into waterbodies.
- Grading will be directed away from wetlands. Stockpiled materials from grubbing will not block natural drainage patterns.
- Temporary berms, cross ditches or silt fences will be installed between wetlands and disturbed areas when deemed necessary by the environmental officer. Subsoil and topsoil material will be replaced, and pre-construction contours and drainage patterns will be re-established within wetland boundaries as soon as possible following construction.
- Environmental protection measures for working in and around wetlands will be reviewed with the contractor and employees prior to commencement of any construction activities.
- All equipment must arrive at the right-of-way or project site clean and free of soil or vegetation debris.
- Large areas identified as having invasive plant and non-native weed species occurrences prior to the start of construction will be mapped. Weed control

along access roads and trails will be conducted in accordance with the Rehabilitation and Weed Management Plan (Section .7.5.).

- Non-herbicide methods such as hand cutting, mechanical cutting or winter shearing will be used to clear the transmission line right-of-way and other sites. If herbicides are required to control vegetation growth, such as noxious/invasive weeds during construction, all applicable permits, and provincial regulations (*The Noxious Weed Act*) will be followed. Weed control along access roads and trails, at temporary construction camps, marshalling yards and borrow sites will be conducted in accordance with the Rehabilitation and Weed Management Plan.
- Disturbed areas along transmission line rights-of-way will be rehabilitated in accordance with the Rehabilitation and Invasive Species Management Plan.
- The Rehabilitation and Invasive Species Management Plan will include objectives for the restoration of natural conditions, wildlife habitat and aesthetic values, and for erosion protection, sediment control, non-native and invasive plant species management, as required.

Additional mitigation measures relevant to minimizing effects to wetland community vegetation diversity are captured in Chapter .0 (Fish and fish habitat), which includes mitigation measures identified to minimize potential effects on riparian habitat in Section 8.4.2.

6.4.4.3 Mitigation measures related to vegetation species diversity

In addition to the mitigation measures identified for reducing potential effects to landscape intactness and vegetation community diversity, mitigation measures to reduce project-related changes to vegetation species diversity include:

- Species at risk and critical habitat will be protected in accordance with provincial and federal legislation and provincial and federal guidelines. A 30 m setback distance will be applied to known species at risk.
- If listed plant species are identified and avoidance is not possible, the regulators will be contacted to determine the most appropriate mitigation action. This could include harvesting seed from the PDA, salvaging and transplanting portions of sod, collecting cuttings or transplanting whole plants.
- Environmentally sensitive sites, such as specific locations of traditional use plants identified as important harvesting locations, will be identified and mapped prior to clearing, and are outlined in the Construction Environmental Protection Plan (Section .7.4.1).
- Setbacks, buffers, and sensitive sites along the right-of-way (where applicable) will be clearly identified by signage or flagging prior to construction, and

signage or flagging will be maintained during construction to alert crews to the presence of the setback.
- If previously unidentified plant species at risk are found on the right-of-way prior to or during construction, the occurrences will be flagged for avoidance.
- Final tower siting will avoid confirmed locations of species of conservation concern and traditional use plants, where possible.

6.4.5 Characterization of residual effects

This section describes the residual project effects to vegetation predicted to remain after the application of mitigation measures. Table 6- describes the factors used to characterize the residual effects on vegetation.

6.4.5.1 Residual effects on landscape intactness

Following the implementation of mitigation measures, predicted residual effects on change in landscape intactness include the following:

- Direct loss of intact areas of native vegetation resulting from clearing and ground disturbance to construct the transmission line
- Ongoing effects to landscape intactness through operations of the project resulting from vegetation maintenance along the right-of-way for safe and reliable operation of the transmission line

Development of the PDA will increase the density of linear features (e.g., ROWs) in the LAA by 18% (from approximately 4.17km/km^2 to 5.03km/km^2).

Although the project is proposed within a developed transmission corridor, it will contribute to landscape intactness as additional area of native vegetation will be cleared and maintained in an altered state throughout operations of the project.

Following the implementation of mitigation measures, residual effects for change in landscape intactness are characterized as follows:

- Direction: adverse
- Magnitude: low
- Geographic extent: PDA; if marshalling/fly yards cannot be entirely confined to pre-developed areas, residual effects may extend to the LAA
- Duration: long-term
- Frequency: single event during construction (clearing), continuous throughout operations
- Reversibility: reversible following decommissioning and reclamation

6.4.5.2 Residual effects on vegetation community diversity

After mitigation, predicted residual effects on change in vegetation community diversity include:

- Direct loss or alteration of native upland and wetland vegetation communities in the PDA resulting from clearing to establish the transmission line right-of-way and ground disturbance related to construction activities
- Maintaining altered vegetation communities along the PDA throughout operations via vegetation management activities
- Potential spread of non-native invasive plant species causing indirect effects on the composition of native vegetation communities in the PDA and LAA

Clearing for the project will alter 90.7ha (2.8%) of forested landcover within the LAA. Forested landcover types intersected by the PDA include coniferous (dense, open, sparse) and mixedwood forests.

Wetland shrub is the most abundant landcover along the PDA (109 ha).

Neither of the two currently listed at risk ecosystems under ESEA, alvars and tall grass prairie, are present in the project area.

Indirect effects on upland native vegetation cover types from edge effects may cause changes in the upland native vegetation community structure, species composition, and function up to 250 m from the edge of the right-of-way (Harper, Macdonald and Burton, et al. 2005) (Harper, Macdonald and Mayerhofer, et al. 2015)). Regulated weeds and non-native species may cause changes in the upland native vegetation communities by out-competing native species and thus changing community structure from within 30 m of the PDA out to 1,000 m (Kembel et al. 2008; Henderson 2011; Rai and Singh 2020).

Based on a qualitative assessment of potential effects on wetland vegetation, the project is not anticipated to affect wetland benefit due to the care taken to avoid impact to wetlands and riparian habitat through the application of mitigation measures. It is not anticipated that construction will have direct effects on wetlands because construction work is anticipated to take place under frozen conditions.

Following the implementation of mitigation measures described above, residual effects for change in vegetation community diversity are characterized by the following:

- Direction: adverse
- Magnitude: low
- Geographic extent: LAA for potential edge effects

- Duration: long-term
- Frequency: single event during construction (clearing), irregular events throughout operations
- Reversibility: reversible

6.4.5.3 Residual effects on vegetation species diversity

After mitigation, predicted residual effects on change in vegetation species diversity include:

- Direct loss or alteration of plant species of conservation concern and traditional use plants from vegetation clearing, ground disturbance, and vegetation maintenance
- Maintaining the right-of-way through operations such that certain species of conservation concern and traditional use will be removed through vegetation management throughout operations
- A potential decrease in abundance of species of conservation concern and traditional use that most favour forested areas and a potential increase in species that thrive in open areas without tree canopy coverage
- Potential spread of non-native species that may outcompete species of conservation concern and traditional use in the PDA and LAA
- Perceived negative effects of herbicide application on the quality and safety of traditional us plants and on the broader environment

There are currently no species at risk listed with either the ESEA or SARA, nor were any listed species observed during field studies. As such, the project is not anticipated to effect protected species.

However, twelve species of conservation concern and at least 36 traditional use plants have been identified throughout all upland and wetland vegetation community types in the PDA. These species will be directly affected by the project.

Additional undocumented species of conservation concern and traditional use plants may also be present in the PDA. Those dependent on forested habitat will experience a loss of abundance from development of the PDA.

During vegetation surveys in 2022 and 2023, nine non-native, invasive or noxious species were observed, mainly along existing roadways and trails. The average number of non-native species per site was found to be greater in developed areas (0.46 species/site) than in undeveloped areas (0.20 species/site). The number of observations was only slightly higher in developed areas than in undeveloped areas. It is anticipated that following mitigation, this project will in newly cleared areas of right-of-way with non-native invasive species in similar abundance to that of the exiting developed portions of the transmission corridor.

Although non-native species can compete with native species, few weed species can invade mature forest and abundance is typically low (Sumners and Archibold 2007).

Following the implementation of mitigation measures described above, residual effects for change in vegetation species diversity are characterized by the following:

- Direction: adverse; known traditional use plants and species of conservation concern will experience a loss in abundance
- Magnitude: low; project effects are not predicted to affect sustainability in the LAA and there are no predicted effects on listed species
- Geographic extent: LAA for edge effects
- Duration: long-term
- Frequency: single event during construction (clearing), irregular events throughout operations
- Reversibility: reversible

6.4.5.4 Summary of residual effects on vegetation

Most effects will occur during construction due to the removal of vegetation along the ROW. Effects during construction are expected to be adverse, moderate in magnitude and infrequent except during operation. The geographic extent of effects community diversity and species diversity extends to the LAA due to the loss of upland native vegetation habitat and edge effects of regulated and non-native invasive weeds.

Table 6-9 characterizes the residual effects on vegetation.

Table 6-9: Project residual effects on vegetation

Residual Effects Characterization						
Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility
Residual effect on change in landscape intactness						
Construction	Adverse	Low	PDA/LAA	Long-term	Single event	Reversible
Operation	Adverse	Low	PDA	Long-term	Continuous	Reversible
Decommissioning	Neutral	Low	PDA	Long-term	Single event	Reversible

Residual effect on vegetation community diversity						
Construction	Adverse	Low	LAA	Long-term	Single event	Reversible
Operation	Adverse	Low	LAA	Long-term	Irregular	Reversible
Decommissioning	Adverse	Low	LAA	Long-term	Single event	Reversible
Residual effect on vegetation species diversity						
Construction	Adverse	Low	LAA	Long-term	Single event	Reversible
Operation	Adverse	Low	LAA	Long-term	Irregular	Reversible
Decommissioning	Adverse	Low	LAA	Long-term	Single event	Reversible

6.4.6 Cumulative effects on vegetation

The assessment of cumulative effects is initiated with a determination of whether two conditions exist:

- The project has residual effects on the VC
- A residual effect could interact with residual effects of other past, present, or reasonably foreseeable future physical activities.

If either condition is not met, further assessment of cumulative effects is not warranted because the project does not interact cumulatively with other projects or activities.

For vegetation, both conditions are met. The project is anticipated to have adverse residual effects on landscape intactness, vegetation community diversity, and vegetation species diversity. Each of the residual effects could interact with residual effects of other past, present, or reasonably foreseeable future physical activities.

Native vegetation has been altered from a natural state by past land use activities. The abundance of native vegetation in the RAA has been reduced over time, primarily through the development of infrastructure such as roads, rail, and electrical transmission lines and stations. These developments have increased fragmentation and changed vegetation communities and species diversity over time.

To understand the baseline of residual effects from past projects that the project's residual effects on vegetation may interact cumulatively with, the findings of the 2015 Regional Cumulative Effects Assessment (RCEA) were considered. The RCEA found that overall impacts of hydroelectric development within the Boreal Plains Ecozone were the result of clearing and physical disturbance of vegetation and soils along the transmission lines, roads, and rail corridors. Habitat loss and alteration due to transmission development was assessed as being small, dispersed throughout the area and closely followed the pre-existing transportation corridors in most cases. In the Hudson Plains Ecozone, land fragmentation was assessed as being concentrated on or near the Nelson River. The RCEA found that developments had limited effects on the land fragmentation of the overall area.

Table 6-10 presents the project and physical activities inclusion list which identifies other ongoing and reasonably foreseeable future projects and physical activities that might act cumulatively with the project on vegetation. Where residual effects from the project act cumulatively with residual effects from other projects and physical activities, a cumulative effects assessment is carried out.

Table 6-10: Potential cumulative effects on vegetation

Other Projects and physical activities with potential for cumulative environmental effects	Potential cumulative environmental effects		
	Change in landscape intactness	Change in vegetation community diversity	Change in vegetation species diversity
Existing/ongoing projects and activities			
Domestic Resource Use (hunting, trapping, fishing)	-	✓	✓
Recreational Activities (Canoeing, Snowmobiling, Hiking)	-	✓	✓
Infrastructure (i.e., provincial trunk highways, provincial roads,	✓	✓	✓
Generating and converter stations	✓	✓	✓
Transmission lines	✓	✓	✓
Vale nickel mine	✓	✓	✓
Future projects and activities			
Project 6 – All-season road linking Manto Sipi Cree Nation, Bunibonibee Cree Nation, and God's Lake First Nation	–	–	–
Kivalliq Hydro Fibre Link (A proposed 1,200 km hydroelectric transmission line initiating near Gillam and terminating in the Kivalliq Region of Nunavut.)	✓	✓	✓

Table 6-10: Potential cumulative effects on vegetation

Other Projects and physical activities with potential for cumulative environmental effects	Potential cumulative environmental effects		
	Change in landscape intactness	Change in vegetation community diversity	Change in vegetation species diversity

✓ = Other projects and physical activities whose residual effects are likely to interact cumulatively with project residual environmental effects.
– = Interactions between the residual effects of other projects and those of the project residual effects are not expected.

The assessment of the cumulative effects to vegetation likely to result from the project in combination with other projects and physical activities, including the pathways to effect and mitigations, are discussed in subsequent sections.

6.4.6.1 Pathways for cumulative effects on vegetation

Ongoing and future projects in the RAA (Table 6-) have the potential to interact cumulatively with the project if their plans include development in areas of native vegetation as these activities would contribute to changes in landscape intactness, vegetation community diversity, and potentially vegetation species diversity.

The ongoing and future activities identified as likely to interact with the residual effects of the project on vegetation have similar effects pathways as those identified for this project. Physical activities that involve clearing vegetation, ground disturbance and the use of vehicles and equipment are likely to cause residual effects resulting in the direct and indirect loss or alteration of native vegetation.

Since all projects identified, are anticipated to involve these types of physical activities (i.e., effects pathways), the project is anticipated to interact cumulatively with all projects in relation to effects to vegetation.

The nature and extent of cumulative effects will likely differ depending on the project.

In relation to landscape intactness specifically, it is not anticipated that the project will interact cumulatively with ongoing domestic resource use or recreational activities because these ongoing physical activities on their own are not assumed to involve a clearing of vegetation that would increase fragmentation.

The proposed Kivalliq Hydro Fibre Link transmission line, if developed, would likely have the most cumulative interaction with residual effects of the project and other past, ongoing, and future projects on vegetation because of the proposed size and location of the project. The proposed project would be roughly 1,200 km in length, initiate near to Gillam, and travel through relatively undeveloped landscapes, and therefore intact native vegetation communities.

6.4.6.2 Mitigation for cumulative effects on vegetation

Project mitigation measures, including equipment arriving clean and free of soil or vegetation debris, vegetation clearing during dry or frozen conditions, and reclamation of temporary disturbances will help reduce project residual effects to native vegetation. Other future projects are expected to implement similar standard mitigation measures and avoid or minimize effects to native vegetation as appropriate.

6.4.6.3 Residual cumulative effects on vegetation

Many of the ongoing projects that may interact cumulatively with residual project effects on vegetation are in or alongside previously disturbed, modified habitats rather than each intersecting new areas of intact native vegetation.

Project routing reduced potential change in landscape intactness, native upland vegetation communities, and species diversity by choosing a route in an existing transmission corridor adjacent to the cleared rights-of-way of other transmission lines.

With the implementation of mitigation measures identified for vegetation, this project, in combination with other ongoing and future projects, is predicted to have small contributions to cumulative effects on native vegetation.

6.4.7 Determination of significance

With mitigation and environmental protection measures, the residual effects on vegetation and the cumulative effects on vegetation are predicted to be not significant.

Although the project will decrease the amount of forested habitat on the landscape, the project is not anticipated to affect the long-term sustainability of any plant species, is not affecting new core areas of intact native vegetation, nor are there any known listed species located within the RAA. No native vegetation communities will be lost in the LAA because of the project. The abundance of plants of interest to Indigenous groups will also be reduced, but the plants will not be lost from the LAA as they are provincially common species.

6.4.8 Prediction confidence

Prediction confidence in the assessment of effects on vegetation name is moderate.

Vegetation types were mapped at a scale allowing identification of individual cover types with characteristic vegetation structure and composition, which were reviewed and subsequently evaluated in the field. However, the mapping did not account for the age of the land cover types (e.g., forest stands) based on fire history. The mapping also supported assessment of landscape intactness and community diversity, which informed quantification of changes in landscape intactness.

Effects conclusions for traditional use plants may be underestimated because we did not receive any current feedback through engagement about specific traditional use plants or locations of concern through engagement. Past studies were referenced to gather an understanding of traditional use plants that have been previously identified in the project area. Additionally, through engagement feedback, it is understood that there is sometimes reluctance to share specific locations of importance for concern that revealing their location may place them at an increased risk of disruption.

Other limitations with data include imperfect detection of species of conservation and traditional use plants in the field, survey timing, and seasonal changes experienced by different species. There is also uncertainty related to unsurveyed areas, where additional occurrences of species of conservation concern, traditional use plants, and non-native invasive plants may be present.

Further, the magnitude of effects to plant species diversity can be difficult to assess because certain species may be adversely affected while other species may be positively affected by altered conditions (e.g., light) resulting from the project.

However, post-construction vegetation monitoring on past transmission projects in the project area, the Keeyask Transmission Project, found that the monitored effects of the project on vegetation were aligned with or less than the predicted effects anticipated in the environmental assessment.

6.4.9 Follow-up and monitoring

Due to limited project interactions and well-established vegetation protections and mitigation measures, natural vegetation monitoring is not proposed for the project. If significant natural vegetation damage is observed, remediation efforts will be implemented, and a monitoring plan developed to address concerns at each site.

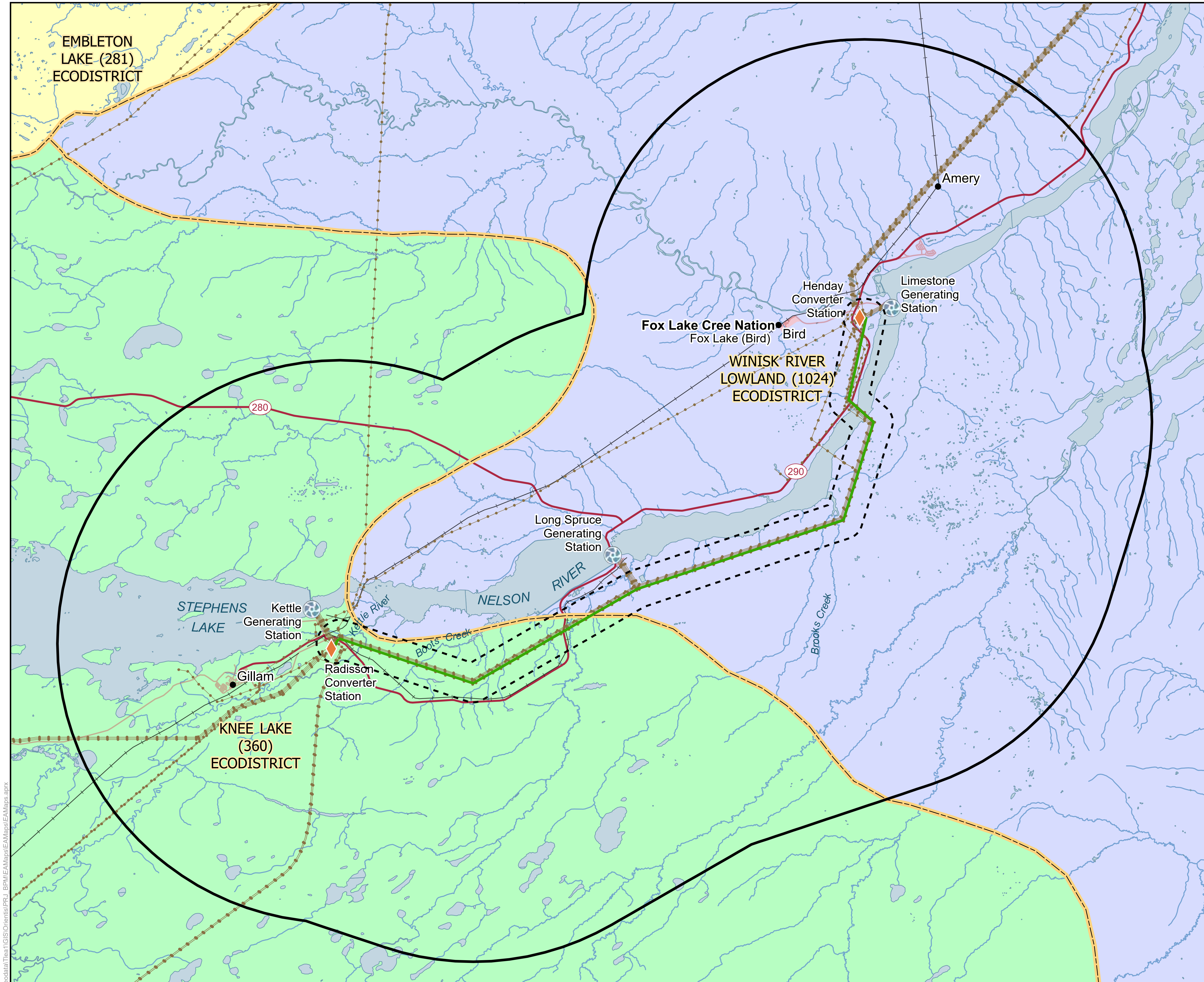
Protections for natural vegetation will be implemented as part of the environmental protection program. The environmental protection program is a framework for the implementation, management, monitoring and evaluation of protection activities in keeping with environmental effects identified in environmental assessments, regulatory requirements, and public expectation. It prescribes measures and practices to avoid and reduce adverse environmental effects on vegetation.

6.4.10 Sensitivity to future climate change scenarios

Effects of climate change on vegetation are expected to relate to the anticipated increase in temperature, changes in precipitation patterns, and associated extreme weather events (e.g., flooding), which may cause reductions in permafrost and changes to the frequency and impact of wildfires.

Fires hold an important role in shaping the ecology of boreal forests. Jack pine and black spruce have serotinous cones, which store seeds and require the heat from fires to regenerate (Weber and Stocks 1998). Although wildfires are a natural and essential component of the forest regeneration cycle, with species such as jack pine, black spruce, and paper birch and trembling aspen immediately regrowing after a forest fire, changes to the prevalence or impact of wildfires that may result from climate change has the potential to significantly alter vegetation composition and age distribution.

With the increase in flooding that may result from climate change because of melting permafrost and increased precipitation, wetland vegetation communities may experience increased pressure. Retaining and restoring wetland areas provide an efficient and effective means of resiliency to flooding, providing flood mitigation benefits that are disproportionately large in relation to their size, not only in collecting and storing water, but also reducing erosion, drought intensity, and impacts of extreme heat on water quality (Ontario Nature 2023).



Manitoba Hydro

R44H Transmission Line

Project Infrastructure
- Final Preferred Route

Ecoregions and Ecodistricts
- Hayes River Upland
- Hudson Bay Lowland
- Selwyn Lake Upland
- Ecodistrict

Assessment Area
- Vegetation LAA (PDA Buffer 1km)
- Vegetation RAA (PDA Buffer 15km)

Existing Infrastructure
- Converter Station
- Generating Station
- Existing ≥69kV Transmission Line

Landbase
- Community
- Railway
- Provincial Highway
- Provincial Road
- Local Road
- First Nation Lands

Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023

N

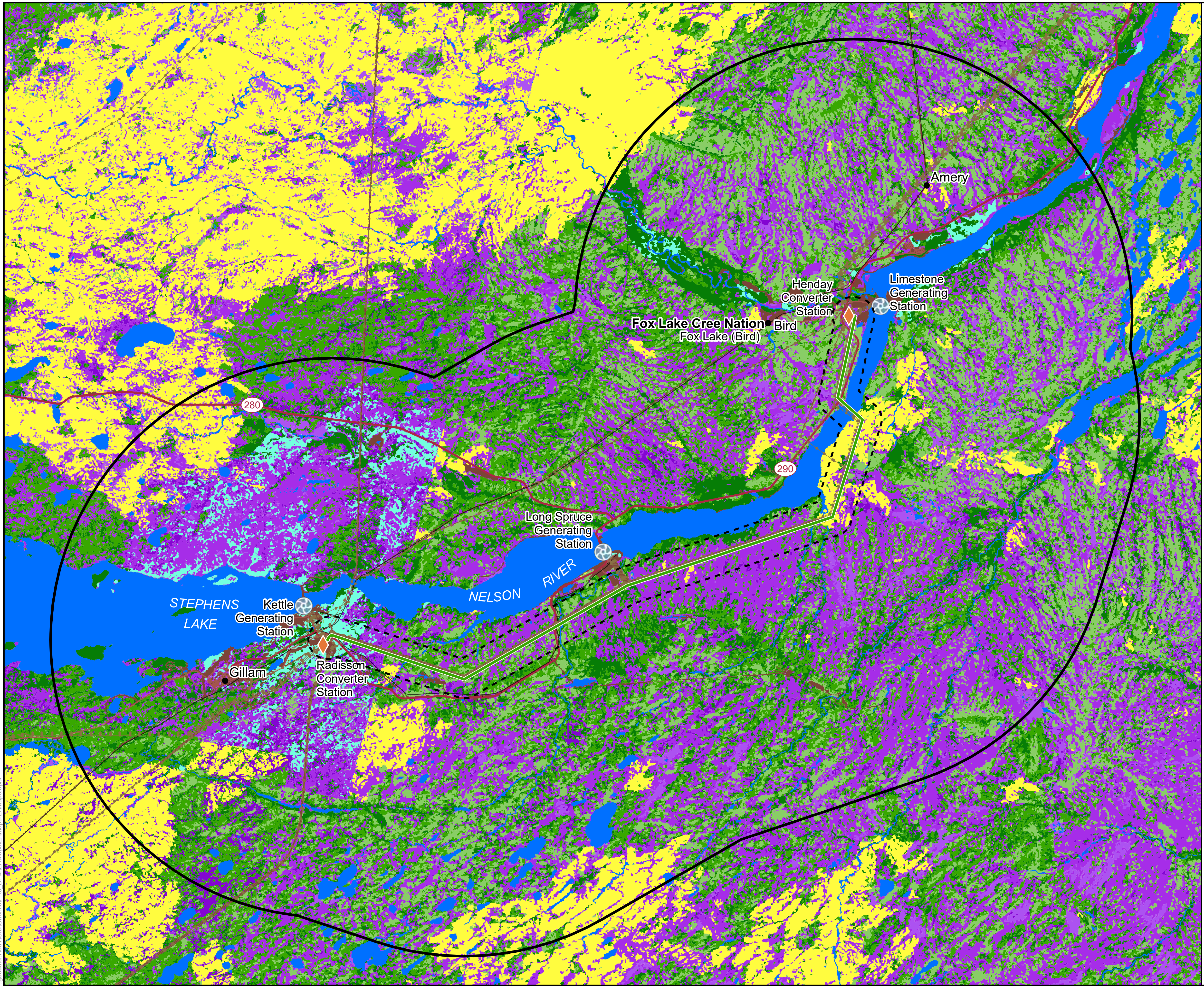
0 1 2 3 4 5 6 Kilometres
0 0.5 1 2 3 4 Miles

1:200,000

Spatial Boundaries for Vegetation

Draft: For Discussion Purposes Only

Map 6-1



R44H Transmission Line

Project Infrastructure
- Final Preferred Route

Landcover Classification
- Water
- Exposed Land
- Bryoids
- Shrub Tall
- Wetland Treed
- Wetland Shrub
- Wetland Herb
- Coniferous Dense
- Coniferous Open
- Coniferous Sparse
- Mixedwood Dense

Assessment Area
- Vegetation LAA (PDA Buffer 1km)
- Vegetation RAA (PDA Buffer 15km)

Existing Infrastructure
- Converter Station
- Generating Station
- Existing ≥69kV Transmission Line

Landbase
- Community
- Railway
- Provincial Highway
- Provincial Road
- Local Road

Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023

N

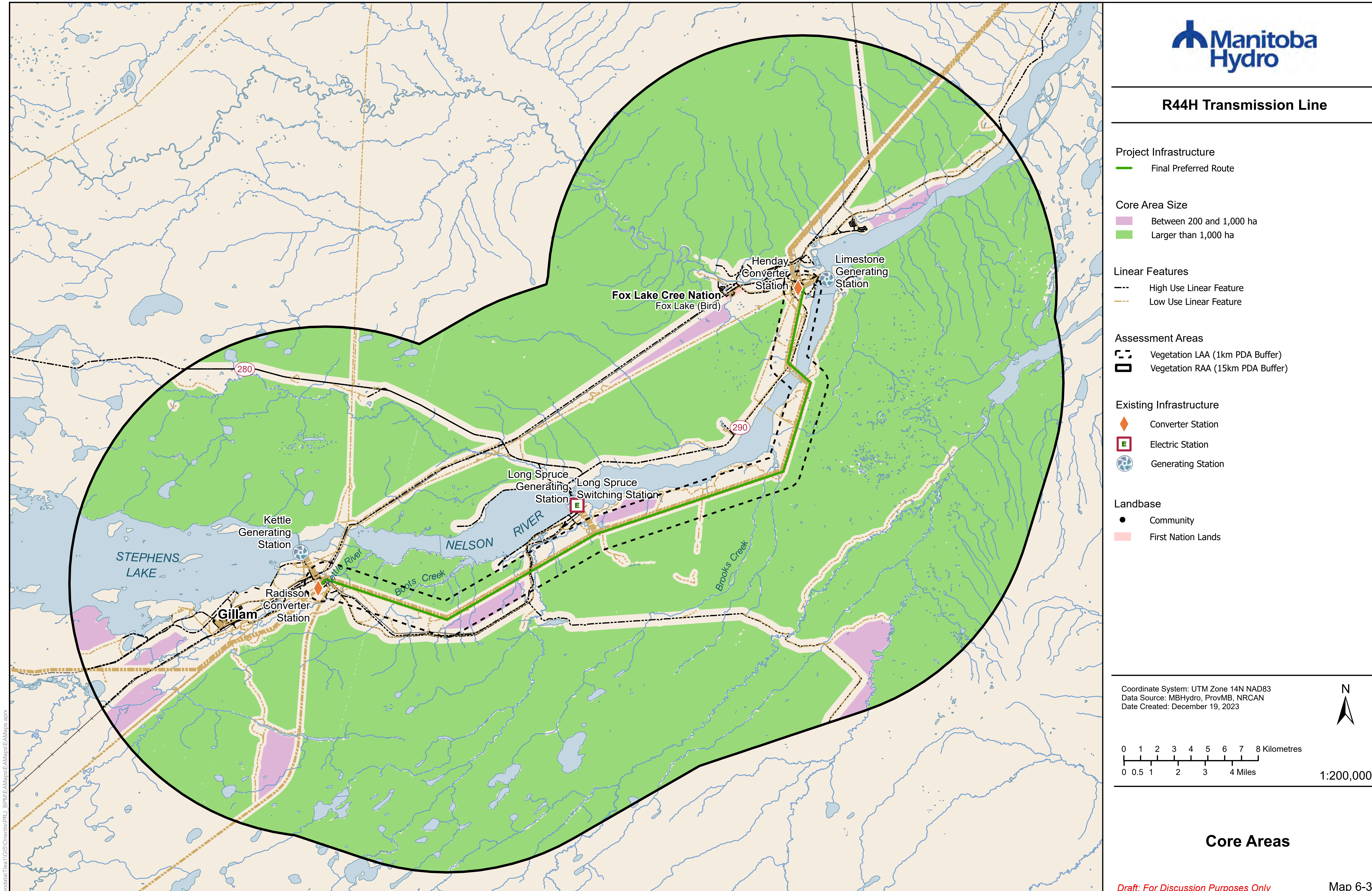
0 1 2 3 4 5 6 Kilometres
0 0.5 1 2 3 4 Miles

1:200,000

Land Cover Classes

Draft: For Discussion Purposes Only

Map 6-2



Manitoba Hydro
R44H Transmission Line
Project Infrastructure
Final Preferred Route
Core Area Size
Between 200 and 1,000 ha
Larger than 1,000 ha
Linear Features
High Use Linear Feature
Low Use Linear Feature
Assessment Areas
Vegetation LAA (1km PDA Buffer)
Vegetation RAA (15km PDA Buffer)
Existing Infrastructure
Converter Station
Electric Station
Generating Station
Landbase
Community
First Nation Lands
Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023
N
0 1 2 3 4 5 6 7 8 Kilometres
0 0.5 1 2 3 4 Miles
1:200,000
Core Areas
Draft: For Discussion Purposes Only
Map 6-3
Henday Converter Station
Limestone Generating Station
Fox Lake Cree Nation
Fox Lake (Bird)
280
290
Long Spruce Generating Station
Long Spruce Switching Station
Kettle Generating Station
STEPHENS LAKE
NELSON RIVER
Kettle River
Boots Creek
Brooks Creek
Radisson Converter Station
Gillam

7.0 Wildlife and wildlife habitat

Wildlife and wildlife habitat for this assessment includes birds, mammals, terrestrial invertebrates, amphibians, and reptiles.

Wildlife are components of ecological cycles, provide economic benefits from hunting, guiding, and trapping, and provide a source of food and materials. Over 100 wildlife species could range into the RAA and include small mammals, aquatic and terrestrial furbearers, large carnivores, ungulates, birds, reptiles, and amphibians.

Wildlife and wildlife habitat was selected as a valued component as they provide ecological, aesthetic, recreational, economic, and cultural value to Indigenous communities, stakeholders, the public, local businesses, and government agencies.

7.1 Scope of the assessment

This chapter assesses the effects of project activities during construction, operation, and decommissioning on wildlife and wildlife habitat from project activities. An assessment of cumulative effects on wildlife and wildlife habitat is also presented.

This assessment was influenced by engagement feedback (Chapter .0), Manitoba Hydro's experience with the regional cumulative effects assessment (Manitoba Hydro 2016) and recent transmission line projects in northern Manitoba (e.g., the Bipole III Transmission Project (2011) and the Keeyask Transmission Project (2012)). The assessment considers the following:

- Change in wildlife habitat, and
- Change in wildlife mortality

7.1.1 The project

The scope of the project consists of the construction, operation, and decommissioning of a new and approximately 42-km long, 230-kV transmission line that would terminate at the Radisson and Henday converter stations, within an existing transmission line corridor.

A new transformer associated with the project would be added at Radisson converter station. There will not be footprint expansions at either converter station as modifications would be done within existing station properties.

7.1.2 Regulatory Setting

The following federal and provincial laws, and associated regulations, policies, and guidelines, were considered for assessing project effects to wildlife and wildlife habitat.

7.1.2.1 Federal guidance

Species at Risk Act (SARA)

The SARA provides protection for species at risk in Canada. The legislation provides a framework to facilitate recovery of species listed as threatened, endangered, or extirpated and to prevent species listed as special concern from becoming threatened or endangered. Species at risk and their habitats are protected under *SARA* which prohibits:

1) the killing, harming, or harassing of endangered or threatened species at risk (sections 32 and 36); and
2) the destruction of critical habitat of and endangered or threatened species at risk (sections 58, 60, and 61).

Migratory Birds Convention Act (MBCA)

The MBCA (1994) and associated regulations (Migratory Birds Regulations [MBR], 2022) provide for the protection of migratory birds, their eggs, and their nests. It applies to most native bird species.

7.1.2.2 Provincial guidance

The Endangered Species and Ecosystems Act (ESEA)

The ESEA provides protection to threatened and endangered ecosystems and plant and animal species at risk in Manitoba. The ESEA facilitates the management and development of recovery strategies for threatened, endangered, and extirpated or extinct species to prevent further declines and promote recovery. ESEA-listed species are those that “are of ecological, educational, aesthetic, historical, medical, recreational, and scientific value to Manitoba and the residents of Manitoba.

The Wildlife Act

The Wildlife Act provides general provisions for regulating the activities relating to the take and trade of wild animals in Manitoba. A “wild animal" is defined as “an animal or bird of a species or type listed in Schedule A or declared by the regulations to be a wild animal”, and includes select amphibian, reptile and mammal species and most bird species (including those not protected under the MBCA) known to exist in Manitoba.

7.1.3 Consideration of feedback from project engagement

Ongoing project engagement (Chapter .0) actively sought to provide opportunities to provide wildlife related feedback.

Based on information gathered during engagement, the area supports habitat used by important wildlife including caribou and birds. The following questions, concerns, comments, and interests about the project regarding wildlife and wildlife habitat were raised during project engagement:

- The Split Lake Resource Management Board asked if the buffers (portions of uncleared vegetation) for caribou within the existing rights-of-way will be maintained. The board expressed an interest in understanding project impacts to caribou and how they will be considered.
- The Manitoba Métis Federation inquired about whether biologists have been asked about the effects of an existing narrow strip of trees in the rights-of-way.
- Individual field tour participants noted concerns about potential short-term disruptions to wildlife from noise during construction; caribou habitat; creeks and fish habitat along the corridor; sandhill cranes and potential nest sites; beaver lodges in treed areas; lichen; trails used by wildlife; moose; and eagles, pelicans, swans, and other birds (particularly near the Long Spruce Dam).
- Fox Lake Cree Nation expressed concerns that the project may either scare off animals or make them curious and draw them into new areas or situations of higher risk and vulnerability; the presence of transmission lines impacting birds, in particular diverting travel routes or migration paths; effects on wildlife if they pass through areas of habitat that have been sprayed with chemicals, protecting moose from September to November; and about eagles due to their cultural significance. The First Nation recommended following the Split Lake Resource Management Board's protocol for restricted air travel during the spring and fall hunting seasons.
- In discussion with Manitoba Hydro regarding project routing along the existing rights-of-way, no specified wildlife concerns were noted by the provincial regional wildlife manager.

7.1.4 Potential effects, pathways, and measurable parameters

The potential project effects on wildlife and wildlife habitat, along with effects pathways and measurable parameters are outlined in Table 7-1.

Table 7-1: Potential effects, effects pathways, and measurable parameters for wildlife and wildlife habitat

Potential Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in habitat	Direct and/or indirect loss or alteration of habitat due to vegetation clearing, ground disturbance, sensory disturbance and/or fragmentation and edge effects	Amount (ha) of wildlife habitat (wetland, shrub, forest) directly altered by the project, including for species of interest: • Moose • Caribou • Raptors • Common nighthawk • Olive-sided flycatcher • Rusty blackbird Change in habitat intactness (broad land cover types, length of linear features/km^2)
Change in mortality risk	Direct change in mortality risk due to vegetation clearing activities, vehicle collisions, bird-wire collisions, human-wildlife conflicts, and indirect change in mortality risk due to predation and harvest pressure	Total area (ha) of PDA that intersects wildlife habitat (i.e., wetland, forest, and shrub) within the LAA Change in habitat intactness (number and size of core areas, length of linear features/km^2)

7.1.5 Spatial boundaries

Three spatial boundaries are used to assess residual and cumulative environmental effects of the project on wildlife and wildlife habitat:

Project development area (PDA): The PDA is the footprint of the proposed project as described in Chapter 0, including the transmission line right-of-way and any additional areas such as marshalling yards and access road allowances.

Local assessment area (LAA): includes all components of the PDA and consists of a 1-km buffer on either side of the final preferred route (as with vegetation; Map 6-1), based on measurable effects of noise on wildlife (e.g., (Benitez-lopez, Alkemade and Verweij 2010); (Shannon, et al. 2016)), while also considering maximum recommended setback distances for sensitive habitat features (Manitoba

Conservation Data Center 2023). This is also consistent with LAA boundaries used for other recent transmission line projects in Manitoba (Manitoba Hydro 2023).

Regional assessment area (RAA): includes the PDA and LAA and is a 15-km buffer of the final preferred route (Map 6-1) used to capture information on a broader scale and to provide regional context. A 15 km buffer is consistent with other recent transmission line projects in Manitoba (Manitoba Hydro 2023). The RAA is used to assess cumulative effects and the significance of project-specific effects on wildlife species (e.g., birds, mammals, amphibians, and reptiles). The RAA encompasses the home ranges or dispersal distances of most wide-ranging species potentially affected by the project, including black bear (*Ursus americanus*; 5 to 25 km^2 for female bears (Government of British Columbia 2001), and non-migratory moose (*Alces alces*; 97 km^2 (Hauge and Keith 2981).

7.1.6 Temporal boundaries

The primary temporal boundaries for the assessment of project effects on wildlife and wildlife habitat are based on the timing and duration of project activities as follows:

- Construction – Anticipated to start in December 2024 and be completed by July 2026. Station work to occur year-round, transmission line construction to occur under frozen conditions.
- Operations and maintenance – for the life of the project, estimated to be a 75-year design life.
- Decommissioning – estimated to be two years once the project has reached the end of its serviceable life.

7.1.7 Residual effects characterization

Table 7-2 provides the definitions used to characterize the residual effects on wildlife and wildlife habitat.

Table 7-2: Characterization of residual effects on wildlife and wildlife habitat

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Positive –** a residual effect that moves measurable parameters in a direction beneficial to Wildlife and wildlife habitat relative to baseline.

Table 7-2: Characterization of residual effects on wildlife and wildlife habitat

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
		Adverse – a residual effect that moves measurable parameters in a direction detrimental to wildlife and wildlife habitat relative to baseline. **Neutral –** no net change in measurable parameters for wildlife and wildlife habitat relative to baseline.
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Change in Habitat**[1] **Negligible** – no measurable change in habitat for wildlife, including species at risk and species of conservation concern. **Low** – Project changes less than 10% of wildlife habitat in the LAA, or less than 5% of habitat for species at risk and species of conservation concern in the LAA **Moderate** – Project changes 10-20% of wildlife habitat in the LAA, or 5-10% of habitat for species at risk and species of conservation concern in the LAA. **High** – Project changes more than 20% of wildlife habitat in LAA, or more than 10% of habitat for species at risk and species of conservation concern in the LAA. **Change in Mortality Risk** **Negligible** – a measurable change in the abundance of wildlife in the LAA is not anticipated. **Low** – a measurable change in the abundance of wildlife in the LAA is

Table 7-2: Characterization of residual effects on wildlife and wildlife habitat

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
		not anticipated, although temporary local shifts in distributions in the LAA might occur. **Moderate** – a measurable change in the abundance and/or distribution of wildlife in the LAA might occur, but a measurable change on the abundance of wildlife in the RAA is not anticipated. **High** – a measurable change in the abundance and/or distribution of wildlife in the RAA might occur.
Geographic Extent	The geographic area in which a residual effect occurs	**PDA –** residual effects are restricted to the PDA. **LAA –** residual effects extend into the LAA. **RAA –** residual effects extend into the RAA.
Duration	The time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Short-term –** the residual effect is restricted to the construction phase. **Medium-term –** the residual effect extends through to completion of post-construction reclamation. **Long-term -** the residual effect extends for the life of the project
Frequency	Identifies how often the residual effect occurs and how often during the project or in a specific phase	**Single event** **Multiple irregular event –** occurs at no set schedule. **Multiple regular event –** occurs at regular intervals. **Continuous –** occurs continuously.

Table 7-2: Characterization of residual effects on wildlife and wildlife habitat

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and reclamation. **Irreversible –** the residual effect is unlikely to be reversed.

[1] Based on benchmarks used for other recent environmental assessments (Keeyask Hydropower Limited Partnership 2012); (Nalcor 2012); (Joint Review Panel 2014), (Manitoba Hydro 2015a); (Manitoba Hydro 2023).

7.1.8 Significance definition

For this assessment, adverse residual effects on wildlife and wildlife habitat are considered significant if the proposed project:

- results in a threat to the long-term persistence or viability of a wildlife species in the RAA; and/or,
- results in effects that are contrary or inconsistent with the goals, objectives, and activities of recovery strategies, action plans, and management plans.

7.2 Project interactions with wildlife and wildlife habitat

Anticipated interactions between project activities and the potential effects are identified in Table 7-3 with a check mark and are discussed in detail in Section 7.1.4, in the context of effects pathways, standard and project-specific mitigation, and residual effects. Justification for no effect (indicated by a dash) is provided following the table.

Project activities for each phase are described in detail in Chapter 0.

The potential interactions between project activities and wildlife and wildlife habitat were considered for the construction and operation and maintenance phases of the project.

The identification of project activities and their potential interactions was based on engagement with interested parties, the professional judgment of technical specialists involved in the assessment, and a review of existing conditions. The selection of interactions is informed by the potential effects and effects pathways for the VC.

Table 7-3 identifies, for each potential effect, the physical activities that might interact with the VC and result in the identified effect.

Table 7-3: Project interactions with wildlife and wildlife habitat

Project activity	Change in habitat	Change in mortality risk
Transmission Line Construction		
Mobilization and staff presence	✓	✓
Vehicle and equipment use	✓	✓
Access development	✓	✓
Right-of-way clearing	✓	✓
Borrowing sites	✓	✓
Watercourse crossings	✓	-
Marshalling / fly yards	✓	✓
Transmission tower construction	✓	-
Implosive connectors	✓	-
Helicopter use	✓	-
Clean-up and demobilization	✓	✓
Station Modification		
Vehicle and equipment use	✓	✓
Marshalling / fly yard	✓	✓
Site preparation	✓	✓
Clean-up and demobilization	✓	✓
Transmission Line and Station Operation and Maintenance		
Transmission line and station presence	✓	✓
Vehicle and equipment use	✓	✓
Inspection and maintenance	✓	✓
Vegetation management	✓	✓
Decommissioning		
Mobilization and staff presence	✓	✓
Vehicle and equipment use	✓	✓
Removal of transformers, disassembled towers, foundations, conductors, and associated equipment	✓	✓
Rehabilitation	✓	✓
Clean-up and demobilization	✓	✓

✓ = Potential interaction
– = No interaction

Installation of electrical equipment will occur within existing transmission stations (Henday and Radisson converter stations) and is not expected to interact with change in habitat or mortality risk for the lifetime of the project as there is no pathway for these activities to affect wildlife or wildlife habitat.

Transmission tower construction, implosive connectors, and helicopter use are not expected to cause a change in mortality risk. Transmission tower construction will be conducted on previously cleared land and there are no pathways for tower construction to cause wildlife fatalities.

7.3 Existing conditions

Baseline information for this assessment was gathered through a detailed review of available desktop data including pertinent reports and peer-reviewed literature, federal and provincial databases, not-for-profit publications, and other data sources.

Information on existing conditions was also gathered through avian and vegetation surveys and engagement with Indigenous peoples, local resource users, and regulators. Engagement feedback was used to inform the field studies.

For more detailed information about the field surveys that took place and their findings, refer to the technical reports included in Appendix C.

The existing conditions described in this section focus on:

- occurrence, distribution, and habitat associations of wildlife
- species of conservation concern
- species important to Indigenous peoples

7.3.1 Overview

Habitat in the RAA consists primarily of coniferous forest with bog and fen wetlands intermixed. The forest habitat is mainly black spruce forest with occasional tamarack, and an understory of low shrubs, mosses, and lichens. The bog wetlands consist of sphagnum mosses and scattered stunted black spruce. The fen wetlands are typically dominated by herbs and may support sparce tamarack trees or bog birch shrubs (Appendix B).

The developed portions of the existing rights-of-way, where coniferous forest was previously cleared, is exposed land that is moderately well-developed (35% cover), with relatively high components of herbs (14%), sedges (9%) and low shrubs (7%). The rights-of-way are interspersed with rivers, streams, and creeks (Appendix B).

Concerns for wildlife habitat were shared by the Split Lake Resource Management Board, the Manitoba Métis Federation, and individual community members during project engagement. As discussed in section 7.1.3, vegetation buffers and corridors within the ROWs; bird nesting sites; and aquatic habitat used by mammals and fish were of particular concern.

7.3.2 Birds

Approximately 182 bird species potentially breed within or migrate in the RAA due to the widespread availability of wetlands, rivers, lakes, and forests. These include waterfowl, waterbirds, birds of prey, upland game birds, woodpeckers, and songbirds.

Waterfowl and waterbirds (e.g., gulls, ducks, geese, and pelicans) are migratory, nesting in Manitoba in spring and wintering in the southern United States and Central and South America. Nesting mainly occurs within inland lakes. The Nelson River provides limited potential nesting habitat; however, it provides important habitat for large numbers of migratory waterfowl in the spring and fall (Hydro 2015). Rivers, wetlands, and forest are important habitat for birds of prey (owls, and falcons). Upland game birds (e.g., grouse and ptarmigan) can be found in forested and non-forested habitats.

Nine woodpecker species occur in Manitoba, five are permanent residents, three are summer visitors, and one is an infrequent visitor (Manitoba Hydro 2023). A noteworthy species detected in edge and open forest habitat during the avian surveys was pileated woodpecker (*Dryocopus pileatus*). As per the Migratory Birds Regulations, pileated woodpecker nests are protected year-round unless deemed abandoned occupied for a minimum of 36 months.

Songbirds and other birds, including passerines, are the most abundant of all bird groups in Manitoba. Some of the bird families in this group such as chickadees, nuthatches, and some finches and jays are year-round residents, while other groups including flycatchers, swallows, thrushes, kinglets, pipits, vireos, tanagers, blackbirds, sparrows, and warblers are migrants.

An aerial stick nest survey was conduced in May 2022 to determine the presence of large stick nests used by birds of prey, scavengers/predators, and colonial waterbirds (Appendix C). Regulations under the *Migratory Birds Convention Act* and *The Wildlife Act* prohibit the removal or destruction of the nests of protected species such as eagles, hawks, falcons, and herons. Nests commonly reused from year to year may be protected for 12-36 months, depending on the species. The results of the stick nest survey indicate that habitat for large stick nests is not limited in the project area; and transmission towers are used opportunistically. No large nests (e.g., bald eagle, *Aliaeetus leucocephalus*) or colonial waterbird colonies (e.g., great blue heron, *Ardea Herodias*) were observed (Appendix C).

7.3.3 Mammals

Mammal groups that occur within the RAA include ungulates, furbearers, small mammals, and large carnivores (Manitoba Hydro 2012).

7.3.3.1 Ungulates

Ungulates include caribou and moose (Manitoba Hydro 2012). The presence of white-tailed deer (*Odocoileus virginianus*) is unlikely due to limited habitat and severe winters (Manitoba Hydro 2012a). Ungulates contribute to ecosystem function by consuming plants and are a main prey source for large carnivores.

<u>Moose</u>

Moose require varied habitats for food and shelter (Government of Manitoba n.d.), including forest, shrub, and wetland habitats (Joro Consultants Inc. and Wildlife Resource Consulting Services 2011). Moose are not expected to occur at high densities in the project area due to fewer shoreline areas and poor food quality and supply. East of the project area there are more lakes, rivers, and creeks which provide plentiful shoreline habitat and support a healthy population of moose (Manitoba Hydro 2016).

Moose require varied habitats for food and shelter (Government of Manitoba n.d.), including forest, shrub, and wetland habitats (Joro Consultants Inc. and Wildlife Resource Consulting Services 2011). As discussed in Vegetation section 6.3.1, the RAA is within two ecozones, the Hudson Plains ecozone and the Eastern Boreal Shield Ecozone

The availability of moose habitat varies between these zones. In the Hudson Plains Ecozone, moose are not expected to occur at high densities due to fewer shoreline areas and poor food quality and supply. The Eastern Boreal Shield Ecozone contains many lakes, rivers, and creeks which provide plentiful shoreline habitat and support a healthy population of moose (Manitoba Hydro 2016). Map 7-1 and Map 7-2 display the distribution of primary and secondary moose habitat in the local and regional assessment areas.

In addition to rights-based moose harvest, Game Hunting Area (GHA 3) is open to licenced moose hunting by resident, non-resident, and foreign resident hunters. Licenced hunting is restricted to bull moose during specific seasons.

Caribou

As discussed in section 7.1.3, caribou are an important species for Indigenous communities in the region.

The Government of Manitoba identifies three distinct groups of caribou (Map 7-3):

- boreal woodland caribou (*Rangifer tarandus caribou*)
- coastal caribou:
    - Cape Churchill herd
    - Pen Islands herd
- and barren-ground caribou (*Rangifer tarandus groenlandicus*):
    - includes the Qamanirjuaq herd

The boreal woodland caribou range does not extend into the RAA (Government of Manitoba 2015).

The Cape Churchill herd and the Pen Islands herd are two distinct populations of coastal caribou. Both populations are stable or increasing. These herds migrate between the coastal areas of Hudson Bay (where they tend to calve) to the northern fringe of the boreal forest (Manitoba Hydro 2016). Range maps and radio-collaring studies indicate that the Cape Churchill coastal caribou range is not within the project RAA (Manitoba Hydro 2012). The Pen Island coastal caribou occupy the RAA mainly in winter, but individuals have been observed in summer, some of which calved in the area (Map 7-3; (Manitoba Hydro 2016). Map 7-4 portrays the distribution of natural and human caused disturbances in caribou habitat in the RAA.

The Qamanirjuaq herd of barren-ground caribou migrate from Nunavut in autumn to overwinter in Manitoba. The herd may be shrinking and/or has been redistributed, however, they are still plentiful, and the decline is not statistically significant. The Qamanirjuaq caribou do not commonly migrate to the extreme southern extent of their winter range, into the project RAA (Manitoba Hydro 2012).

7.3.3.2 Furbearers

Furbearers are generally medium-sized mammals that inhabit aquatic or terrestrial habitat.

Aquatic furbearers that occur in the RAA include beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus),* mink (*Mustela vison*), and river otter (*Lontra canadensis*).

Terrestrial furbearers in the area include snowshoe hare (*Lepus americanus*), woodchuck (*Marmota monax*), red fox (Vulpes vulpes) arctic fox (Alopex lagopus), American marten (*Martes Americana*), fisher (*Martes pennanti*), weasels (*Mustela spp*.), and lynx (*Lynx canadensis)* (Wildlife Resource Consulting Services 2012).

Wolverine (*Gulo gulo*) is a furbearer listed as Special Concern under SARA and COSEWIC.

7.3.3.3 Small Mammals

Small mammals within the RAA include mice, voles, bats, shrews, squirrels, and chipmunks (Wildlife Resource Consulting Services 2012). They are found in all types of habitats, especially riparian areas, wetlands, and forested bogs (Wildlife Resource Consulting Services 2012); (Joro Consultants Inc. and Wildlife Resource Consulting Services 2011). Small mammals are the primary food source for numerous species of carnivores.

Currently, small mammals are abundant and widespread in Manitoba (Wildlife Resource Consulting Services 2012). The little brown myotis (*Myotis lucifugus*) is listed as endangered by ESEA, SARA, and COSEWIC.

7.3.3.4 Large carnivores

Large predatory species in the RAA include gray wolf (*Canis lupus*) and black bear. The gray wolf and black bear population are considered stable in Manitoba (Manitoba Hydro 2012).

7.3.4 Terrestrial invertebrates

Terrestrial invertebrates include species living in the soil (nematodes, earthworms), on the ground (beetles, spiders), in the air (butterflies, moths, flies, bees), and within the vegetation canopy (spiders, aphids, beetles). Terrestrial invertebrates are ecologically important for their role as nutrient cyclers and decomposers (e.g., earthworms), as predators of pest species, as pollinators of flowering plants (e.g., bees) and as food for other animals (e.g., birds) (Manitoba Hydro 2012).

7.3.5 Amphibians and reptiles

There are three species of amphibians known to inhabit the RAA, the boreal chorus frog (*Pseudacris maculata*), the wood frog (*Lithobates sylvaticus*), and the northern leopard frog (*Lithobates pipiens*) (Keeyask Hydropower Limited Partnership 2012). Both the boreal chorus frog and wood frog have abundant populations in Manitoba.

The Northern leopard frog is common throughout the southern regions of Manitoba. Its population has rebounded since experiencing sharp decline in the 1970’s (COSEWIC 2009a).

None of the reptile species native to Manitoba are known to have breeding ranges within the project RAA (Keeyask Hydro Power Partnership 2012).

7.3.6 Species of conservation concern

7.3.6.1 Birds

Of the bird species found in the region, 12 are species of conservation concern (Appendix C). All 12 require open wetland habitat for nesting and foraging (COSEWIC 2007) (COSEWIC 2009) (COSEWIC 2009a) (COSEWIC 2013) (COSEWIC 2013a) (COSEWIC 2017) (COSEWIC 2018). Bank swallow (*Riparia riparia*), barn swallow (*Hirundo rustica*), horned grebe (*Podiceps auritus*), olive-sided flycatcher (*Contopus cooperi*), common nighthawk (*Chordeiles mino*), rusty blackbird (*Euphagus carolinus*) are the species most likely to breed in the region. All six species require open wetland habitat for nesting and foraging (COSEWIC 2007) ; (COSEWIC 2009); (COSEWIC 2009a); (COSEWIC 2013); (COSEWIC 2013a); (COSEWIC 2017); (COSEWIC 2018).

7.3.6.2 Mammals

Among the mammals within the project RAA, the little brown myotis and wolverine are the only species of conservation concern.

<u>Little Brown Myotis</u>

The little brown myotis is listed as endangered by ESEA, SARA, and COSEWIC. The primary threat to these species is white-nose syndrome, a fungal infection (ECCC 2018). White-nose syndrome is spreading rapidly across North America (Zimmer 2021) and was first detected in Manitoba in 2018 (Ferstl 2023).

In 2018, Environment and Climate Change Canada developed a recovery strategy for the little brown myotis, which identifies known critical habitat (hibernacula) that is necessary for the survival or recovery of the species. No areas of critical habitat are located within the project RAA (ECCC 2018).

The little brown myotis occurs in the RAA as a migrant (Manitoba Hydro 2012). The Manitoba Conservation Data Centre lists the non-breeding status of the little brown myotis as widespread, abundant, and secure in the province or throughout its range (Manitoba Conservation Data Center 2023).

Little brown myotis generally roost in tall, large diameter snags (i.e., decadent trees) in mature or over-mature forest, in tree cavities, or under bark on mature coniferous trees. Individuals may travel hundreds of kilometers from overwintering hibernacula to these sites for the breeding season. During the spring, summer, and fall, little brown myotis forage along forest openings and over waterbodies (COSEWIC 2013b).

Wolverine

The western Canada population of wolverine is listed as a Special Concern by SARA and COSEWIC. Wolverine are distributed throughout the northern Canada and all British Columbia (Nature Conservancy Canada 2023). They are not abundant in the project region (Keeyask Hydropower Limited Partnership 2012). In Manitoba, the population appears to be increasing and returning to its traditional range further south (Nature Conservancy Canada 2023).

7.3.6.3 Invertebrates

Yellow-banded bumble bee

The Yellow-banded Bumble Bee (*Bombus terricola*) is listed by COSEWIC as Special Concern (Manitoba Conservation Data Center 2023). It is found in variety of habitats. The species is relatively abundant in the northern part of its range (including northern Manitoba.

There have been recent declines of at least 34% in areas of southern Canada. Contributing factors may include pesticide use, habitat conversion, and pathogen spill over from managed bumble bee colonies (COSEWIC 2015).

7.3.6.4 Amphibians

Northern leopard frog

The Northern leopard frog is listed as Special Concern by SARA and COSEWIC due to population declines throughout most of Western Canada. However, it's population has rebounded since experiencing sharp decline in the 1970's (COSEWIC 2009a).

7.4 Assessment of effects

While effects to wildlife and wildlife habitat could occur during construction, operation, and decommissioning, they are anticipated to be most pronounced during construction and include the following:

- Change in habitat
- Change in mortality

7.4.1 Effects pathways

7.4.1.1 Change in habitat

Construction

Potential pathways for construction-related effects on wildlife in the LAA were primarily mitigated during the planning and routing process by aligning the final preferred route with an existing ROW to reduce habitat fragmentation and maintain intactness.

During construction, vegetation clearing and grubbing of the ROW is the primary pathway for a direct and measurable change in wildlife habitat. Vegetation clearing and grubbing for the new transmission line ROW will result in the loss of some forest and edge habitats and changes in habitat structure in the PDA.

Areas recently cleared of forested habitat are expected to be managed to support a modified shrubby, wetland, or grass habitat. Wetland and riparian habitats are expected to remain relatively intact outside of tower footprints and the removal of large trees.

Clearing of the ROW will result in a wider corridor for wildlife to cross between forest cover. This may result in reduced connectivity between wildlife mating areas, overwintering grounds, and dispersal corridors. Habitat connections are important in maintaining local and regional wildlife movements.

Fragmented forested areas may present a barrier for some species that reduce their risk of predation by avoiding open areas (e.g., American marten (Kurki, et al. 1998), some species of mice and voles (Storm and Choate 2014).

Construction of the ROW has the potential to further separate forested habitats and create larger edge effects. Some species, such as moose, could be drawn to edges for the diversity of habitats that form (e.g., browsing, travel corridors).

No known bat hibernacula are present in the RAA and as a result, sensory disturbances near these features are not anticipated.

Forest-dependent birds (e.g., evening grosbeaks, *Coccothraustes vespertinus*) will lose some habitat due to clearing. Core areas larger than 200 ha are important for bird species and ecosystem function (Environment Canada 2013). For the most common species observed in the study area, the additional clearing of forest habitat may result in a greater abundance of American robins (*Turdus migratorius*) and a decrease in ruby-crowned kinglets (*Regulus calendula*), while species such as the white-throated sparrow (*Zonotrichia albicollis*) and Lincoln's sparrow (*Melospiza* *lincolnii*) would remain stable (Appendix C). Clearing and grubbing can also result in the loss of bird's nests.

The avian species of conservation concern are relatively evenly distributed between the habitat types in the project area (open areas along the ROWs, forest edged, and contiguous forest). This suggests that abundance will not change with the clearing of the ROW. However, some shifts may occur in these species due to their habitat preferences. Species such as the olive-sided flycatcher, which prefers edges, and common nighthawk, which prefers open areas, will likely continue to use habitat around the ROW (Appendix C).

Indirect effects on habitat are those that reduce the effectiveness of existing or remaining habitat for birds. Indirect effects may occur through construction-related sensory disturbances (i.e., noise, light) causing temporary displacement of some wildlife from otherwise suitable habitat adjacent to the PDA. Such activity may be associated with ROW clearing, mobilizing staff and equipment (including access route and bypass trail development), watercourse crossing, transmission tower construction and conductor stringing (i.e., implosive connections, helicopter use), and upgrade work at the converter stations. These activities could disrupt and displace some wildlife within the LAA.

<u>Mitigation Measures</u>

Project-specific mitigation measures to avoid or reduce the potential effects of the project on wildlife and habitat during construction include the following:

- Wildlife features (i.e., mineral licks and stick nests) will be identified in the CEnvPP and mitigation applied such as buffers and/or setbacks prior to clearing.
- Clearing activities will not be carried out during the reduced risk timing windows for wildlife species without additional mitigation measures such as pre-clearing nest searches.
- Construction activities will be restricted to established roads, trails and cleared construction areas in accordance with the Access Management Plan (Section .7.5.1).
- Environmentally sensitive sites, features and areas will be identified and mapped before clearing.
- Trees containing large nests of sticks and areas where active animal dens or burrows are encountered within the ROW will be buffered left undisturbed until unoccupied.
- Artificial structures for nesting may be provided if unoccupied nests must be removed.

- Natural low growing shrub and grass vegetated buffer areas of 30 m will be established around wetlands and riparian zones.
- Vehicle, equipment and machinery maintenance and repairs will be carried out in designated areas located at least 100 m from the ordinary high-water mark of a waterbody, riparian area or wetland.
- Vehicle, equipment, and machinery operators will perform a daily inspection for fuel, oil and fluid leaks and will immediately shutdown and repair any leaks found. All machinery working near watercourses will be kept clean and free of leaks.
- The contractor will follow the erosion and sediment control management plan. Clearing wastes and other construction debris or waste will not be placed in wetland areas.
- Rehabilitation plans will include objectives for restoration of natural conditions, erosion protection, sediment control, non-native and invasive plant species management, wildlife habitat restoration and restoration of aesthetic values as required.
- To reduce potential disturbance to wildlife and traditional hunting practices the use of helicopters for construction during unfrozen ground conditions will be minimized.

Operation

Potential pathways for operation-related effects on wildlife in the LAA were mitigated during the planning and routing process by aligning the final preferred route with the existing ROW to reduce habitat fragmentation and maintain intactness.

Although changes to habitat availability will be most pronounced during construction, operation and maintenance will continue to have an influence on wildlife and wildlife habitat through the presence of the ROW (e.g., habitat avoidance due to increased predation and hunter access) and periodic disturbances associated with vegetation maintenance and inspection activities (i.e., noise).

Positive changes along cleared areas of the ROW during the operation phase will be the re-establishment of vegetation, as parts of the ROW will become foraging habitats for species like moose that prefer food sources such as grasses and early successional trees and shrubs (Banfield, A.W.F. 1974); (Bramble and Byrnes 1982); (Bartzke, et al. 2014). However, based on moose collaring data and habitat selection modelling in southeastern Manitoba, moose tend to avoid areas within 300 m to 500 m of linear features (Kingdon 2023).

The cleared areas will also become more attractive to open-forest and shrub-land species that prefer edge habitats such as common nighthawk and olive-sided flycatcher.

For some species of small mammal (least chipmunk [*Tamias minimus*]*)*, this new habitat may lead to localized increases in abundance, which can in turn can lead to an increase in the abundance of medium-sized predators that prey on these (e.g., American marten).

American marten typically remain within 100 m of forest cover and edges for security when not dispersing (e.g., (Hargis and McCullough 1984), (Slough 1989), (Lofroth and Steventon 1990). Despite this, marten have been shown to disperse through large expanses (10 km to 20 km) of non-forested habitats (Buskirk 2002) and forestry management guidelines for marten suggest avoiding the creation of gaps between core habitat areas of 1 km to 2 km (Watt, Baker and Hogg 1996).

The widened ROW may benefit larger sized predators (e.g., grey wolf) by increasing access to prey foods and increasing travel efficiency in forested areas where access is limited and snowmobiles provide a packed snow base (Latham, Latham and Boyce, et al. 2011a), (Latham, Latham and McCutchen, et al. 2011b).

An increased use of linear features by predators has been observed with a corresponding avoidance of linear features by ungulates species (e.g., caribou, moose; (Latham, Latham and McCutchen, et al. 2011b). Some evidence suggests that ungulates such as moose moved quicker when travelling across or along transmission lines, likely in response to associating linear features with increased mortality risk (DeMars, et al. 2019), (Dickie, et al. 2019).

Vegetation management (i.e., for controlling noxious or restricted weeds and managing woody vegetation along the ROW), and use of all-terrain vehicles (ATVs) and snowmobiles for transmission line inspection, could temporarily reduce the effectiveness of wildlife habitat by causing some species (e.g., upland birds, moose) to avoid the ROW and adjacent areas until the disturbance has ceased.

Mitigation Measures

Project-specific mitigation measures to avoid or reduce the potential effects of the project on wildlife and habitat during operation include the following:

- Natural low growing shrub and grass vegetated buffer areas of 30 m will be established around wetlands and waterbodies.
- Vegetation clearing activities will not be carried out during the reduced risk timing windows for wildlife species without additional mitigation measures.

- Vehicle, equipment and machinery maintenance and repairs will be carried out in designated areas located at least 100 m from the ordinary high-water mark of a waterbody or wetland, unless approved by a Manitoba Hydro environmental officer, where additional mitigations measures will apply.
- Vehicle, equipment, and machinery operators will perform a daily inspection for fuel, oil and fluid leaks and will immediately shutdown and repair any leaks found. All machinery working near watercourses will be kept clean and free of leaks.

7.4.1.2 Change in mortality

<u>Construction</u>

During construction, the primary pathways for direct changes in wildlife mortality risk are associated with vegetation clearing in the PDA and collisions with project-related transportation in the LAA.

Clearing of the ROW will involve vegetation removal and soil disturbance, which could result in an increased mortality risk for less mobile wildlife species such as small mammals living in the leaf litter or burrowing/hibernating in the soil, and nests and nesting birds if conducted during the bird nesting period (April 25 to August 14).

Project-related transportation and heavy equipment also have the potential to crush or collide with birds.

Heavy equipment used during clearing has the potential to destroy habitat used by denning mammals such as black bear and American marten. Black bear and American marten are known to den within the RAA and therefore have potential to overwinter within the PDA.

Project-related transportation and heavy equipment have the potential to collide with wildlife (e.g., caribou and birds) inhabiting the LAA.

Installation of a new transmission line may increase the risk of bird-wire collisions. Although, clustering transmission lines (i.e., several lines sharing the same ROW) may create less risk of collisions than multiple, separate ROWs because the threat is more concentrated and visible. Birds must only make one ascent and descent to avoid clustered lines rather than multiple lines in separate ROWs (Avian Power Line Interaction Committee 2012).

Human-wildlife encounters or conflicts (e.g., from attraction to food waste, garbage) may occur at site facilities that can lead to wildlife mortality through trapping of rodents or destroying larger problem wildlife species such as black bear or red fox.

Changes in predator-prey interactions, nest parasitism, and harvest pressure are expected to be the primary pathways through which indirect changes in mortality risk to wildlife will occur during construction. Construction of the ROW will increase edge habitat (section 7.4.1.1). The ROW may benefit predators (e.g., grey wolf) by increasing access to prey foods and increasing travel efficiency in heavily forested areas where access is limited (Latham, Latham and Boyce, et al. 2011a) (Latham, Latham and McCutchen, et al. 2011b).

Sensory disturbance from construction may also cause an indirect increase in mortality risk due to disturbance to birds, resulting in behavioural changes (e.g., flushing) that may increase chances of predation from exposure (Habib, Bayne and Boutin 2007).

Mitigation Measures

Project-specific mitigation measures to avoid or reduce the potential effects of the project on wildlife mortality risk during construction includes the following:

- Construction activities will be restricted to established roads, trails and cleared construction areas in accordance with the Access Management Plan
- Clearing activities will not be carried out during reduced risk timing windows for wildlife species without additional mitigation
- Trees containing large nests of sticks and areas where active animal dens or burrows are encountered will be buffered and left undisturbed until unoccupied
- Artificial structures for nesting may be provided if unoccupied nests must be removed
- To reduce the potential for collisions with wires following wire installation, bird diverters will be placed at environmentally sensitive sites
- Hunting and harvesting of wildlife, or possession of firearms by Project staff will not be permitted while working on the Project sites

Operation

The primary pathways that may result in a change in wildlife mortality risk during the operation phase are bird collisions with transmission wires, increased access associated with the presence of the ROW that may increase harvest pressure or predation, and vehicle collisions and mortality associated with ROW inspections and vegetation management.

Potential pathways for operation-related effects on wildlife mortality in the LAA were mitigated during the planning and routing process by aligning the final preferred route with an existing ROW.

Vegetation management and transmission line inspection could increase direct mortality risk to wildlife from collisions with vehicles or equipment. Nest mortality could also occur from maintenance and repair vehicles and/or the clearing of brush or small patches of trees during vegetation management of the ROW.

Collisions with transmission lines are among the top causes of human-related bird mortality in Canada (Calvert, et al. 2013). The degree of mortality 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 behaviour (flocking, aerial courtship displays (Avian Power Line Interaction Committee 2012). Larger-bodied species such as waterfowl (e.g., geese, ducks, sandhill crane) and raptors (e.g., bald eagle) can have difficulty performing evasive manoeuvres to avoid transmission lines and structures (Bevanger 1998).

The project has the potential to increase bird collision risk where the transmission line crosses or is adjacent to watercourses or waterbodies that concentrate large-bodied birds (e.g., Nelson River) or are located between roosting (i.e., resting), foraging, or breeding sites. In these areas, waterbirds are particularly vulnerable to collisions due to their daily movement patterns, which peak during low light periods around sunrise and sunset (Savereno, et al. 1996).

During operation, presence of transmission towers may increase the availability of perching structures for raptors, potentially resulting in an increase in mortality risk to birds, small mammals, and other prey species (Lammers and Collopy 2005).

Increased access along the ROW by resource users and/or predators may result in an indirect change to mortality risk, such as shifts in predator-prey relationships and harvest pressure on certain bird species (e.g., ruffed grouse (*Bonasa umbellus)*, sandhill crane, and waterfowl). Recreational users (e.g., ATVs, snowmobiles) may also frequent the ROW, increasing bird collision risk and/or destruction of nests.

Mitigation Measures

Project-specific mitigation measures to avoid or reduce the potential effects of the project on wildlife mortality risk during operation includes the following:

- Areas where active animal dens or burrows are encountered will be buffered and left undisturbed until unoccupied.
- To reduce the potential for collisions with wires following wire installation, bird diverters will be placed at environmentally sensitive sites.

- Hunting and harvesting of wildlife, or possession of firearms by project staff will not be permitted while working on the project sites (e.g., during inspections or vegetation maintenance).
- Vegetation clearing activities will not be carried out during the sensitive timing windows for wildlife species without additional mitigation measures such as preclearing nest sweeps.
- Vegetation maintenance and inspection vehicles will travel at reduced speeds while on ROW.
- Vegetation maintenance and inspection activities will be restricted to established roads, trails and cleared construction areas in accordance with the access management plan.

7.4.2 Characterization of residual effects

7.4.2.1 Change in habitat

Construction

Most construction-related change in habitat was mitigated during the planning and routing process by aligning the final preferred route with an existing ROW.

Removal of vegetation (i.e., trees, shrubs) will result in a direct, long-term change in over 250 ha of wildlife habitat in the LAA. The amount of forest habitat removed is approximately 2.8% of the total amount of forested habitat in LAA (Table 7-4).

Table 7-4: Change in broad land cover types used by wildlife in the LAA

Landcover type	Existing conditions				Post-construction area in the LAA		Wildlife species associated with broad land cover type
	LAA		PDA				
	Area (ha)	% Area	Area (ha)	% of PDA	Area (ha)	% Change	
Wetland	3,383.5	38%	114.3	45%	8,686	3.4%	Moose, black bear, beaver, muskrat, mink, river otter
Forest	3,181.8	36%	90.7	36%	3,091	2.8%	Little brown myotis, moose, grey wolf, black bear, rabbit,

Table 7-4: Change in broad land cover types used by wildlife in the LAA							
Landcover type	Existing conditions				Post-construction area in the LAA		Wildlife species associated with broad land cover type
	LAA		PDA				
	Area (ha)	% Area	Area (ha)	% of PDA	Area (ha)	% Change	
							American marten, lynx, weasel, red squirrel
Exposed land	974.3	11%	14.3	6%	960.0	1.5%	American robin, moose
Shrub land	852.5	10%	25.6	10%3	826.8	3.0%	moose, rabbit

Vegetation clearing and grubbing outside of the primary migratory bird breeding window will reduce the indirect effects on birds and bird habitat. Some disruption of year-round resident species, such as the great gray owl (*Strix nebulosa*) and ruffed grouse may occur during winter clearing activities.

Removal of trees will reduce habitat for some forest dwelling species (e.g., American marten, ruby-crowned kinglet) but as a result will increase modified wildlife habitat for other species particularly open-habitat and forest edge species including American robin. Forest areas cleared along the ROW will eventually regenerate to modified habitat consisting of new growth trees, shrub, herb, and grass dominated plant community. Some wildlife species may benefit from the creation of these habitats. Open-habitat and forest edges may be used as travel corridors by grey wolf, provide grazing and browsing opportunities for caribou and moose. For most birds, the change in the availability of habitat will be minimal especially for wetland species such as sandhill crane. Olive-sided flycatcher, which prefers edges, and common nighthawk, which prefers open areas, will continue to use habitat around the ROW.

Construction of the project will increase the density of linear features (e.g., ROWs) in the LAA by 18% (from approximately 4.17 km/km^2 to 5.03 km/km^2). This increase is primarily attributed to ROW clearing along the forested portion of the final preferred route extending through the center of the exiting ROWs. Within this area, ROW clearing will have indirect effects on habitat by reducing landscape intactness and altering edge habitat. However (Map 6-3) Chapter 6 shows how no core areas larger than 200 ha will be traversed as part of the Project. See section 6.4.1 for a detailed description of residual effects on landscape intactness.

For some species (e.g., denning black bears, upland game birds), habitat avoidance and reduced habitat effectiveness due to sensory disturbance and fragmentation effects during construction can extend upwards of 1 km from the PDA. Sensory disturbance is expected to cease immediately following the conclusion of construction activities.

Following the implementation of mitigation measures described above, residual effects for change in habitat during construction are characterized by the following:

- Direction is adverse:
    - There will be direct and indirect habitat loss or alteration during construction.
- Magnitude is low:
    - Construction of the project will result in a 2.8% change in wildlife habitat in the LAA (Table 7-4) and a 18% increase in linear disturbance. The combined direct loss of natural wildlife habitat is low (i.e., <10% of the LAA) based on magnitude criteria presented in Table 7-2. In addition, no core areas greater than 200 ha will be changed by the project.
- Geographic extent is the LAA:
    - Direct habitat loss will be confined to the PDA; however, indirect effects (i.e., sensory disturbance, edge effects) will extend into the LAA.
- Timing is low sensitivity:
    - Construction of the project will occur in the winter, under frozen ground conditions, when many species are dormant or overwintering outside the RAA and will avoid the sensitive spring and summer breeding periods of most wildlife species.
- Duration is short-term to long-term (depending on habitat type and project component):
    - Direct (i.e., habitat loss) and indirect effects (i.e., edge effects) on habitat availability due to clearing and alteration will be permanent because the effects will extend for the lifetime of the project.
    - Indirect effects on habitat availability associated with sensory disturbance from ROW clearing, construction of transmission infrastructure and station upgrades and expansion will be short-term.

- Frequency is a single and irregular event:
  - Habitat alteration will primarily occur once during ROW clearing.
  - Sensory disturbance associated with ROW clearing, construction of transmission infrastructure and station upgrades will occur multiple times at irregular intervals.
- Change is reversible:
  - Direct (i.e., habitat loss) and indirect effects (i.e., edge effects) on habitat availability due to clearing and alteration are reversible after the life of the project (i.e., with natural regeneration of ROW vegetation).
  - Indirect effects on habitat availability associated with sensory disturbance from ROW clearing, construction of transmission infrastructure and station upgrades are reversible once activity has ended.

<u>Operation</u>

During operation, residual effects on wildlife and wildlife habitat associated with sensory disturbance from equipment used during ROW vegetation management and inspections are not expected to have much of an effect on wildlife as transmission line inspection will occur once or twice a year outside of critical life stages for wildlife (e.g., moose calving).

Vegetation management activities will be repeated over a longer cycle (every five to seven years as required) and will involve the use of less invasive and less destructive techniques (i.e., herbicide) to control woody vegetation than initial clearing.

Based on observed use of other existing transmission lines (e.g., Manitoba-Minnesota Transmission Project), use of ATVs and other recreational vehicles may occur year-round on portions of the ROW. Shrubby vegetation will be maintained on the ROW where possible to impede ATV access and limit disturbance to wildlife. However, the portions of the ROW already in operation are directly adjacent to this project.

The direct (via ROW clearing) and indirect (due to sensory disturbance) change in habitat availability that occurred during construction will persist during operation; however, the magnitude of effects are expected to lessen as vegetation will re-establish and provide habitat for species that use open forest habitat and/or edge habitat (e.g., moose).

Following the implementation of mitigation measures described above, residual effects for change in habitat during operation are characterized by the following:

- Direction is adverse and positive:
    - There will be an adverse indirect effect on wildlife use of ROW and adjacent habitat due to sensory disturbance associated with vegetation maintenance activities and recreational vehicle use.
    - The presence of the ROW could have an adverse effect on moose due to their avoidance of linear features (Kingdon 2023) pers. Comm).
    - There will be positive direct habitat gain for forest edge, exposed land (mixture of moss, lichen, and litter ground cover), and shrubland for some wildlife species as vegetation naturally regenerates along the ROW.
- Magnitude is low:
    - Indirect effects of sensory disturbance on wildlife are unlikely to have a measurable effect on the abundance of wildlife in the LAA; however, temporary local shifts in wildlife distributions might occur in the PDA and adjacent areas.
- Geographic extent is the LAA:
    - ROW vegetation maintenance is limited to the PDA; however, the effects of sensory disturbance can extend into the LAA.
- Timing is moderate sensitivity:
    - Operation of the project will occur during sensitive timing windows (e.g., ungulate calving season) of wildlife species in the LAA, however, potential disturbance such as vegetation management will not be scheduled during sensitive timing windows without additional mitigation measures such as pre-clearing nest searches.
- Duration is short-term to long-term:
    - Indirect effects on ROW and edge habitat due to sensory disturbance (i.e., avoidance) will be short-term, as most wildlife using these areas will return once sensory disturbance ceases.
    - ROW vegetation will be managed as open habitat over the long-term.
- Frequency is at multiple, irregular intervals:
    - Sensory disturbance from vegetation management, ROW inspections, and recreational vehicle use will occur multiple times at irregular intervals.
- Change is reversible:
    - Indirect effects on ROW and edge habitat due to sensory disturbance (i.e., avoidance) will be short-term and reverse once activity has ended.
    - The effects of vegetation management along the ROW are reversible after the life of the project with natural regeneration of ROW vegetation.

7.4.2.2 Change in mortality

Construction

Most construction-related mortality risks to wildlife in the LAA were mitigated during the planning and routing process by aligning the final preferred route with an existing ROW.

Mitigation measures (e.g., clearing outside of critical life stages [e.g., moose calving], applying setbacks and buffers to denning sites, controlling project vehicle speeds on the ROW) will be implemented to reduce mortality risk to wildlife during construction.

However, clearing of the ROW presents some residual risk to resident wildlife, particularly small mammals with limited dispersal capabilities, and furbearers that use dens or burrows. Hibernating bears are particularly vulnerable to disturbance by construction activities, which can lead to indirect mortality if denning disturbance occurs. Overall, with the implementation of mitigation measures described above the change in mortality risk for small mammals, furbearers, and hibernating bears is considered low.

Increased wildlife mortality from hunting is not anticipated to increase during construction because most game species are likely to avoid the ROW during construction. Mortality from vehicle collisions is not anticipated to increase because traffic volumes are expected to be within the normal variation for highways in the LAA.

Mortality risk to black bears may increase for individuals denning in the PDA, however, the risk is expected to be low because most of the final preferred route is aligned with an existing ROW and black bear tend to select denning sites 1 km to 2 km from human activity (Linnell, et al. 2000).

Following the implementation of mitigation measures described above, residual effects for change in mortality risk during construction are characterized by the following:

- Direction is adverse:
  - There will be an increase in mortality risk to wildlife during construction.
- Magnitude is low:
  - With mitigation, the change in mortality risk is anticipated to be low. The project is not anticipated to have population level effects on wildlife.
- Geographic extent is the LAA:
  - Direct change in mortality risk will be confined to the PDA; however, indirect effects (i.e., potential for increased predation) will extend into the LAA.

- Timing is low sensitivity:
  - Construction of the project transmission line will occur, primarily in the winter when many species are dormant or overwintering outside the RAA (e.g., migratory birds) and will avoid the sensitive timing windows for most wildlife species.
- Duration is short-term:
  - Wildlife mortality risk will be elevated during the construction period.
- Frequency is a multiple, irregular event:
  - Change in mortality risk will vary throughout the construction period.
- Change is reversible:
  - Increased wildlife mortality risk due to presence of project vehicles will cease once construction activity has ended.

<u>Operation</u>

During operation, mortality risk to wildlife is expected to increase due to hunting and predation. Grey wolves often use linear features on the landscape as a travel corridor, which increases their ability to search for prey (e.g., caribou, moose) and reduces the amount of effort required to find prey (Kunkel and Pletscher 2000). Mortality risk associated with improved access by hunters and predators was reduced by routing the final preferred route along an existing linear feature.

Construction of the project will increase the density of linear features (e.g., ROWs) in the LAA by 18% (from approximately 4.17 km/km^2 to 5.03 km/km^2.). This increase is primarily attributed to ROW being routed along an existing cleared ROW corridor.

Increased access to the ROW for hunters could contribute to wildlife mortality, including for caribou and big game species like black bear and grey wolf (James and Stuart-Smith 2000).

During operation the ROW will naturally revegetate with grass, herb, and shrub species, increasing cover habitat. As a result, access opportunities for hunters will decrease.

Vegetation clearing will occur outside of sensitive timing windows for wildlife to reduce mortality risk to wildlife. Mortality risk due to vehicle collisions during vegetation maintenance and inspections is expected to be mitigated by reduced vegetation maintenance vehicle speeds.

Following the implementation of mitigation measures described above, residual effects for change in mortality risk during operation are characterized by the following:

- Direction is adverse:
    - There will be increased mortality risk.
- Magnitude is low:
    - The change in hunter and predator access resulting from the project is anticipated to be low as the project will marginally contribute to the existing level of fragmentation in the RAA.
- Geographic extent is the LAA:
    - Increased mortality risk will be confined to the PDA; however, indirect effects on mortality risk (i.e., hunting pressure) will extend into the LAA.
- Timing is moderate sensitivity:
    - Operation of the project will occur during sensitive timing windows (e.g., ungulate calving season) of wildlife in the LAA, however, potential disturbance such as vegetation management will not be scheduled during sensitive periods without additional mitigation measures such as pre-clearing nest searches.
- Duration is long-term:
    - The mortality risk associated with increased access will persist for the life of the project.
- Frequency is continuous:
    - Change in mortality risk will occur throughout the operation period.
- Change is reversible:
    - Factors contributing to a change in wildlife mortality risk are reversible after the life of the project (i.e., natural regeneration of ROW vegetation).

Table 7-5 characterizes the residual effect on wildlife and wildlife habitat.

Table 7-5: Project residual effects on wildlife and wildlife habitat

Residual Effects Characterization						
Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility
Change in habitat						
Construction	Adverse	Low	LAA	Short-term/ Long-term	Single event/ Irregular	Reversible

Operation	Adverse/ Positive	Low	LAA	Short-term/ Long-term	Irregular	Reversible
Decommissioning	Adverse	Low	LAA	Short-term	Irregular	Reversible
Change in mortality						
Construction	Adverse	Low	LAA	Short-term	Irregular	Reversible
Operation	Adverse	Low	LAA	Long-term	Continuous	Reversible
Decommissioning	Adverse	Low	LAA	Short-term	Irregular	Reversible

7.4.3 Cumulative effects on wildlife and wildlife habitat

The assessment of cumulative effects is initiated with a determination of whether two conditions exist:

- the project has residual effects on the VC and
- a residual effect could interact with residual effects of other past, present, or reasonably foreseeable future physical activities.

Native vegetation abundance in the RAA has been reduced by past land use activities, including roads and electrical transmission lines. Some of these projects and activities have fragmented habitat and changed vegetation communities and species diversity.

The project will have residual effects on wildlife and wildlife habitat, including habitat availability and mortality risk, that will act cumulatively with residual effects of other past, present, and reasonably foreseeable future physical activities.

7.4.3.1 Project residual effects likely to interact cumulatively with wildlife and wildlife habitat

Table 7-6 presents the project and physical activities inclusion list which identifies other projects and physical activities that might act cumulatively with the project. Where residual effects from the project act cumulatively with residual effects from other projects and physical activities, a cumulative effects assessment is carried out.

Table 7-6: Potential cumulative effects on wildlife and wildlife habitat		
Other Projects and physical activities with potential for cumulative environmental effects	Potential cumulative environmental effects	
	Change in habitat	Change in mortality
Existing/ongoing projects and activities		
Domestic Resource Use (hunting, trapping, fishing)	✓	✓
Recreational Activities (Canoeing, Snowmobiling, Hiking)	✓	✓
Infrastructure (i.e., provincial trunk highways, provincial roads)	✓	✓
Generating and converter stations	✓	✓
Transmission lines	✓	✓
Vale nickel mine	✓	✓
Future projects and activities		
Kivalliq Hydro Fibre Link	✓	✓
Project 6 – All-season road linking Manto Sipi Cree Nation, Bunibonibee Cree Nation, and God's Lake First Nation	–	–

✓ = Other projects and physical activities whose residual effects are likely to interact cumulatively with project residual environmental effects.
– = Interactions between the residual effects of other projects and those of the project residual effects are not expected.

7.4.3.2 Cumulative effects pathways for change in habitat availability

All past and current projects and activities have contributed to a change in wildlife and wildlife habitat availability through clearing and conversion of natural habitat within parts of the RAA. Existing infrastructure, generating stations, transmission lines, and other industrial and processing developments have contributed to direct (i.e., habitat loss or alteration) and indirect changes (e.g., habitat avoidance due to disturbance or edge effects) in wildlife habitat availability. The primary pathways of these effects are through land clearing and/or operation-related disturbances (e.g., noise).

Domestic resource use and recreational activities make small contributions to changes in wildlife habitat availability directly through the creation and use of all-terrain vehicle (ATV) and snowmobile trails and indirectly due to noise disturbance.

One of the two future potential projects in the RAA, the Kivalliq Hydro Fibre Link, has potential to interact cumulatively with the proposed project. Potential cumulative effects on wildlife and wildlife habitat are associated with negative, direct loss in habitat and temporary indirect habitat loss due to sensory disturbance caused by human activity and equipment.

7.4.3.3 Mitigation for cumulative effects for change in habitat availability

Mitigation measures that will help avoid, reduce, or eliminate project environmental effects on change in wildlife habitat availability were presented in section 7.4.1.1. Additional mitigation measures proposed to reduce the cumulative environmental effects on change in wildlife habitat availability include the following:

- For Manitoba Hydro projects occurring in the same geographic area, coordinate access requirements to reduce the need to construct additional access roads in areas of wildlife habitat.

7.4.3.4 Cumulative effects for change in habitat availability

Vegetation clearing is one of the key factors affecting the availability of wildlife habitat in the RAA. Approximately 252 ha of the LAA will be modified by the project. Construction of the project will increase the density of linear features (e.g., ROWs) in the LAA by 18% (from approximately 4.17 km/km^2 to 5.03 km/km^2.

7.4.3.5 Cumulative effects pathways for change in mortality risk

All past and current activities have contributed to a change in mortality risk for wildlife inhabiting the RAA. Roads and highways elevate mortality risk to wildlife through wildlife-vehicle collisions, and transmission lines elevate mortality risk through bird collisions and increased access for resource users and predators.

Operation of generating stations, converter stations and other facilities have vehicle traffic that contributes to mortality risk.

Domestic resource use, such as hunting, has and continues to be an activity that increases wildlife mortality risk throughout the RAA.

Future developments like the Kivalliq Hydro Fibre Link may have residual effects on wildlife mortality risk that interact with the project's residual effects. The primary pathway for these interactions is through collision with project construction and/or operation vehicles.

7.4.3.6 Mitigation for cumulative effects for change in mortality risk

To reduce potential wildlife mortality risk, existing trails and roads will be used to access the ROW to the extent possible. The mitigation measures suggested for cumulative effects for change in mortality risk (Section 7.4.2.2) are also applicable for the cumulative effects for change in mortality risk.

7.4.3.7 Cumulative effects for change in mortality risk

The modified landscape of the RAA has already been and continues to be a source of mortality risk to wildlife due to ongoing recreational use, resource use, and presence of roads, traffic, and transmission projects. Increased traffic associated with the Kivalliq Hydro Fibre Link may elevate wildlife mortality risk through wildlife-vehicle interactions.

The cumulative effect for change in wildlife mortality risk is adverse as mortality risk will increase for some wildlife in areas of the RAA; however, the magnitude of this effect is low as some of the project is in disturbed areas. Residual cumulative effects of change in mortality risk will be continuous yet reversible upon completion of the Kivalliq Hydro Fibre Link.

7.4.3.8 Summary of cumulative effects

This section summarizes the cumulative effects analysis for change in wildlife habitat availability and change in mortality risk. Table 7-7 characterizes the cumulative environmental effects of the project and other current and future projects and activities on wildlife and wildlife habitat.

Table 7-7: Residual cumulative effects on wildlife and habitat

Residual cumulative effect	Residual cumulative effects characterization					
	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility
Residual cumulative effect on change in habitat availability						
Residual cumulative effect	Adverse	Low	RAA	Short-term	Continuous	Reversible
Contribution from the project to the residual cumulative effect	When current and reasonably foreseeable future project effects on wildlife habitat are considered, the project's contributions to direct change in habitat availability will be low in magnitude. Contributions of indirect effects on habitat availability are also expected to be small due to winter construction. Furthermore, routing has avoided large tracts of intact habitat (e.g., forests, wetlands), and protected areas. Indirect effects on habitat resulting from construction noise and activity are expected to be localized and short-term.					
Residual cumulative effect on change in mortality risk						
Residual cumulative effect	Adverse	Low	RAA	Short-term	Continuous	Reversible
Contribution from the Project to the Residual Cumulative Effect	When current and future project effects on wildlife habitat are considered, the project's contribution to direct change in mortality risk will be low in magnitude. Project routing has avoided large tracts of intact habitat (e.g., forests, wetlands), and protected areas. To reduce mortality risk to wildlife, ROW clearing will occur in the winter. To the extent possible, existing roads and trails will be used to access the PDA during construction.					

7.4.4 Determination of significance

With mitigation and environmental protection measures, the cumulative effects on wildlife and wildlife habitat are predicted to be not significant. Residual effects are not expected to threaten the long-term persistence or viability of wildlife and habitat within the RAA, nor are they expected to diminish conservation efforts for the survival, management, and recovery of species at risk and species of conservation concern.

The project will result in the loss or alteration of approximately 250 ha (<3%) of wildlife habitat within the LAA. The anticipated change in habitat within the LAA is predicted to result in a low magnitude effect on wildlife habitat, including for species at risk and species of interest. The project will result in a loss or alteration of 252 ha wildlife habitat in the LAA.

Indirect loss or alteration of habitat resulting from sensory disturbance and edge effects are generally expected to be minor and limited to the LAA. During operation, the PDA will become naturalized, providing habitat for a variety of species, including moose, birds, and small mammals.

Fragmentation effects are also expected to be small, as the project will contribute 0.86 km/km^2 of new linear disturbance in the LAA (an 18% increase above existing conditions from approximately 4.17 km/km^2 to 5.03 km/km^2).

The project may contribute to a small increase in wildlife mortality within the LAA, primarily through increased project-related traffic. Traffic-related mortality risk will be managed by conducting vegetation removal in the winter and implementing road safety measures such as speed limits and signage.

Increased access along the ROW during construction and operation are not expected to result measurable changes in the abundance of wildlife, including moose.

7.4.5 Prediction confidence

The prediction confidence in the final determination of significance is considered high. This level of confidence is based on:

- The quantity and quality of data available.
- Professional judgement and experience with similar projects.
- Effectiveness of mitigation measures, which reflect best industry practices.

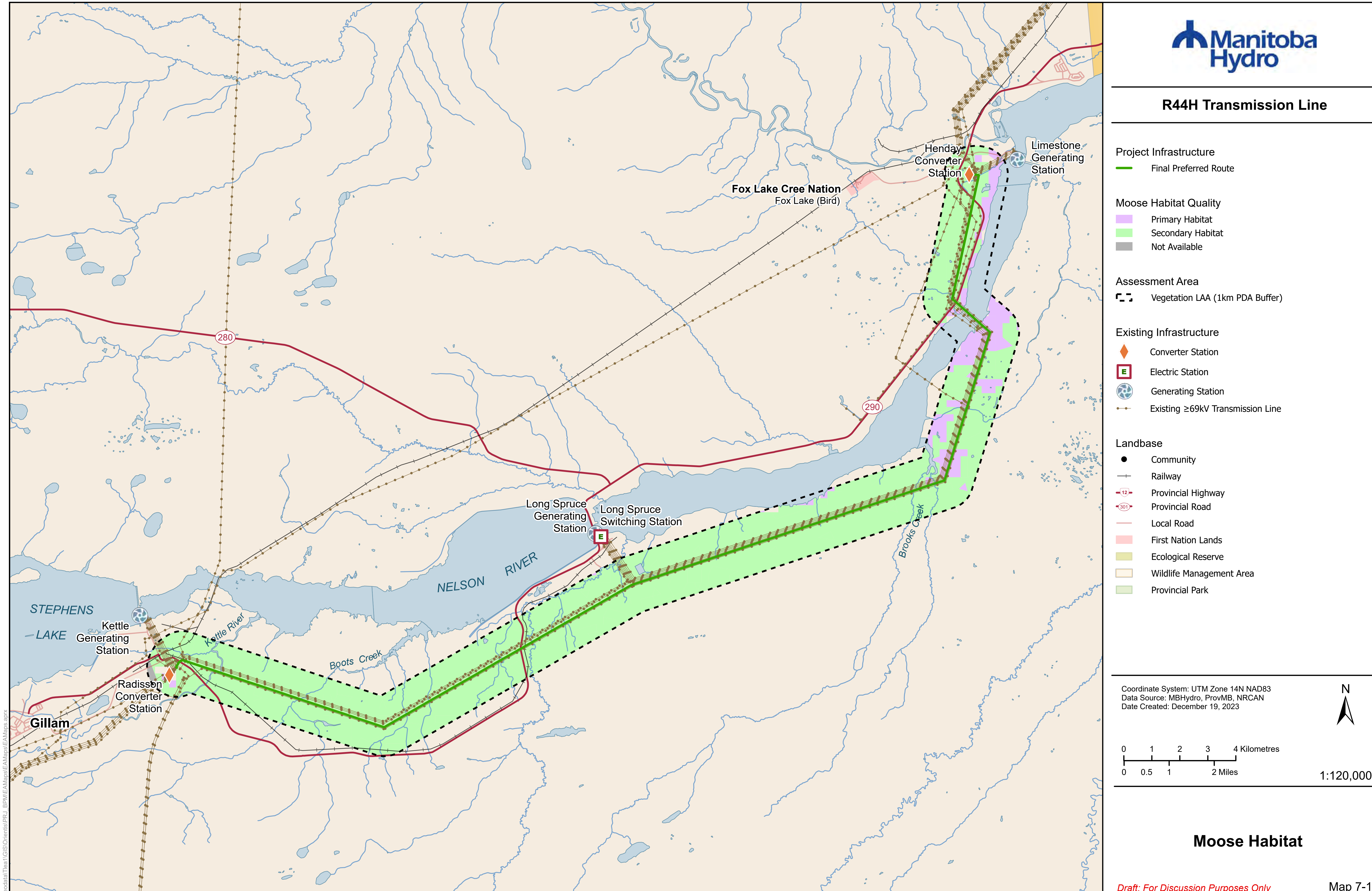
Overall, only a small amount of wildlife habitat will be lost or altered relative to the RAA and most adverse effects on mortality risk to wildlife were mitigated during the planning and routing process. Mitigation measures (e.g., timing windows, setbacks, and buffers) will be implemented to reduce adverse effects on wildlife and habitat. The level of confidence in the effectiveness of the mitigation measures is high based the results of baseline studies and past project experience (*e.g.,* Keeyask Transmission Project, Manitoba-Minnesota Transmission Project, Wuskwatim Transmission Project, Bipole III Transmission Project).

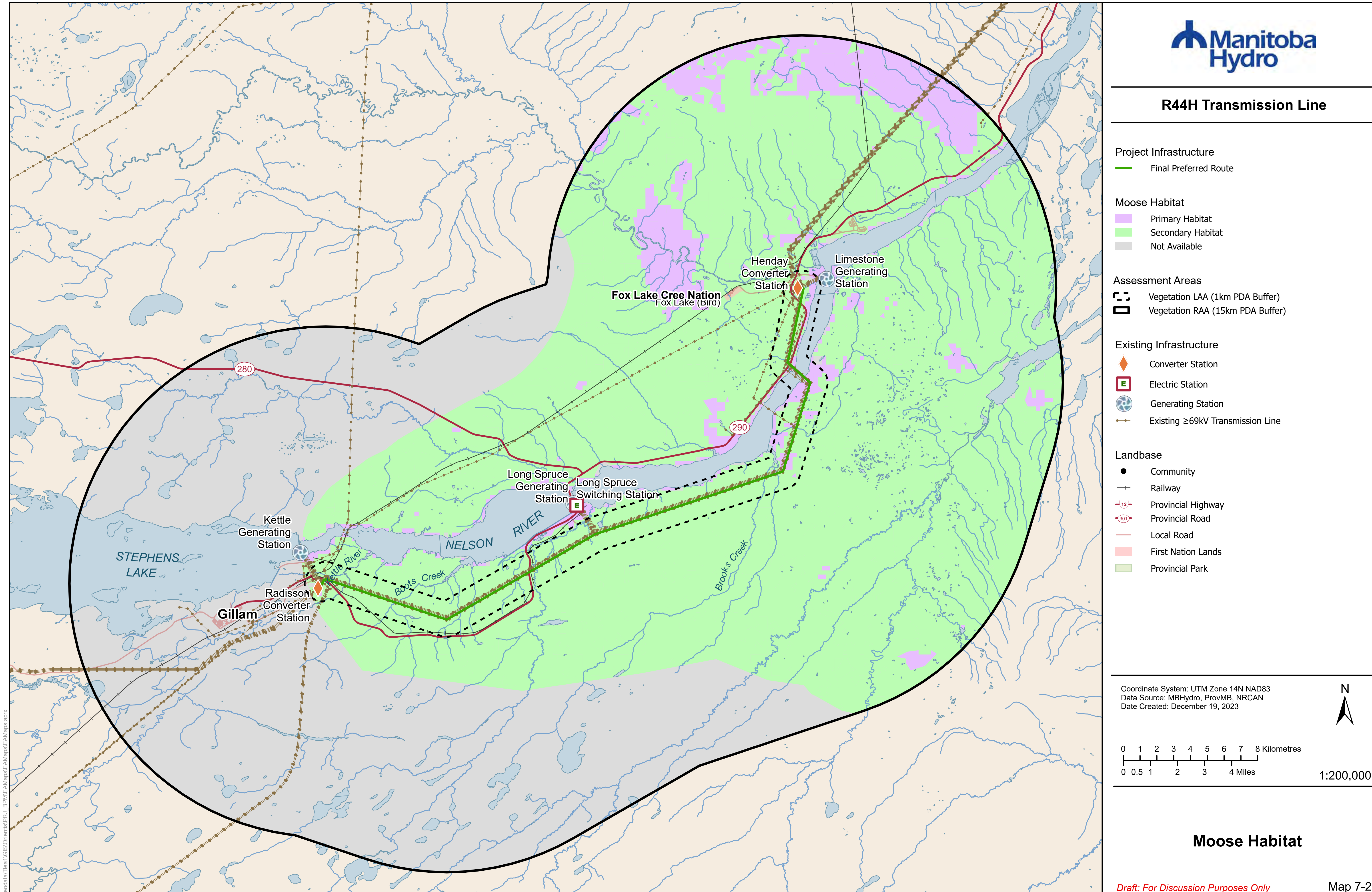
7.4.6 Follow-up and monitoring

Due to limited project interactions, well-established wildlife and wildlife habitat protections and mitigations, and outcomes from similar projects, wildlife monitoring is not proposed for the project. However, should environmental inspection identify unexpected environmental effects or damage to wildlife and wildlife habitat, the EPP will outline monitoring steps to ensure appropriate rehabilitation and follow-up.

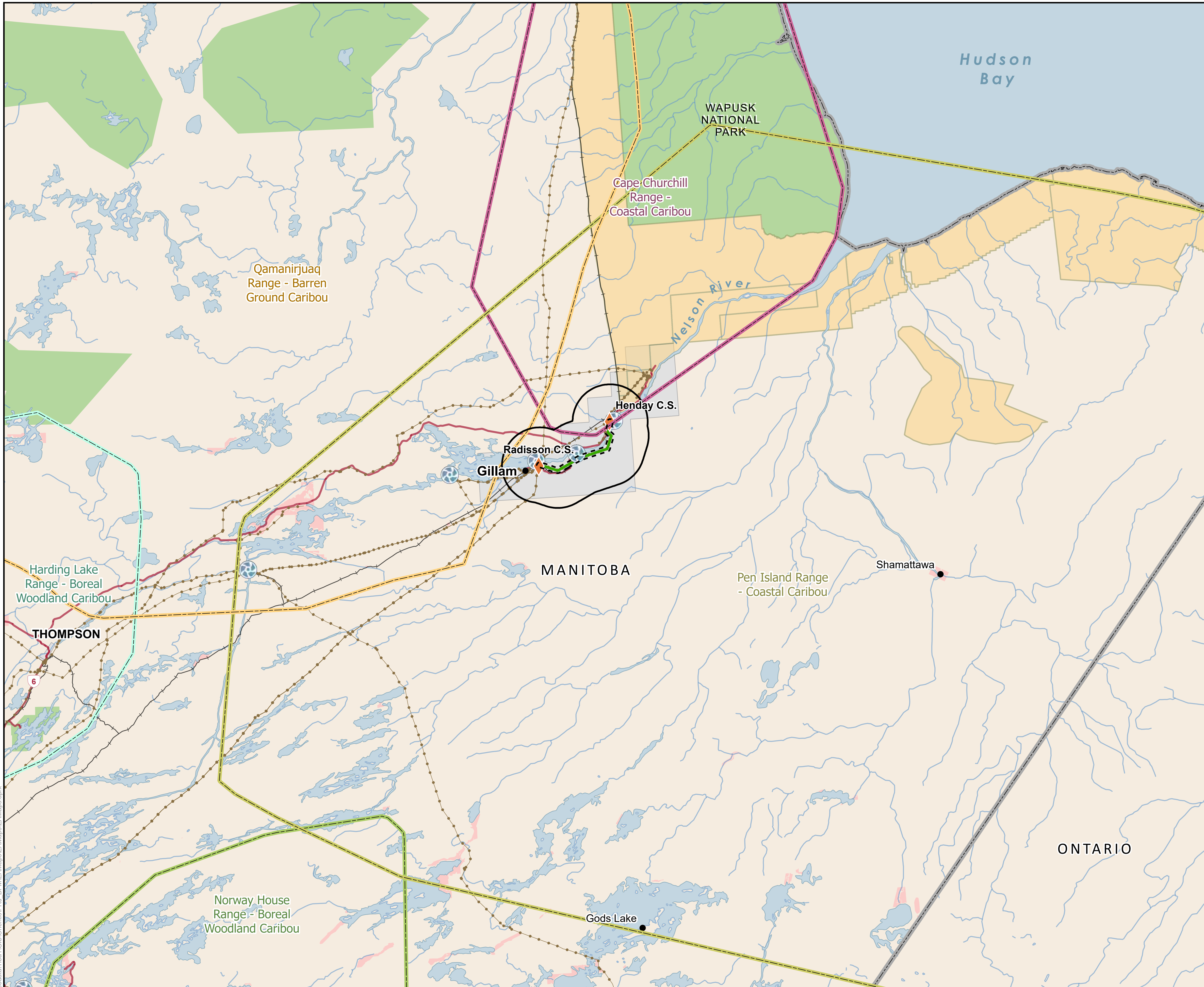
7.4.7 Sensitivity to future climate change scenarios

Effects of climate change on wildlife and wildlife habitat are expected to relate to the anticipated increase in temperature, changes in precipitation patterns, and associated extreme weather events (e.g., flooding). These factors may cause reductions in permafrost and changes to the frequency and impact of wildfires, which in turn can change habitat and affect access to food. Warmer temperatures may also result in more numerous insects and disease outbreaks affecting the health of some wildlife such as caribou (Environment and Climate Change Canada 2023).


Manitoba Hydro
R44H Transmission Line
Project Infrastructure
Final Preferred Route
Moose Habitat Quality
Primary Habitat
Secondary Habitat
Not Available
Assessment Area
Vegetation LAA (1km PDA Buffer)
Existing Infrastructure
Converter Station
Electric Station
Generating Station
Existing ≥69kV Transmission Line
Landbase
Community
Railway
Provincial Highway
Provincial Road
Local Road
First Nation Lands
Ecological Reserve
Wildlife Management Area
Provincial Park
Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023
N
0 1 2 3 4 Kilometres
0 0.5 1 2 Miles
1:120,000
Moose Habitat
Draft: For Discussion Purposes Only
Map 7-1
Henday Converter Station
Limestone Generating Station
Fox Lake Cree Nation
Fox Lake (Bird)
280
290
Long Spruce Generating Station
Long Spruce Switching Station
NELSON RIVER
STEPHENS LAKE
Kettle Generating Station
Kettle River
Boots Creek
Brooks Creek
Radisson Converter Station
Gillam



Manitoba Hydro
R44H Transmission Line
Project Infrastructure
Final Preferred Route
Moose Habitat
Primary Habitat
Secondary Habitat
Not Available
Assessment Areas
Vegetation LAA (1km PDA Buffer)
Vegetation RAA (15km PDA Buffer)
Existing Infrastructure
Converter Station
Electric Station
Generating Station
Existing ≥69kV Transmission Line
Landbase
Community
Railway
Provincial Highway
Provincial Road
Local Road
First Nation Lands
Provincial Park
Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023
N
0 1 2 3 4 5 6 7 8 Kilometres
0 0.5 1 2 3 4 Miles
1:200,000
Moose Habitat
Draft: For Discussion Purposes Only
Map 7-2
Henday Converter Station
Limestone Generating Station
Fox Lake Cree Nation
Fox Lake (Bird)
280
290
Long Spruce Generating Station
Long Spruce Switching Station
Kettle Generating Station
STEPHENS LAKE
NELSON RIVER
Kettle River
Boots Creek
Brooks Creek
Radisson Converter Station
Gillam



Manitoba Hydro

R44H Transmission Line

Project Infrastructure
- Final Preferred Route

Caribou Ranges
- Harding Lake Range - Boreal Woodland Caribou
- Norway House Range - Boreal Woodland Caribou
- Cape Churchill Range - Coastal Caribou
- Pen Island Range - Coastal Caribou
- Qamanirjuaq Range - Barren Ground Caribou

Assessment Areas
- LAA (1km PDA Buffer)
- RAA (15km PDA Buffer)

Existing Manitoba Hydro Infrastructure
- Converter Station
- Generating Station
- Existing ≥69kV Transmission Line

Landbase
- Community
- Railway
- 12 Provincial Highway
- 301 Provincial Road
- First Nation Lands
- Ecological Reserve
- Wildlife Management Area
- National/Provincial Park
- City/Town

Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023

N

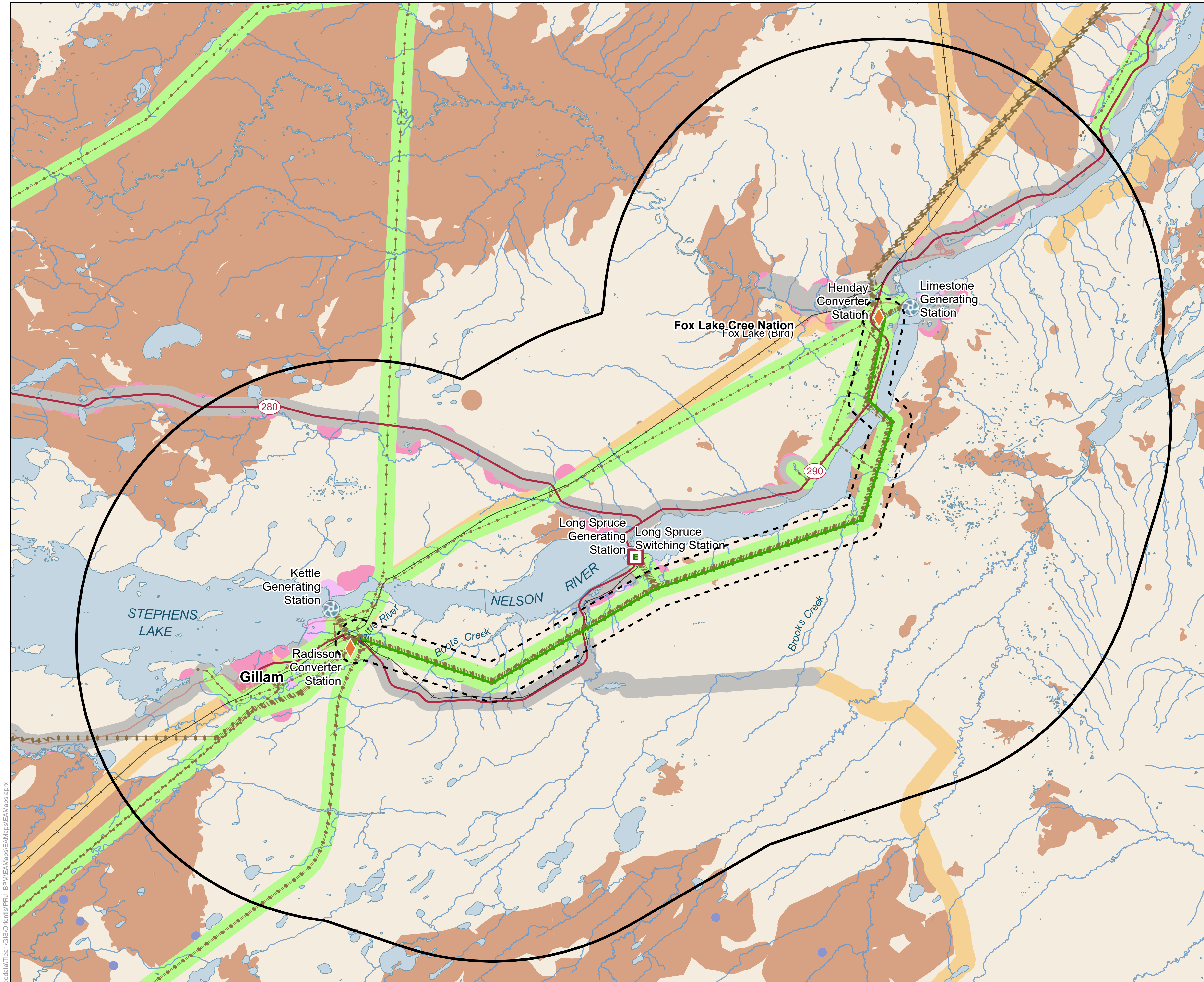
0 20 40 60 Kilometres
0 15 30 Miles

1:1,500,000

Caribou Ranges

Draft: For Discussion Purposes Only

Map 7-3



Manitoba Hydro

R44H Transmission Line

Project Infrastructure

- Final Preferred Route

Caribou Disturbance Areas

- Drill Hole (250m Buffer)
- Generating Station for Hydro (500m Buffer)
- Human Footprint not for Hydro Development (500m Buffer)
- Mine (500m Buffer)
- Natural Disturbance - Fire
- Other Development for Hydro (500m Buffer)
- Road for Hydro Development (500m Buffer)
- Transmission Line (500m Buffer)

Assessment Areas

- Vegetation LAA (1km PDA Buffer)
- Vegetation RAA (15km PDA Buffer)

Existing Infrastructure

- Converter Station
- Electric Station
- Generating Station
- Existing ≥69kV Transmission Line

Landbase

- Community
- Railway
- Provincial Highway
- Provincial Road
- Local Road
- First Nation Lands
- Provincial Park

Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023

N

0 1 2 3 4 5 6 7 8 Kilometres
0 0.5 1 2 3 4 Miles

1:200,000

Caribou Disturbance

Draft: For Discussion Purposes Only

Map 7-4

8.0 Fish and fish habitat

Fish and fish habitat was selected as a valued component (VC) because of its fundamental role in the functioning of natural ecosystems with fish as key indicators of aquatic health and its economic and recreational importance to Canadians.

Changes in the distribution or occurrence of fish or fish habitat may strongly affect ecosystem function and environmental cycles and the ability of other organisms to use and benefit from this natural resource.

Fish and fish habitat are valued by Indigenous peoples, recreational and commercial users, and the public for social, recreational, commercial, and spiritual reasons. In addition, fish and fish habitat are protected under *The Fisheries Act*.

Quality of fish habitat incorporates a variety of biophysical parameters, including hydrology, channel characteristics, substrate, bank material, cover, water quality, aquatic vegetation, organic matter and microorganisms and aquatic invertebrate communities. Surface water quality parameters that influence fish habitat suitability include temperature, dissolved oxygen, turbidity, pH, and total suspended solids.

Given the anticipated absence of in-water works for the project, this assessment focuses primarily on changes to riparian vegetation and the potential effects of that on fish and fish habitat.

8.1 Scope of the assessment

This chapter assesses the effects of project activities during construction, operation and decommissioning on fish and fish habitat. An assessment of cumulative effects on fish and fish habitat is also presented.

The project falls within the lower Nelson River sub-watershed (Map 8-1). The proposed transmission line's footprint crosses 24 watercourses (Map 8-2; watercrossings mapbook).

This assessment was influenced by engagement feedback and Manitoba Hydro's experience with other recent transmission line projects in Northern Manitoba (e.g., the Bipole III Transmission Project (2011) and the Keeyask Transmission Project (2012).

The assessment considers the following:

- Change in fish habitat
- Change in fish mortality risk

8.1.1 The project

The scope of the project consists of the construction, operation, and decommissioning of a new and approximately 42-km long, 230-kV transmission line that would terminate at the Radisson and Henday converter stations, within an existing transmission line corridor.

A new transformer associated with the project would be added at Radisson converter station. There will not be footprint expansions at either converter station as modifications would be done within existing station properties.

8.1.2 Regulatory and policy setting

The following provincial/federal laws, and associated regulations, policies, and guidelines, as well as Manitoba Hydro's policies were considered for assessing project effects to fish and fish habitat.

- The Fisheries Act (Canada)
- The Species at Risk Act (Canada)
- The Endangered Species and Ecosystems Act (Manitoba)
- The Water Protection Act (Manitoba)
- The Canadian Council of Ministers of the Environment (1999)

8.1.2.1 Federal guidance

<u>The Fisheries Act</u>

The *Fisheries Act* provides the basis for the protection of fish habitat. This is done through Fisheries and Oceans Canada's Fisheries Protection Policy Statement (Fisheries and Oceans Canada 2019), which explains the fish and fish habitat protection provisions of the Act and outlines how the department will implement these provisions.

The Act prohibits the harmful alteration, disruption or destruction of fish habitat and the deposit of deleterious substances.

The Fisheries Act (R.S.C. 1985, c. F-14) defines fish as including:

a) parts of fish
b) shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans, or marine animals
c) the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans, and marine animals

The Fisheries Act defines fish habitat as water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas.

The Species at Risk Act

The *Species at Risk Act* (S.C. 2002, c. 29) (SARA) provides the basis for the protection of species at risk (SAR). Endangered, threatened and species of special concern protected federally by SARA are listed in Schedule 1 of the Act. The purposes of SARA are to:

> "prevent wildlife species in Canada from disappearing, to provide for the recovery of wildlife species that are Extirpated (no longer exist in the wild in Canada), Endangered, or Threatened as a result of human activity, and to manage Species of Special Concern to prevent them from becoming Endangered or Threatened."

8.1.2.2 Provincial guidance

The Endangered Species and Ecosystems Act

Endangered species are protected provincially under *The Endangered Species and Ecosystems Act* (C.C.S.M., c. E111) (MESEA). The purposes of this Act are:

- to ensure the protection, and to enhance the survival of, Endangered and Threatened species and Species of Special Concern in the province
- to enable the reintroduction of Extirpated species into the province
- to conserve and protect Endangered and Threatened ecosystems in the province and promote the recovery of those ecosystems.

The Threatened, Endangered and Extirpated Species Regulation (M.R. 25/98) lists plants and wildlife considered Threatened, Endangered and Extirpated in the province.

The Canadian Council of Ministers of the Environment (1999) and The Water Protection Act

Surface water quality is managed according to federal guidelines and provincial standards, objectives, and guidelines. The Canadian Council of Ministers of the Environment (Canadian Council of Ministers of the Environment 2001) maintains guidelines for the protection of aquatic life for many water quality parameters. These guidelines are generally applied in environmental assessment to mitigate project activities so that the CCME (Canadian Council of Ministers of the Environment 2001) guidelines are not exceeded, where it is considered technically and economically feasible to do so.

The water quality of watercourses in Manitoba is protected under *The Water Protection Act* (C.C.S.M. c. W65) through the Manitoba Water Quality Standards, Objectives, and Guidelines (Manitoba Water Stewardship 2011).

8.1.3 Consideration of feedback from project engagement

Ongoing project engagement (Chapter .0) actively sought to provide opportunities to provide VC related feedback about the project.

There were no specific concerns raised for fish and fish habitat during project engagement.

8.1.4 Potential effects, pathways, and measurable parameters

The potential project effects on fish and fish habitat, along with effects pathways and measurable parameters are outlined in Table 8-1.

Table 8-1: Potential effects, effects pathways, and measurable parameters for fish and fish habitat

Potential Effect	Effect Pathway	Measurable Parameter(s)
Change in fish habitat	Construction activity on land adjacent to waterbodies supporting fish habitat resulting in changes to: • bank stability, increased erosion potential • loss of riparian habitat	Areal extent (m^2) based on fish habitat type and quality (riparian areas, and habitat functionality)
Change in fish mortality risk	Sedimentation • Mobilization and transport of sediment resulting in fish mortality from gill abrasion and/or limited foraging ability • mortality of fish eggs Change in timing, duration, and frequency of flow (e.g., ice bridges and snow fill, temporary water diversion) resulting in fish mortality by stranding, entraining, or impinging fish, or by preventing access to spawning areas Entry of a deleterious substance into a waterbody through spills from vehicles, equipment, or containers	Direct mortality of fish estimated by species, numbers, and age classes killed

8.1.5 Spatial boundaries

Three spatial boundaries are used to assess residual and cumulative environmental effects of the project on fish and fish habitat:

Project development area (PDA): the project footprint and anticipated area of physical disturbance during construction, operation, and decommissioning of the project.

Local assessment area (LAA): The LAA represents the area where direct effects on fish and fish habitat would be most pronounced or identifiable. The LAA for stream crossings extends 100 m upstream and 300 m downstream from the closest point of the transmission line centreline to the river, and 30 m up-bank from the high-water mark. The 30 m distance is listed in Table A-1 of the Canada Energy Regulator Filing Manual (Canada Energy Regulator 2020) and is recommended as an acceptable distance to protect the riparian area and to buffer effects that construction could have on fish and fish habitat (Alberta Environment and Sustainable Resource Development 2012).

The boundaries for the project were derived from the Alberta Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body (Alberta Environment 2001); (Alberta Environment and Sustainable Resource Development 2013). The Code of Practice guidelines establish an expected zone of impact for watercourse crossings. The zone of impact is the area of direct disturbance at the watercourse crossing site (i.e., the PDA) plus the area where 90% of the sediment potentially generated during construction would be deposited.

Regional assessment area (RAA): The RAA encompasses the boundaries of the lower Nelson River sub-watershed (Map 8-1). The sub-watershed-based RAA boundary was selected to encompass regional aquatic health.

The RAA is the area where any cumulative environmental effects for fish and fish habitat relevant to the project are likely to occur. This includes portions of a watercourse or waterbody where the zone of influence of other projects within the watershed could interact with the project or where population effects could be seen.

8.1.6 Temporal boundaries

The primary temporal boundaries for the assessment of project effects on fish and fish habitat are based on the timing and duration of project activities as follows:

- Construction – Anticipated to start in December 2024 and be completed by July 2026. Station work to occur year-round, transmission line construction to occur under frozen conditions.
- Operations and maintenance – for the life of the project, estimated to be a 75-year design life.
- Decommissioning – estimated to be two years once the project has reached the end of its serviceable life.

8.1.7 Residual effects characterization

Table 8-2 provides the definitions used to characterize the residual effects on fish and fish habitat.

Table 8-2: Characterization of residual effects on fish and fish habitat

Characterization	Description	Quantitative measure or definition of qualitative categories
Direction	The long-term trend of the residual effect	**Positive –** a residual effect that moves measurable parameters in a direction beneficial to fish and fish habitat relative to baseline. **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to fish and fish habitat relative to baseline. **Neutral –** no net change in measurable parameters for fish and fish habitat relative to baseline.
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Negligible –** no measurable change in the effect can be noted. **Low –** a measurable change to fish and fish habitat that is within applicable guidelines, legislated requirements and/or federal and provincial management objectives, or that does not affect the sustainability and productivity of fish populations **Moderate –** Measurable change in fish and fish habitat that is not within applicable guidelines, legislated requirements and/or federal and provincial management objectives but does not affect sustainability and productivity of fish populations **High –** Measurable change in fish and fish habitat that is not within applicable guidelines, legislated requirements and/or federal and provincial management objectives, and that is likely to affect

Table 8-2: Characterization of residual effects on fish and fish habitat

Characterization	Description	Quantitative measure or definition of qualitative categories
		sustainability and productivity of fish populations
Geographic Extent	The geographic area in which a residual effect occurs	**PDA –** residual effects are restricted to the PDA **LAA –** residual effects extend into the LAA **RAA –** residual effects extend into the RAA
Duration	The time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Short-term –** the residual effect is restricted to the construction phase **Medium-term –** the residual effect extends through to completion of post-construction reclamation **Long-term -** the residual effect extends for the life of the project
Frequency	Identifies how often the residual effect occurs and how often during the project or in a specific phase	**Single event** **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and reclamation **Irreversible –** the residual effect is unlikely to be reversed

8.1.8 Significance definition

A significant adverse residual environmental effect on fish and fish habitat is defined as one that results in any of the following:

- The harmful alteration disruption or destruction of fish habitat of a spatial scale, duration or intensity that directly or indirectly impairs the habitat's capacity to

support one or more life processes of fish as outlined in the Fish and Fish Habitat Protection Policy Statement (Fisheries and Oceans Canada 2019)
- The death of fish because of the project, considering the relative contribution of the potentially affected fish and their habitat to the productivity of the relevant fisheries
- Changes to water quality parameters, because of the project, that exceed Manitoba's Water Quality Standards, Objectives and Guidelines (Manitoba Water Stewardship 2011) which provide recommended limits for chemical constituents and water quality conditions aimed to protect aquatic life

8.2 Project interactions

As outlined in Table 8-3, project activities that will interact with fish and fish habitat include:

Construction

- Vehicle and equipment use
- Right-of-way clearing
- Watercourse crossings

Operations and Maintenance

- Vehicle and equipment use
- Vegetation management

Decommissioning

- Vehicle and equipment use

Table 8-3 identifies, for each potential effect, the physical activities that might interact with fish and fish habitat to result in the identified effect.

Table 8-3: Project interactions with fish and fish habitat

Project activity	Change in fish habitat	Change in fish mortality
Transmission Line Construction		
Vehicle and equipment use	–	✓
Right-of-way clearing	✓	✓
Watercourse crossings	✓	✓
Transmission Line and Station Operation and Maintenance		
Vehicle and equipment use	–	✓
Vegetation management	✓	✓

Table 8-3: Project interactions with fish and fish habitat		
Project activity	Change in fish habitat	Change in fish mortality
Decommissioning		
Vehicle and equipment use	–	✓
✓ = Potential interaction		
– = No interaction		

8.3 Existing conditions

Baseline information for this assessment was gathered through a detailed review of available desktop data, engagement results, and regulator information. The existing conditions described in this section focus on:

- Water quality
- Fish species including species at risk
- Riparian vegetation

8.3.1 Nelson River basin

The Nelson River basin consists mostly of Canadian Shield; however, the easternmost extent is on the Hudson Bay coastal plain (Mills, et al. 1976).

Marsh and bog areas are common throughout and the landscape is generally hummocky and predominated by small to medium sized, oval, and rounded lakes with smooth shorelines.

Many larger lakes exist; often shallow with irregular rocky shorelines (Cleugh 1974); (Schlick 1972); (Veldhuis, Mills and Forrester 1979). Riparian vegetation typically consists of a combination of alders, birch, larch, sphagnum, poplar, sedge, spruce, or willow (Mills, et al. 1976).

The Lower Nelson River sub-basin begins at Split Lake and flows northeast. The sub-basin includes the Nelson River mainstem and Split Lake as well as numerous headwater lakes and tributaries of these water bodies.

8.3.2 Surface water quality

Water quality in the Nelson River basin is influenced by glacio-lacustrine deposits which overly the Precambrian bedrock (Hecky and Ayles 1974).

Although lakes in this region may be considered Precambrian in nature, the water is somewhat harder, more nutrient rich, and turbid than typical shield lakes, primarily due to the presence of the glacio-lacustrine deposits (Hecky and Ayles 1974).

Lakes within this area are generally similar in chemical composition and are predominantly isothermal throughout the summer (Hecky and Ayles 1974); (Cleugh 1974); (Bezte and Kroeker 2000).

The isothermal nature of the lakes throughout most of the open-water season can be attributed to shallow average depths and turbulent flows throughout the riverine sections of the system. These characteristics, combined with the presence of glaciolacustrine clays, and the potential for wind-induced mixing, result in relatively high-water turbidity (Cleugh 1974).

As part of studies conducted for the Keeyask generation project from 1999-2006 (Keeyask Hydro Power Partnership 2012), detailed water quality data was collected for the study area. These studies found that the Nelson River mainstem in the study area was moderately nutrient rich, well-oxygenated, moderately soft to hard, and had a slightly alkaline pH largely due to the bicarbonate ion.

Total phosphorus and dissolved oxygen concentrations on the mainstem and tributaries were within the applicable water quality guidelines.

Streams south of Stephens Lake were moderately nutrient-rich, near-neutral, and contained higher concentrations of organic carbon (OC) than the mainstem of the Nelson River. Some streams had low DO levels that did not meet or were very close to the Manitoba water quality standards objectives and guidelines for the protection of aquatic life (Manitoba Water Stewardship 2011). This agreed with data from stream crossing assessments collected as part of the Keeyask Transmission Study in 2009, which found fish habitat in many of the streams assessed was likely limited by dissolved oxygen levels.

8.3.3 Fish species

The Nelson River supports a diverse fish community. Between Gull Rapids and Stephens Lake, common large-bodied fish species include lake whitefish, longnose sucker, northern pike, walleye, and white sucker (MacDonald 2007); (Pisiak 2005).

Common small-bodied species include emerald shiner, rainbow smelt, spottail shiner, and trout perch (Pisiak 2005).

Lake sturgeon have also been captured in this reach of the Nelson River and use the Gull Rapids area for spawning and rearing (Barth and Ambrose 2006); (Barth and Murray 2005); (Barth and Mochnacz 2004).

Fish community assessments were conducted as part of the Keeyask Environmental Studies Program from 1997-2008 (Keeyask Hydro Power Partnership 2012) within the Keeyask generation project study area.

A total of 37 fish species were identified as occurring in the study area. The principal large-bodied species included walleye, sauger, northern pike, yellow perch, burbot, lake whitefish, cisco, longnose sucker, white sucker, and lake sturgeon.

The most common small-bodied species included spottail shiner, emerald shiner, and trout-perch.

8.3.3.1 Streams south of Stephens Lake

The Butnau and Kettle rivers, as well as several other smaller creeks south of Stephens Lake were assessed as part of the Keeyask Environmental Studies Program (Keeyask Hydro Power Partnership 2012). Stream assessments were also conducted as part of the Keeyask Transmission Project in 2009 (North/South Consultants Inc. 2012). Most smaller creeks assessed were found to have pool habitat with low water velocities, and wide, saturated floodplains. They usually drained upstream bog/fen areas, and/or small headwater lakes. Beaver activity was common, and substrates were usually fine organics. Cover was abundant in the form of instream and overhanging vegetation.

The Butnau and Kettle rivers were found to be used extensively by northern pike, with suitable spawning habitat found in both rivers in areas with low to moderate velocity environments, variable water depths, soft substrates, and submerged vegetation.

Walleye were relatively uncommon in both rivers; however suitable spawning habitat existed in the Butnau River diversion channel and the lower Kettle River. White and longnose sucker were found to spawn in both rivers as well. Lake whitefish were uncommon in the Kettle/Butnau river system.

The smaller creeks were found to support forage fish species such as brook stickleback, fathead minnow, and longnose dace. Potential forage, spawning, and rearing habitat existed for forage fish and overwintering potentially occurred in deeper pools.

Northern pike were also captured in some of the smaller creeks. These creeks were characterized by minimal flows after spring freshet, and stagnant conditions due to beaver dams, low stream gradients, and broad floodplains.

Most creeks likely froze to the bottom in winter in most areas. Use by large-bodied fish was likely limited by these low water conditions.

8.3.4 Species at risk

Lake sturgeon occur throughout the study area in the riverine and lacustrine portions of the Nelson River. First Nations have identified lake sturgeon as a culturally important species. It has also been assessed as a heritage species in Manitoba and recently, western Canada lake sturgeon populations (i.e., those in Manitoba, Saskatchewan, and Alberta) have been assessed as 'endangered' by COSEWIC.

Presently, lake sturgeon is under consideration for being listed under Schedule 1 of Canada's *Species at Risk Act* (SARA).

The area also has one introduced species; the rainbow smelt, which was first reported in Stephens Lake in 1996 (Remnant, Graveline and Bretecher 1997).

8.3.5 Riparian vegetation cover at watercourse crossings

Riparian vegetation (within the proposed right-of-way and 30 m from the water's edge) was characterized at each potential fish-bearing watercourse crossing. Existing landcover within the PDA was categorized (as described in Table8-4). The percentage of each landcover class in the riparian area was estimated (Table 8-5).

Analysis of the areal extent of riparian vegetation is focused on land cover types that can have a moderate to high contribution to fish habitat quality.

In 8 of 24 watercourses, riparian vegetation within the PDA was classified as being greater than 90% exposed land. Exposed land provides low contribution to fish habitat quality. At least half of the riparian area in 7 of the crossings is forested. These sites will be altered the most by the project as trees will be removed but shrubs and grasses will be left as is.

Table 8-4: Land cover categories and habitat quality

Land cover class / definition	interaction with fish habitat
Exposed land	
<5% vegetation including river sediments, exposed soils, pond, or lake sediments, burned areas, road surfaces, mudflat sediments, cutbanks, moraines, gravel pits, tailings, railway surfaces, buildings and parking, or other non-vegetated surfaces.	Low contribution to fish habitat quality – Developed areas provide little shade, contribute to erosion and can be a source of salt, sand, petroleum products, entering adjacent watercourses

Table 8-4: Land cover categories and habitat quality

Land cover class / definition	interaction with fish habitat
Forested	
Wetland and upland coniferous, mixed, or deciduous trees.	Highest contribution to fish habitat quality - Native vegetation has established root systems which can reduce erosion. Forested and treed areas provide good shade, moderating water temperature, provides structure and cover and moderates nutrient input.
Shrubs / grass	
Land where the sod layer has never been converted to agricultural production, tilled or seeded and dominated by native plant species; predominately native grass and herbaceous species or land dominated by woody, multi-stemmed plants, or trees 3 m in height or less dominated by shrub species.	Moderate contribution to fish habitat quality - Native upland vegetation has established root systems which can reduce erosion. Shrubland provides moderate shade, structure and cover and nutrient input.

Table 8-5: Riparian vegetation cover at each watercourse crossing

Site	Watercourse Name	Existing landcover % within the riparian PDA (% of riparian PDA)		
		Forested	Shrubs / Grass	Developed
Aqua-100	Kettle River	66	0	34
Aqua-101	Boots Creek	0	0	100
Aqua-102	Nelson River tributary	20	0	80
Aqua-103	Nelson River tributary	0	0	100
Aqua-104	Nelson River tributary	50	0	50
Aqua-105	Nelson River tributary	40	0	60
Aqua-106	Wilson Creek	95	5	0
Aqua-107	Nelson River tributary	11	0	89
Aqua-108	Nelson River tributary	51	0	49
Aqua-109	Nelson River tributary	71	0	29
Aqua-110	Nelson River tributary	35	4	61
Aqua-111	Nelson River tributary	100	0	0
Aqua-112	Nelson River tributary	33	0	67
Aqua-113	Nelson River tributary	18	0	82
Aqua-114	Nelson River tributary	0	0	100
Aqua-115	Brooks Creek	100	0	0
Aqua-116	Nelson River tributary	0	0	100
Aqua-117	Nelson River tributary	6	0	94
Aqua-118	Nelson River tributary	0	0	100
Aqua-119	Nelson River	0	0	100
Aqua-120	Nelson River tributary	0	27	73
Aqua-121	Nelson River tributary	37	0	63
Aqua-122	Nelson River tributary	28	0	72
Aqua-123	Nelson River tributary	0	0	100

8.3.6 Regional cumulative effects assessment findings

Manitoba Hydro (Manitoba Hydro 2016) conducted a regional cumulative effects assessment for hydroelectric developments on the Churchill, Burntwood and Nelson River systems.

The frequent dewatering of near-shore habitat downstream of the Limestone Generating Station daily is the most prominent water regime change resulting from Manitoba Hydro's system in this area. Erosion rates are generally low. The shorelines have been relatively stable since at least the 1950s and suspended sediment and turbidity conditions have been relatively steady since the 1970s.

Water quality conditions continue to fluctuate with the relative contribution of discharges from the Burntwood and upper Nelson rivers. Overall, water quality conditions have been suitable for the protection of aquatic life before and after hydroelectric development.

Impoundment by the generating stations has resulted in shifts in species composition and abundance in the reservoirs. At impoundment, species such as longnose sucker, lake whitefish and lake sturgeon appeared to move downstream out of the reservoirs.

Walleye numbers were higher in the reservoir than in the mainstem of the Nelson River but have recently declined.

Lake whitefish tend to be more abundant in the river downstream of the generating stations, but their abundance varies seasonally and among locations.

Brook trout, which inhabit primarily tributary streams, were adversely affected by several factors such as increased angling pressure.

Potential impacts to lake sturgeon include the loss of spawning habitat due to the generating station footprints, increased harvest due to the construction workforce and changes to water levels and flows affecting habitat conditions. While lake sturgeon in this area have been studied recently because there is little known about the historical populations, the effects associated with hydroelectric development cannot be quantified. Monitoring results indicate that the lake sturgeon population downstream of the Limestone Generating Station is the most abundant population in the Nelson River, and one of the largest populations in Manitoba.

8.4 Assessment of effects

While effects to fish and fish habitat could occur during construction, operation, and decommissioning, they should be most pronounced during construction.

8.4.1 Effects pathways

Fisheries and Oceans Canada pathways of effects (Fisheries and Oceans Canada 2023) were used to determine potential effects to fish and fish habitat. Figure 8-1 combines the two land-based activities relevant to the proposed project:

- Vegetation clearing
- Use of industrial equipment

There is no in-water work planned for the project. The final preferred route will create 24 water crossings where the project will interact with fish and fish habitat.

8.4.1.1 Vegetation clearing

The right-of-way is cleared to accommodate the construction of the transmission line. Post-construction, trees and understory vegetation are cleared to allow for safe and reliable operation. Clearing requirements may also require selective clearing of danger trees beyond the right-of-way.

According to Fisheries and Oceans Canada (Fisheries and Oceans Canada 2023), potential effects to fish and fish habitat related to vegetation clearing include:

- Change in water temperature
- Change in habitat structure and cover
- Change in nutrient concentrations
- Change in sediment concentrations
- Change in food supply
- Change in contaminant concentrations

Brief descriptions of each change are provided below.

Clearing of riparian vegetation, particularly the tree canopy that overhangs watercourses, could reduce cover for fish, reduce shade, which moderates water temperature, and reduce habitat for insects, which can be a food source for fish (Manitoba Water Stewardship 2021); (Manitoba Riparian Health 2015).

Increases in water temperature can diminish egg survival in species with lower thermal thresholds, as well as increasing fungal growth on eggs of summer spawning species (Carter 2005). Increases in water temperature can encourage the microbial breakdown of organic matter, leading to a depletion of dissolved oxygen in the watercourse, which is essential for sustaining aquatic life.

Low order stream communities in deciduous woodlands are energetically dependent upon litter materials (e.g. leaves and branches) contributed by riparian vegetation (Vannote, et al. 1980); (Benfield and Webster 1985); (Malmqvist and Oberle 1995).

Changes in litter inputs can have effects on invertebrate abundance, and in turn decrease food availability for fish.

The potential effects of tree clearing will decrease with increasing stream size. As stream size increases, the reduced importance of terrestrial organic input coincides with enhanced importance of primary production within the waterbody and organic transport from upstream (Vannote, et al. 1980).

The loss of riparian vegetation can also increase erosion and sedimentation, resulting in a change in substrate composition, and altering food supply through turbidity-related reductions in algae and aquatic insect production (Studinksi, et al. 2012). Increased siltation can also damage spawning grounds for species that require cobble substrate for spawning (Fudge, Wautier and Palace 2008). Increased turbidity can decrease light transmission through the water column, decreasing in-water vegetation growth, which is habitat for young fish.

High sediment concentrations may cause fish mortality because of heavy gill abrasion (Herbert and Merkins 1961); (Robertson, et al. 2006). At lower suspended sediment concentrations, the effects could include subtle behavioral changes in fish, such as avoidance reactions. These reactions could lead to higher energy expenditures by individual fish and affect territorial responses in some species (Newcombe and Jensen 1996); (Robertson, et al. 2006). At higher sublethal concentrations, the introduction of fine suspended sediment, such as silts and clays that increase turbidity, could induce effects such as reduced feeding efficiency, sense of smell, decreased visual acuity and predator/prey interactions (Newcombe and Jensen 1996). Silt and clay from erosion can carry contaminants such as pesticides into watercourses increasing fish exposure and causing harm to fish (increased mortality, reduced physiological function in adult fish and reduced egg survival (Levasseur, et al. 2006).

Increased sedimentation could also change the availability of invertebrates needed as food sources for fish (Suttle, et al. 2004); (Ramezani, et al. 2014). The reduced food source can affect fish mortality and health by reducing growth (Harvey, White and Nakamoto 2009) (Sullivan and Watzin 2010); (Kemp, et al. 2011).

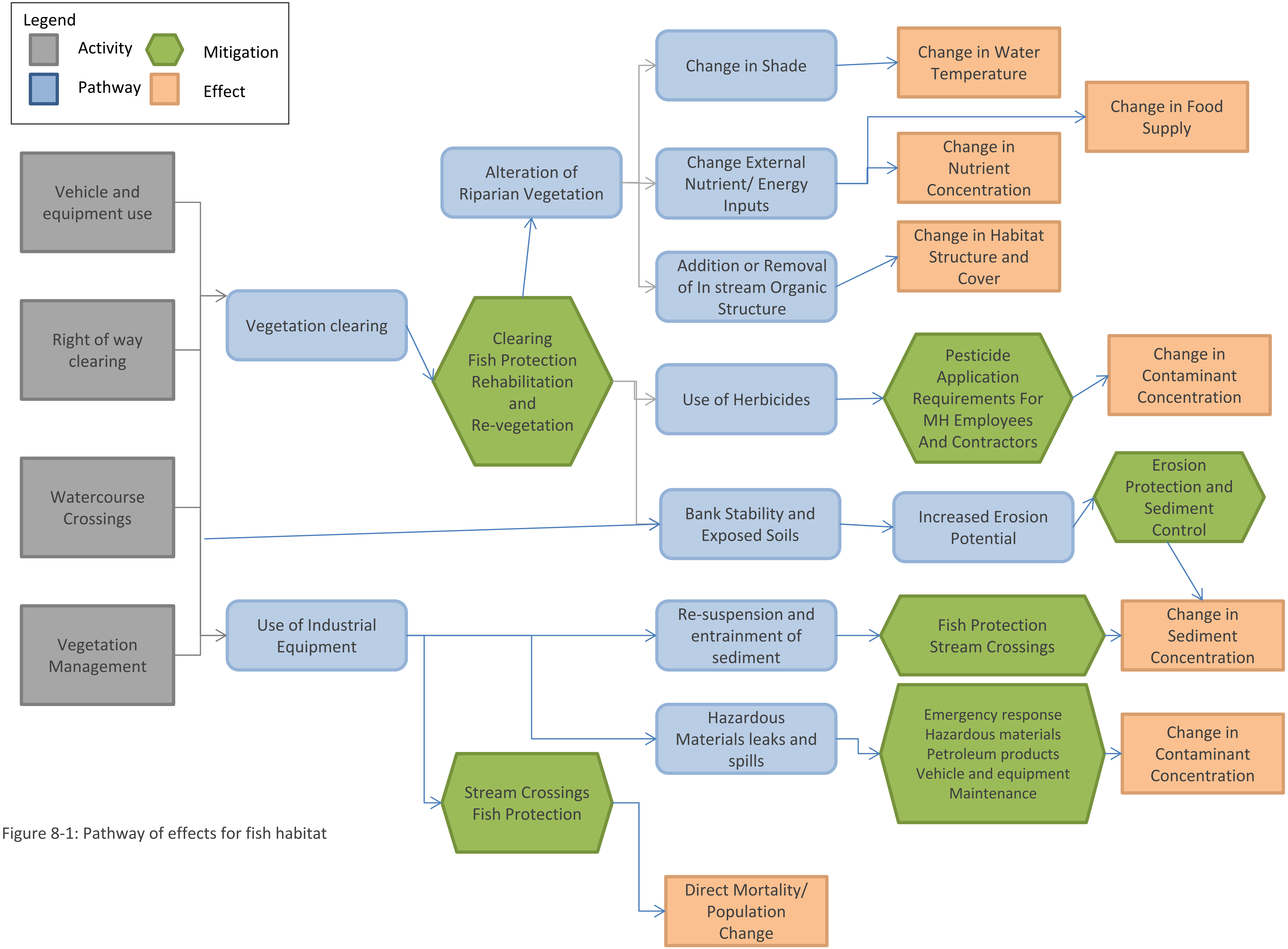


Figure 8-1: Pathway of effects for fish habitat

Herbicide treatment, during operations, in areas close to water could result in accidental (through spills) or unintentional (through aerial drift or runoff) entry into watercourses. Once in a waterbody, herbicides can reduce photosynthesis or other processes in primary producers (e.g., algae, macrophytes), thereby reducing biomass and distribution.

Table 8-5 provides the landcover types at each crossing.

There will be tree clearing required at 16 of the 24 crossings, ranging from 6% to 100% cover. This will alter fish habitat.

Vegetation management

During operation and maintenance, the primary activity that could interact with fish and fish habitat is vegetation management within the transmission line right-of-way.

Riparian vegetation management and potential use of herbicides to control noxious or invasive riparian vegetation species could affect fish health and mortality if the chemicals were sprayed, rinsed, or carried by sediment into a watercourse. The pH of watercourses may also be altered if contaminated sediments are washed into the watercourse. A change in watercourse pH can affect fish mortality and health.

8.4.1.2 Use of industrial equipment

According to Fisheries and Oceans Canada (Fisheries and Oceans Canada 2023), potential effects to fish and fish habitat that are related to use of industrial equipment include:

- Change in sediment concentrations
- Change in contaminant concentrations

Machinery operating near watercourses can create ruts and compact soils, especially in saturated, floodplain areas next to watercourses. Compacted soils can channelize water flow, leading to less infiltration and greater soil erosion which can cause increased sedimentation in watercourses.

Petroleum products such as gasoline and diesel fuels, oil, lubricants, and hydraulic fluids can leak from machinery, be released through maintenance and refuelling activities, and be released through accidental spills. If these situations occur close to a watercourse, these deleterious substances can enter a watercourse, and directly or indirectly affect aquatic organisms (including fish).

Many hydrocarbon products are persistent and will remain in sediments for long periods of time and accumulate in higher organisms in the aquatic food web.

During the operational phase of the project, potential effects relate to herbicides entering the watercourse from vegetation management activities. The use of herbicides, if not applied according to label and pesticide use permit instructions, could lead to release of contaminants to adjacent waterways.

Effects from deleterious substances entering the watercourse can range from lethal to sub-lethal, depending on the volume, concentration, and the substance in question.

8.4.1.3 Species at risk

Lake sturgeon occur throughout the regional assessment area in the riverine and lacustrine portions of the Nelson River. Potential direct project effects should not extend to the Nelson River and therefore should not directly affect lake sturgeon.

8.4.2 Mitigation measures

Standard industry practices and avoidance measures, along with project-specific mitigation as summarized in Chapter 17.0 will be implemented during project construction and operation. This section highlights the key mitigation measures to be implemented during construction and operation to limit effects to riparian areas and riparian habitat, which will minimize potential effects to fish and fish habitat.

Project-specific mitigation measures with respect to aquatic resources will be outlined in detail in the construction environmental protection plan, which will form part of the construction contract. Mitigation will include, but not be limited to:

- Designation of a buffer zone, at least 30 m from the ordinary high-water mark (Figure 8-2), around all waterbodies, which limits riparian vegetation removal to trees and tall shrubs.
- Designating machine-free zones, seven (7) m from the ordinary high-water mark, in riparian areas.
- Marking sensitive areas prior to clearing.
- Maintaining or promoting the growth of shrub species in riparian areas
- Keeping root systems intact during tree removal (thereby minimizing soil disturbance).
- Implementing erosion and sediment control measures where required for sensitive sites.
- Training work crews in spill prevention.
- Ensuring all petroleum and allied products will be handled in compliance with the requirements of Manitoba Regulation 188/2001.
- Storing petroleum and other products more than 100 m from the ordinary highwater mark of watercourses.

- Ensuring machinery is in good working order and free of leaks
- Having emergency spill kits on site
- Using only licensed applicators when herbicides are used
- Siting marshalling yards and borrow sites at least 30 m from watercourses to avoid interaction with fish and fish habitat

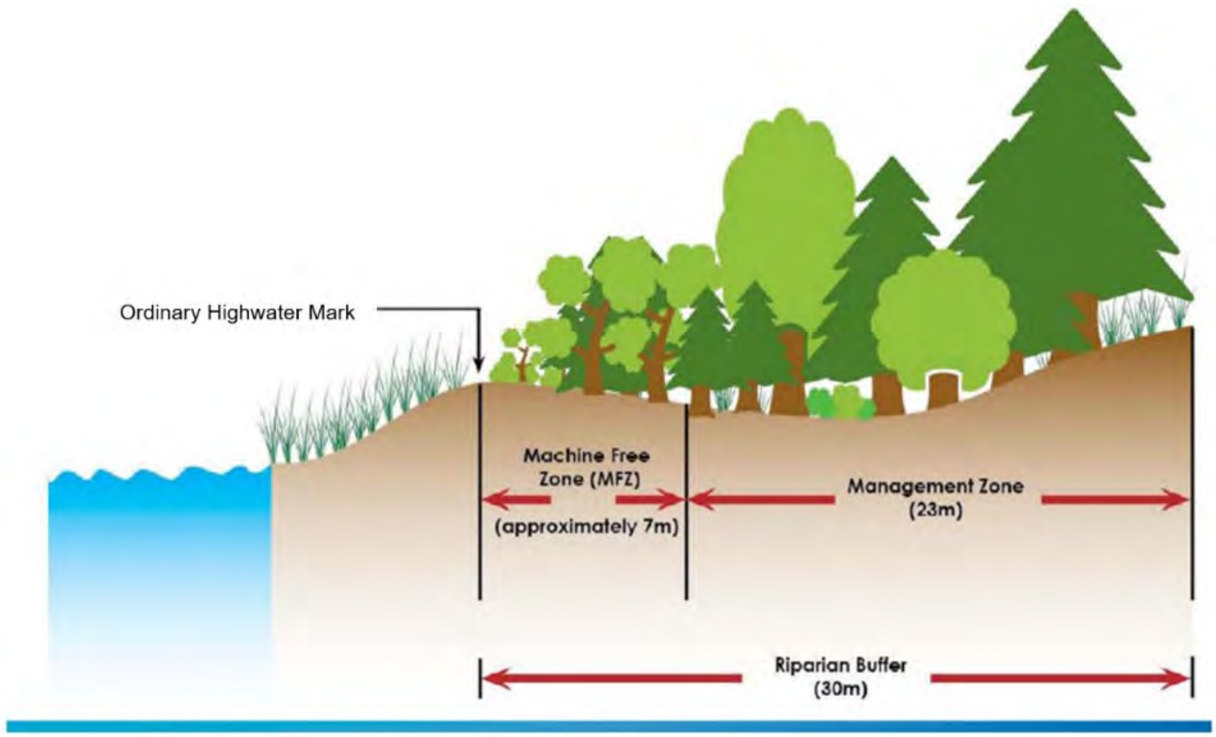


Figure 8-2: Riparian buffers and machine free zones

8.4.2.1 Restricted activity periods

The criteria for identifying restricted activity periods (RAPs) in Manitoba depends on the location of the in-water work and is based on Fisheries and Oceans Canada recommendations (Fisheries and Oceans Canada 2023). The RAPs take into consideration the species inhabiting the watercourse, and their spawning periods. Table 8-6 provides an overview of seasonal spawning times for common species within the RAA and the corresponding RAPs.

Table 8-6: Restricted activity periods for northern Manitoba

Northern Manitoba	Spring Spawning Fish	Summer Spawning Fish	Fall Spawning Fish

	April 15 to June 30	May 15 to July 15	September 1 to May 15

8.4.3 Characterizing residual effects

Table 8-2 describes the factors used to characterize the interactions between the project and fish and fish habitat.

The existing land use in the LAA can be characterized as disturbed because it is largely dominated by hydroelectric transmission development.

Activities associated with this existing dominant land use can increase suspended sediments and sediment in the bedload of adjacent watercourses.

8.4.3.1 Change in fish habitat

Fish could have life processes affected by increased sedimentation, particularly sensitive early life stages.

Analysis of the potential change in percent coverage of riparian vegetation types is focused on land cover categories in which the R44H project will have the largest potential impact.

Development of the right-of-way involves the removal of trees (forested areas), whereas grasses and shrubs will not be cleared. Land cover within the riparian areas was varied. Eight of 24 crossings were predominantly exposed land. No change from current conditions will occur at these sites. Seven of 24 sites had 50% or greater tree cover. These sites will be the most altered by the project.

8.4.3.2 Change in mortality risk

With the application of mitigation measures, residual effects to fish mortality are predicted to be not significant. Direct mortality is not anticipated as work and footprints above the high-water mark do not interact directly with fish. Installation of effective erosion and sediment control measures will effectively mitigate the potential for lethal and sublethal effects on fish and eggs in waterbodies within the PDA and LAA.

Risks of fish mortality associated with construction and vehicle use of ice bridges and snow fills used for temporary water crossings are expected to be mitigated by adhering to the DFO code of practice for Ice bridges and snow fills (Fisheries and Oceans Canada 2023).

8.4.3.3 Summary of residual effects

This assessment considers residual effects on fish and fish habitat after mitigation is implemented. There will be no harmful alteration, disruption, or destruction of fish habitat. There is no net change in fish habitat availability because similar habitat is available within and beyond the LAA. For project effects on fish and fish habitat, the residual environmental effects have been characterized as follows:

- Direction: Adverse
- Magnitude: Low
- Geographic extent: LAA
- Duration: Long-term
- Frequency: Regular
- Reversibility: Permanent

Table 8-7 characterizes the residual effect on fish and fish habitat

Table 8-7: Project residual effects on fish and fish habitat

Residual Effects Characterization						
Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility
Change in fish habitat						
Construction	Adverse	Low	LAA	Medium-term	Single event	Reversible
Operation	Adverse	Low	LAA	Medium-term	Continuous	Reversible
Decommissioning	Positive	Negligible	LAA	Short-term	Single event	Reversible
Change in fish mortality risk						
Construction	Adverse	Low	LAA	Short-term	Irregular	Irreversible
Operation	Adverse	Low	LAA	Medium-term	Irregular	Irreversible
Decommissioning	Adverse	Low	LAA	Short-term	Irregular	Irreversible

Due to the limited amount of riparian clearing required, and well tested mitigation measures to minimize erosion potential, the residual effects for fish and fish habitat are anticipated to be not significant.

8.4.4 Cumulative effects on fish and fish habitat

This section discusses the cumulative effects of the R44H transmission project and other existing or foreseeable future projects and activities on fish and fish habitat.

Table 8- lists the interactions between current and future projects/activities and fish and fish habitat. The existing transmission lines have potential interactions. Clearing along the same right-of-way has affected fish habitat and continued vegetation management will continue to do so. However, these inputs have been ongoing for decades or more and therefore are considered part of the baseline conditions.

The assessment of cumulative effects is initiated with a determination of whether two conditions exist:

- the project has residual effects on the VC and
- a residual effect could interact with residual effects of other past, present, or reasonably foreseeable future physical activities.

If either condition is not met, further assessment of cumulative effects is not warranted because the project does not interact cumulatively with other projects or activities.

8.4.4.1 Project residual effects likely to interact with fish and fish habitat

Table 8-8 shows the project and physical activities inclusion list which identifies past, ongoing, and potential future projects and physical activities that might act cumulatively with the project to impact fish and fish habitat. Where residual effects from the project act cumulatively with residual effects from other projects and physical activities, a cumulative effects assessment is carried out.

Table 8-8: Potential cumulative effects on fish and fish habitat

Other Projects and physical activities with potential for cumulative environmental effects	Potential cumulative environmental effects	
	Change in fish habitat	Change in fish mortality
Existing/ongoing projects and activities		
Domestic Resource Use (hunting, trapping, fishing)	-	✓

Table 8-8: Potential cumulative effects on fish and fish habitat

Other Projects and physical activities with potential for cumulative environmental effects	Potential cumulative environmental effects	
	Change in fish habitat	Change in fish mortality
Commercial resource use	✓	✓
Infrastructure (i.e., provincial trunk highways, provincial roads,	✓	–
Transmission lines	✓	–
Future projects and activities		
Kivalliq Hydro-Fibre Link	✓	✓

✓ = Other projects and physical activities whose residual effects are likely to interact cumulatively with project residual environmental effects.

– = Interactions between the residual effects of other projects and those of the project residual effects are not expected.

8.4.4.2 Change in fish habitat

Pathways for cumulative effect

The construction of the KHFL could lead to an increase in riparian clearing. The R44H transmission line project in combination with the KHFL will increase the clearing of riparian vegetation within the same watershed.

Depending on the mitigation strategies adopted for the KHFL project, there could be a cumulative adverse effect on fish and fish habitat, as described in Section 8.4.1.1.

Mitigation measures

Mitigation measures outlined in Section 8.4.2 will protect fish and fish habitat. It is assumed that similar measures would be in place for KHFL and the project will comply with Fisheries Act requirements.

Residual cumulative effect

The direction of the residual cumulative effects on fish habitat are expected to be adverse, with increase overall clearing in the watershed. The magnitude will be negligible as the rights-of-way are narrow, there will be modified clearing at water crossings, and the overall loss will be small. Geographic extent is the LAA. Duration is long term as the vegetation will be managed for the life of the project.

8.4.4.3 Change in fish mortality

Pathways for cumulative effect

The construction of the KHFL could lead to an increase in riparian clearing. The R44H transmission line project in combination with the KHFL will increase the clearing of riparian vegetation within the same watershed.

Depending on the mitigation strategies adopted for the KHFL project, there could be a cumulative adverse effect on fish and fish habitat, as described in Section 8.4.1.1.

Mitigation measures

Mitigation measures outlined in Section 8.4.2 will protect fish and fish habitat. It is assumed that similar measures would be in place for KHFL and the project will comply with Fisheries Act requirements.

Residual cumulative effect

The direction of the residual cumulative effects on fish mortality are expected to be adverse, with increased overall clearing in the watershed, leading to increased erosion and sedimentation. The magnitude will be negligible as the rights-of-way are narrow, there will be modified clearing at water crossings, and the overall loss will be small. Geographic extent is the LAA. Duration is long term as the vegetation will be managed for the life of the project.

8.4.5 Determination of significance

With mitigation and environmental protection measures, the residual effects on fish and fish habitat are predicted to be not significant.

8.4.6 Prediction confidence

Prediction confidence in the assessment of effects on fish and fish habitat is high. Transmission line stream crossings have been monitored on previous projects and the clearing prescriptions and ongoing maintenance have shown no impact to fish and fish habitat.

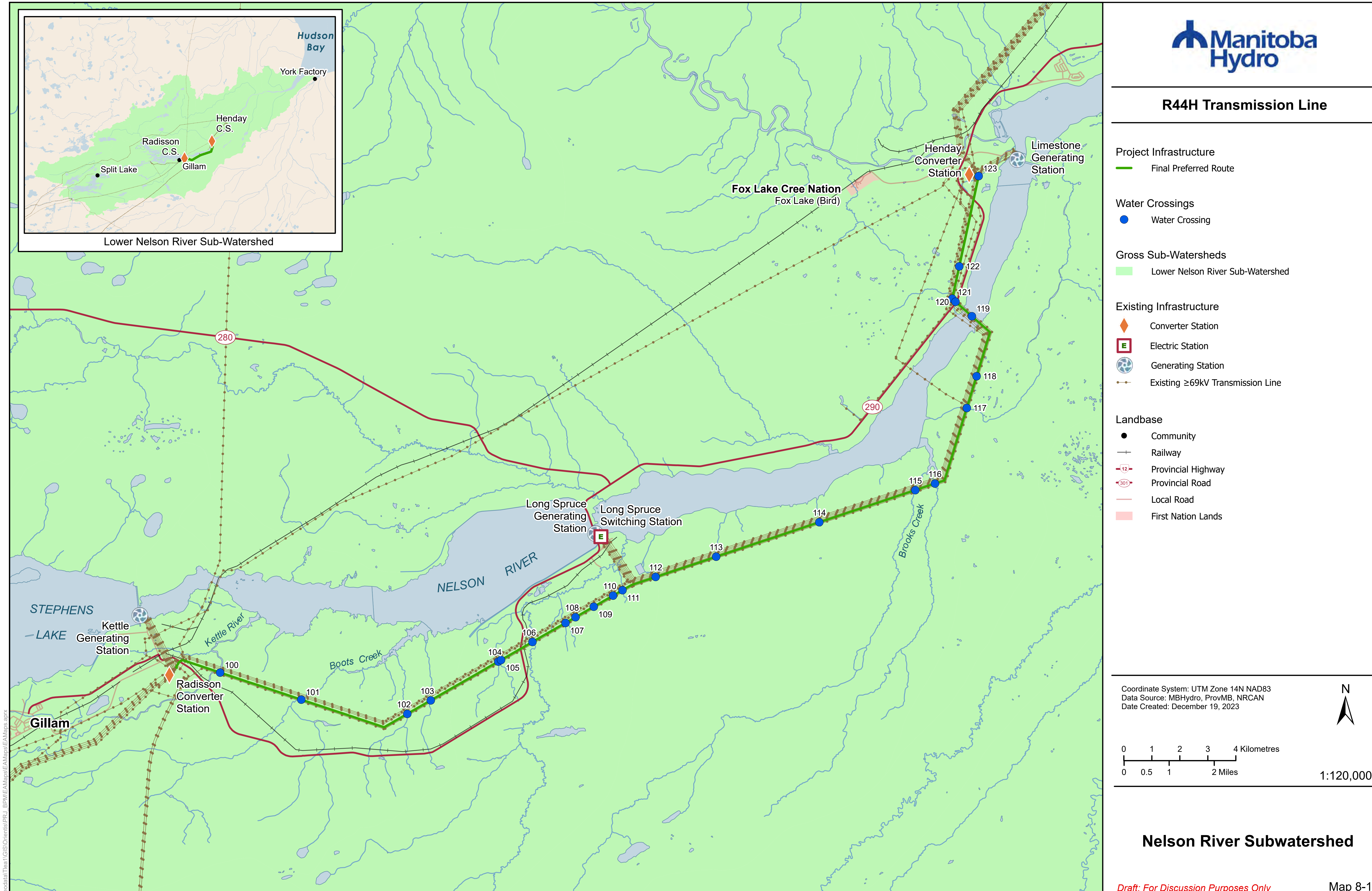
8.4.7 Follow-up and monitoring

Due to limited project interactions and well-established mitigation measures, monitoring related to fish and fish habitat concerns is not proposed for the project. If appreciable damage is observed, remediation efforts will be implemented, and a monitoring plan developed to address concerns at each site. Protections for fish and fish habitat will be implemented as part of the environmental protection program.

8.4.8 Sensitivity to future climate change scenarios

Effects of climate change on fish and fish habitat are expected to relate to the anticipated increase in temperatures, changes in precipitation patterns, and associated extreme weather events (e.g., flooding). Resulting effects on fish and fish habitat in the RAA may result in substantial change, from increases in maximum water temperatures that could exceed the lethal threshold for some species-to-species shifts.

Subtle changes in flow and temperature will alter thresholds of susceptibility; however, the predicted climate change scenarios would not change the significance determinations for fish and fish habitat, as they are not anticipated to measurably increase the magnitude of project-related effects on fish habitat availability or fish health and mortality.



Manitoba Hydro
R44H Transmission Line
Project Infrastructure
Final Preferred Route
Water Crossings
Water Crossing
Gross Sub-Watersheds
Lower Nelson River Sub-Watershed
Existing Infrastructure
Converter Station
Electric Station
Generating Station
Existing ≥69kV Transmission Line
Landbase
Community
Railway
Provincial Highway
Provincial Road
Local Road
First Nation Lands
Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023
N
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Nelson River Subwatershed
Draft: For Discussion Purposes Only
Map 8-1
Hudson Bay
York Factory
Henday C.S.
Radisson C.S.
Gillam
Split Lake
Lower Nelson River Sub-Watershed
Henday Converter Station
Limestone Generating Station
Fox Lake Cree Nation
Fox Lake (Bird)
280
290
Long Spruce Generating Station
Long Spruce Switching Station
NELSON RIVER
STEPHENS LAKE
Kettle Generating Station
Kettle River
Boots Creek
Brooks Creek
Radisson Converter Station
Gillam
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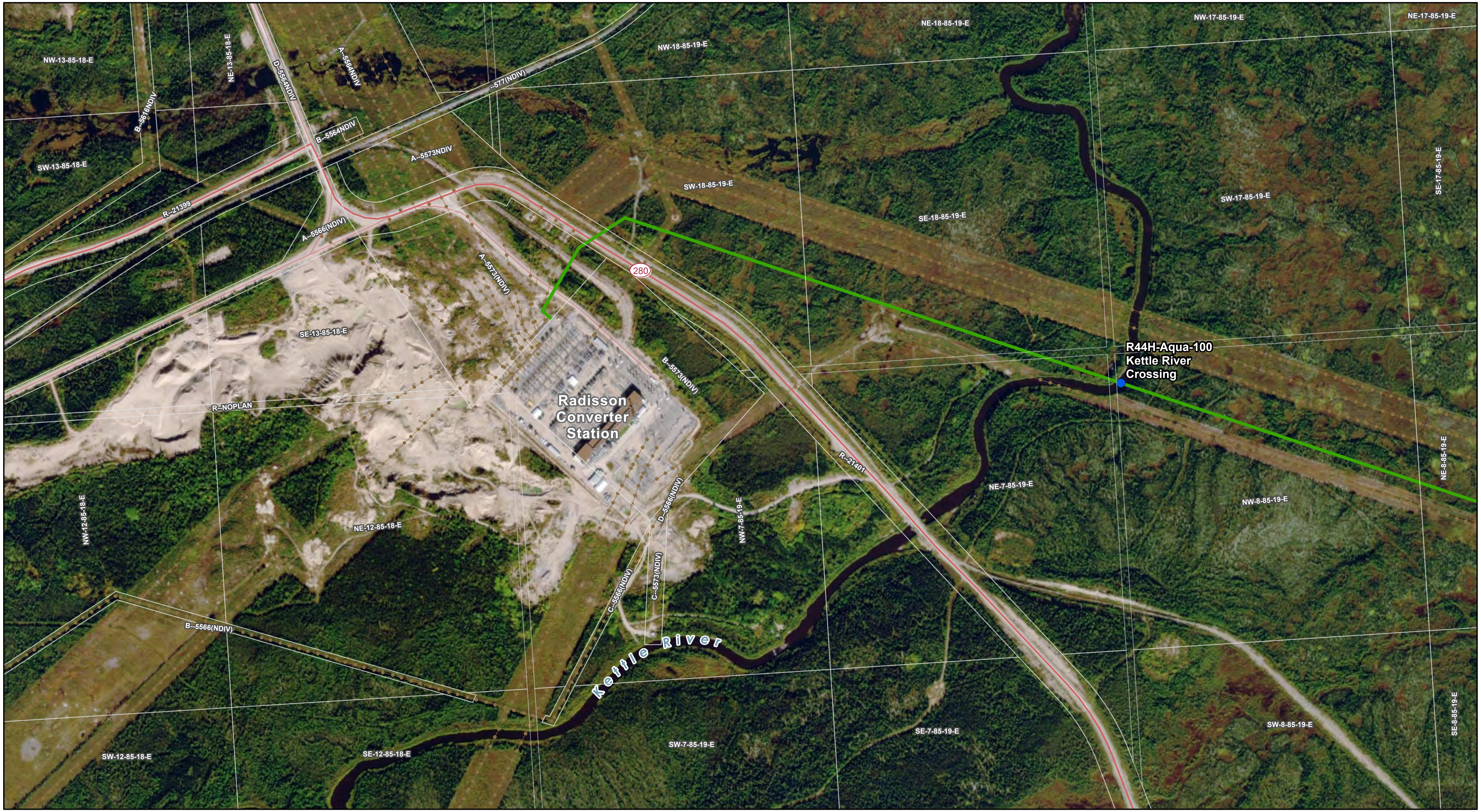

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Manitoba Hydro

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Data Source: MB Hydro, ProvMB, NRCAN
Date Created: December 20, 2023
Version: Draft

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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- R55H Route

Water Crossings
- Water Crossing

Service Layer Credits: World Imagery: Maxar

Water Crossing Locations

Map 1

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Manitoba Hydro

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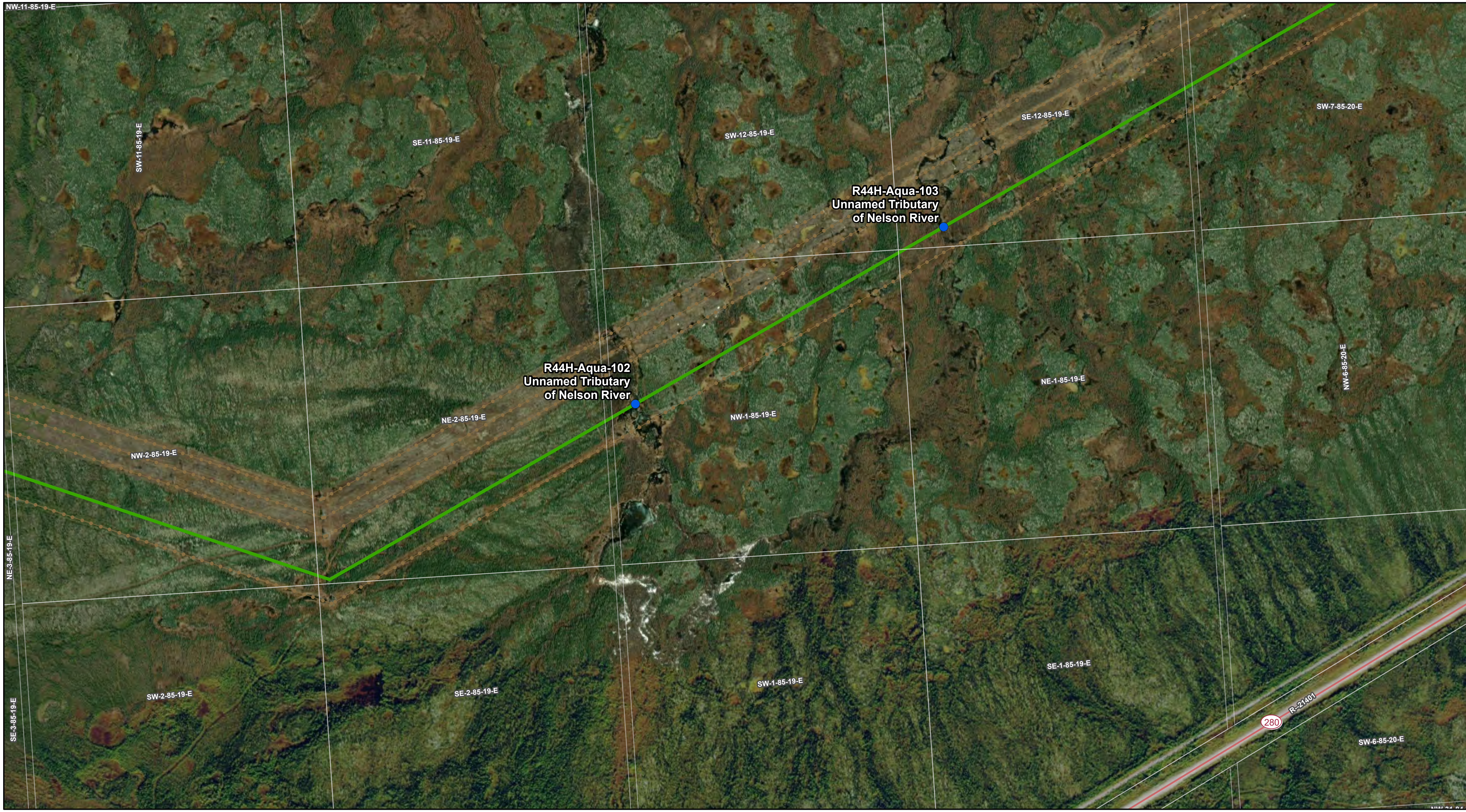
Water Crossing Locations

Map 2



Manitoba Hydro

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Existing Infrastructure
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Project Infrastructure
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Water Crossings
- Water Crossing

Water Crossing Locations

Map 3

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Existing Infrastructure
- Transmission Line

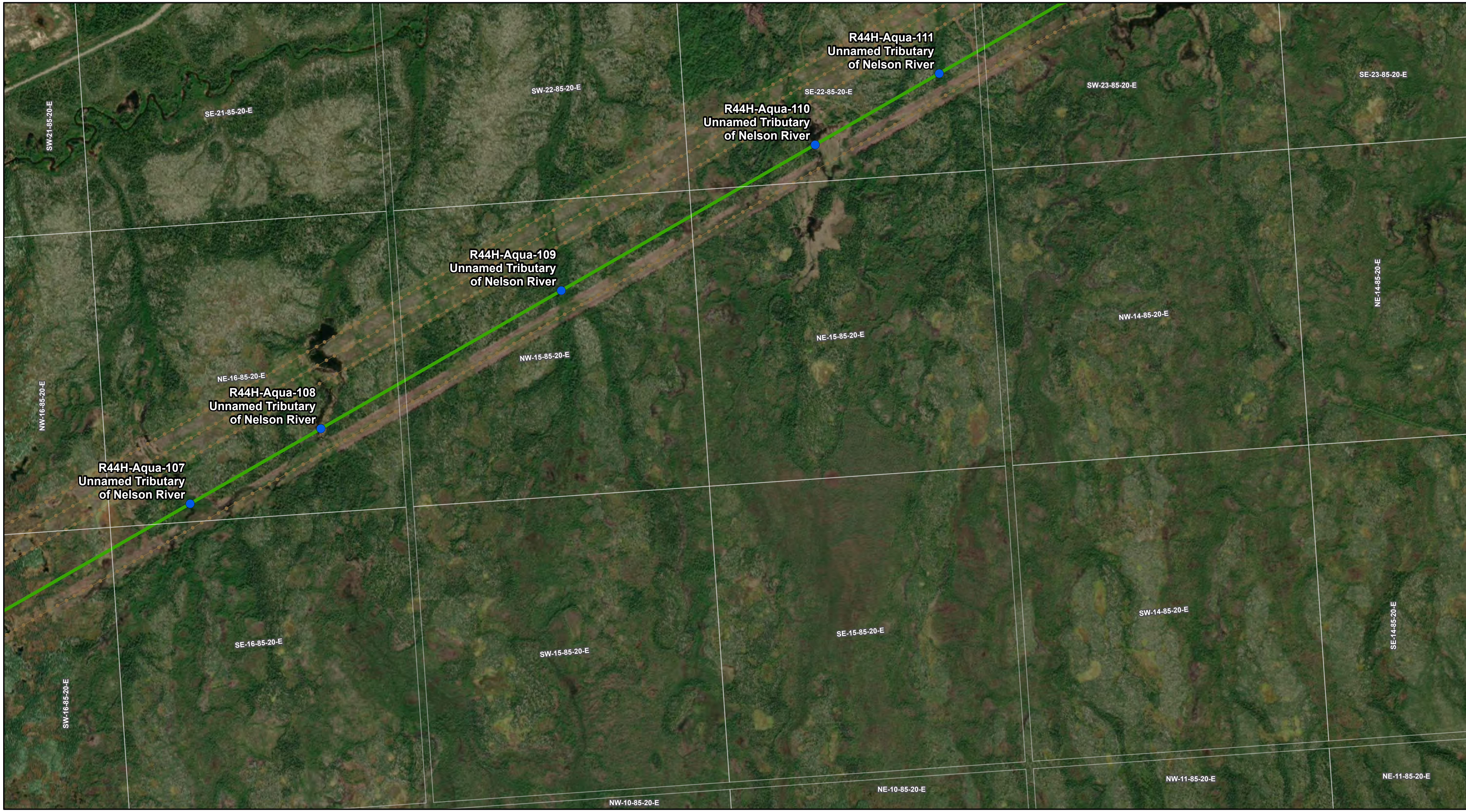
Project Infrastructure
- R55H Route

Water Crossings
- Water Crossing

Service Layer Credits: World Imagery: Maxar

Water Crossing Locations

Map 4



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Manitoba Hydro

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Date Created: December 20, 2023
Version: Draft

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- First Nation
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Existing Infrastructure
- Transmission Line

Project Infrastructure
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Water Crossings
- Water Crossing

Service Layer Credits: World Imagery: Maxar

Water Crossing Locations

Map 5

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Manitoba Hydro

Coordinate System: UTM Zone 14N NAD83
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Land Base
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- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- R55H Route

Water Crossings
- Water Crossing

Service Layer Credits: World Imagery: Maxar

Water Crossing Locations

Map 6

Manitoba Hydro

Coordinate System: UTM Zone 14N NAD83
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Version: Draft

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- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- R55H Route

Water Crossings
- Water Crossing

Service Layer Credits: World Imagery: Maxar

Water Crossing Locations

Map 7

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Manitoba Hydro

Coordinate System: UTM Zone 14N NAD83
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Date Created: December 20, 2023
Version: Draft

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- Railway (Discontinued)
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- Rural Municipality

Existing Infrastructure
- Transmission Line

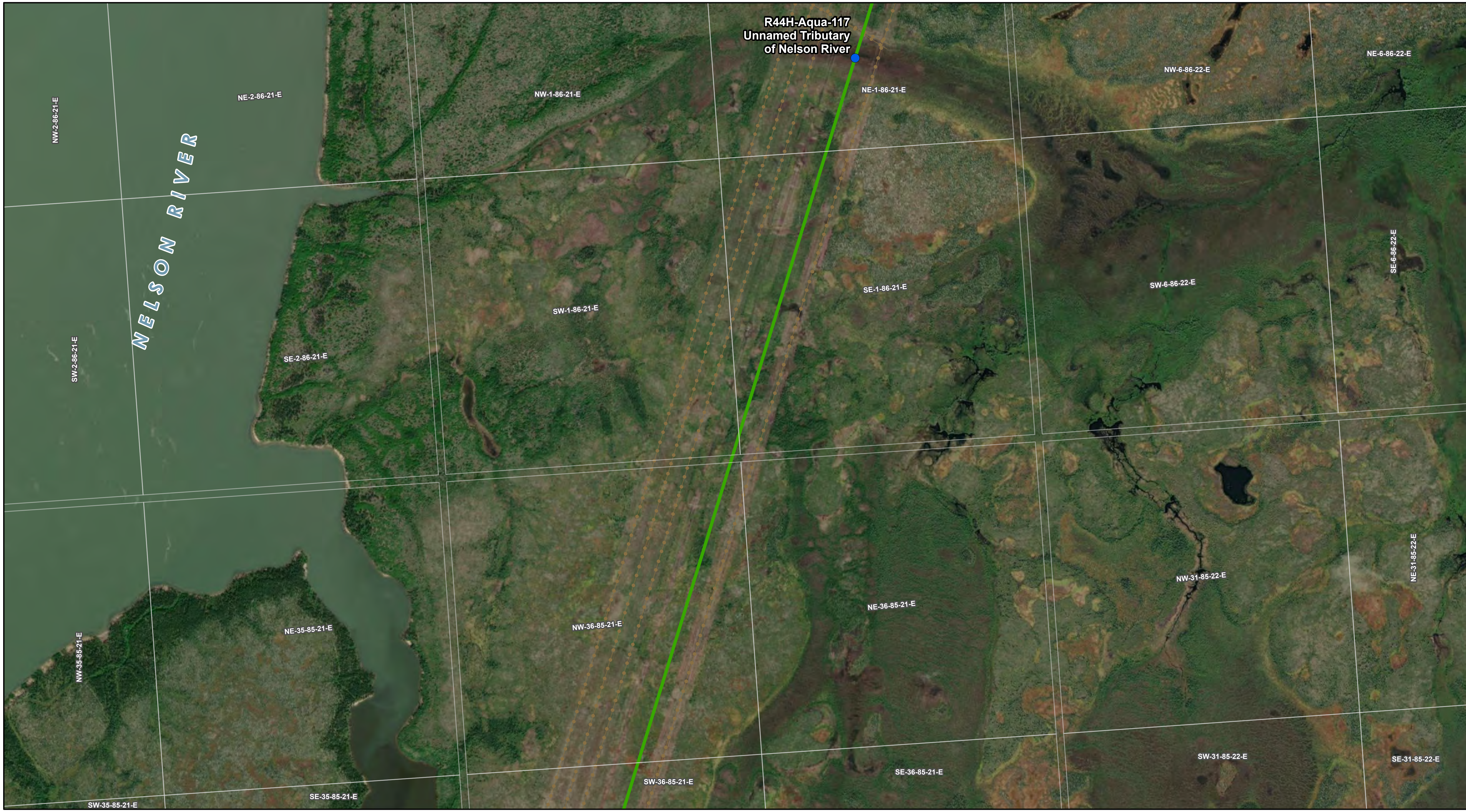
Project Infrastructure
- R55H Route

Water Crossings
- Water Crossing

Service Layer Credits: World Imagery: Maxar

Water Crossing Locations

Map 8



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Existing Infrastructure
- Transmission Line

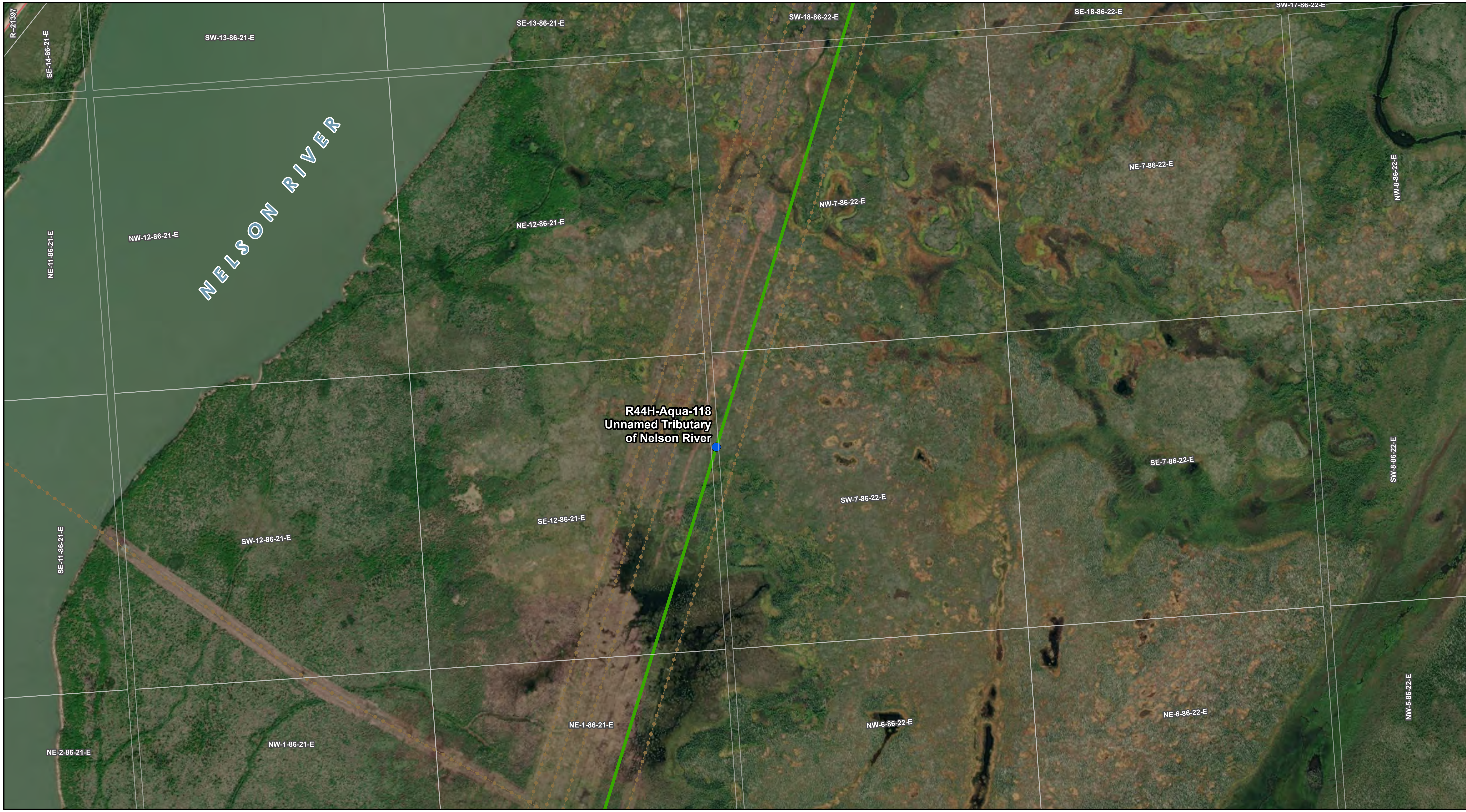
Project Infrastructure
- R55H Route

Water Crossings
- Water Crossing

Service Layer Credits: World Imagery: Maxar

Water Crossing Locations

Map 9



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- Transmission Line

Project Infrastructure
- R55H Route

Water Crossings
- Water Crossing

Service Layer Credits: World Imagery: Maxar

Water Crossing Locations

Map 10

DOCUMENT PATH: \\GEODATA\TLEA1\GIS\ORIENT\S\PRJ_BPM\ANALYSIS\20230301 WATERCROSSINGS DBLOCK\WATERCROSSINGS.APRX

Manitoba Hydro

Coordinate System: UTM Zone 14N NAD83
Data Source: MB Hydro, ProvMB, NRCAN
Date Created: December 20, 2023
Version: Draft

0 125 250 500
Metres

1:10,000

Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- R55H Route

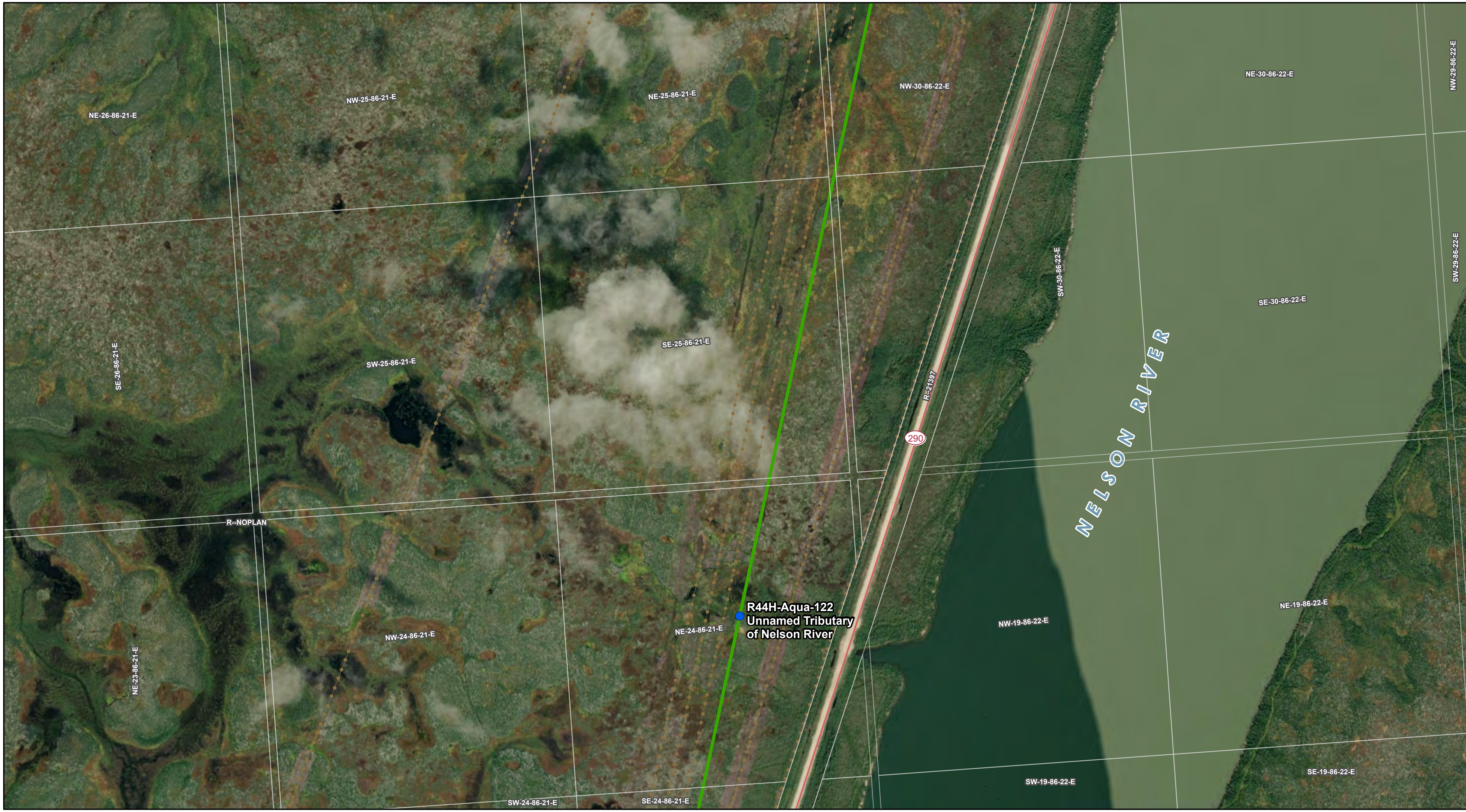
Water Crossings
- Water Crossing

Service Layer Credits: World Imagery: Maxar

Water Crossing Locations

Map 11

DOCUMENT PATH: \\GEODATA\LEA1\GIS\ORIENT\S\PRJ_BPM\ANALYSIS\20230301 WATERCROSSINGS DBLOCK\WATERCROSSINGS.APRX



Manitoba Hydro

Coordinate System: UTM Zone 14N NAD83
Data Source: MB Hydro, ProvMB, NRCAN
Date Created: December 20, 2023
Version: Draft

0 125 250 500
Metres
1:10,000

Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- R55H Route

Water Crossings
- Water Crossing

Service Layer Credits: World Imagery: Maxar

Water Crossing Locations

Map 12

DOCUMENT PATH: \\GEODATA\TLEA1\GIS\ORIENT\S\PRJ_BPM\ANALYSIS\20230301 WATERCROSSINGS DBLOCK\WATERCROSSINGS.APRX

Manitoba Hydro

Coordinate System: UTM Zone 14N NAD83
Data Source: MB Hydro, ProvMB, NRCAN
Date Created: December 20, 2023
Version: Draft

0 125 250 500
Metres
1:10,000

Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- R55H Route

Water Crossings
- Water Crossing

Service Layer Credits: World Imagery: Maxar

Water Crossing Locations

Map 13

9.0 Harvesting and recreation

Harvesting refers to activities such as hunting, fishing, trapping, and gathering wildlife, birds, medicines, food plants and other natural materials. Recreation refers to activities or experiences undertaken for enjoyment, relaxation, and leisure.

For the purposes of this assessment, harvesting refers to both rights-based harvesting and non-rights-based harvesting including commercial harvesting and non-commercial harvesting by non-Indigenous peoples.

Holistically speaking, rights-based harvesting includes the practice of harvesting, the resulting knowledge gained from taking part in harvesting, harvesting success, and the harvesting experience integral to distinct First Nation and Métis cultures. These are important traditional practices for many First Nations peoples and Red River Métis citizens and can be central to providing food and income for one's family, as well as supporting the transmission of culture, traditions, and knowledge in the present and for future generations.

Non-rights-based harvesting refers to harvesting activities undertaken by non-Indigenous peoples or harvesting undertaken for sport/recreation or commercial purposes. Commercial harvesting includes forestry operations and commercial trapping.

In addition to recreational hunting and fishing (i.e., recreational harvesting), other recreational activities in the project area may include snowmobiling, riding all-terrain vehicles (ATVs), hiking, and tourism.

Harvesting and recreation was selected as a valued component because of regulatory considerations and its importance to Indigenous peoples and communities, non-Indigenous resource users (e.g., hunters, fishers, and trappers, commercial operators), and the public.

For other recent transmission projects in Northern Manitoba (e.g., Bipole III transmission project and Keeyask transmission project), project effects to harvesting and recreation were assessed under different but similar valued component names (i.e., Land and Resource Use for the Keeyask transmission project, and Land Use and Resource Use for the Bipole III transmission project). For this assessment, we adopted harvesting and recreation as the VC name as this name resonates with feedback that we have received and VC names for recent transmission projects.

9.1 Scope of the assessment

This section assesses the effects of project activities during construction, operation and decommissioning on harvesting and recreation. An assessment of cumulative effects on harvesting and recreation is also presented (if applicable).

This assessment was influenced by engagement feedback and Manitoba Hydro's experience with other recent transmission line projects in Northern Manitoba (e.g., the Bipole III Transmission Project (Manitoba Hydro 2011) and the Keeyask Transmission Project (Manitoba Hydro 2012)). The assessment considers the following:

- Feedback heard through project engagement (Chapter 3.0)
- Bipole III Transmission Project (2011) environmental impact statement and monitoring reports
- Keeyask Transmission Project (2012) environmental assessment and monitoring reports

Where appropriate and permitted, understandings from studies completed for previous transmission projects have been included in this chapter.

9.1.1 The project

The scope of the project consists of the construction, operation, and decommissioning of a new and approximately 42-km long, 230-kV transmission line that would terminate at the Radisson and Henday converter stations, within an existing transmission line corridor.

A new transformer associated with the project would be added at Radisson converter station. There will not be footprint expansions at either converter station as modifications would be done within existing station properties.

9.1.2 Regulatory and policy setting

The following provincial laws, and associated regulations, policies, and guidelines, as well as Manitoba Hydro's policies were considered for assessing project effects to harvesting and recreation.

- *The Constitution Act (Canada)*
- Manitoba Hydro's Indigenous Relations Commitment Statement
- *The Forest Act* (C.C.S.M. c. F150)
- The Forest Damage Appraisal and Valuation (FDAV) Policy
- Trapping Areas and Zones Regulation of *The Wildlife Act* (C.C.S.<. c. W130)

- Manitoba Hydro's Trapper Compensation Policy for New Transmission Line Developments
- *The Mines and Minerals Act* (C.C.S.M. c. M162)
- *The Provincial Parks Act* (C.C.S.M. c. P20)
- *The Manitoba Hydro Act* (C.C.S.M. c. H190)
- *The Planning Act* (C.C.S.M. c. P80)
- Pesticides Regulation, M.R. 94/88 of *The Environment Act* (C.C.S.M. c. E125)

The proposed transmission line footprint mostly falls on provincial Crown land. Manitoba Hydro will apply for work permits from Manitoba Economic Development, Investment, Trade and Natural Resources (MEDITNR) for project activities occurring on provincial Crown lands.

9.1.2.1 The Constitution Act (Canada), section 35, Part II (1982)

Section 35 of *the Constitution Act*, 1982, recognizes and affirms the existing Aboriginal and treaty rights of the Indigenous peoples of Canada. Among these rights is the right to harvest, which has been recognized by Canadian courts as an inherent Aboriginal right. The right to harvest includes Indigenous hunting/trapping, fishing, and gathering resources for subsistence and cultural purposes. The right is based on historic and continued use and occupation of the land by Indigenous peoples, which has been recognized and affirmed by the Canadian government.

Rights-based harvesting activities and practices included within this chapter reflect traditional activities and practices that the courts have expressly recognized would potentially be constitutionally protected under section 35 of the Canadian Constitution Act, 1982. The authors of this chapter did not try to distinguish whether activities, customs and practices shared through project engagement met the test to be constitutionally protected. If an activity, practice, or custom was shared with Manitoba Hydro and understood to be important to a potentially affected First Nation or the Manitoba Métis Federation, it was considered relevant to this assessment.

Manitoba Environment and Climate Change recognizes the Indigenous right to harvest. Its environmental assessment and project licensing process requires consultation and engagement with Indigenous communities where a government decision may affect Aboriginal and Treaty Rights. As the proponent, Manitoba Hydro is undertaking engagement on the project. Manitoba Hydro's project engagement process (Chapter 3) is separate from the section 35 Crown consultation process that may be initiated by the Province of Manitoba, who has not delegated their duty to consult to Manitoba Hydro. We understand that the Crown may rely on the feedback received through our engagement activities to inform their consultation process. We sought to achieve meaningful engagement that may support the fulfillment of their duty.

9.1.2.2 Manitoba Hydro's Indigenous Relations Commitment Statement

In 2023, Manitoba Hydro released an Indigenous Relations Commitment Statement. Commitments within the statement that are particularly relevant to the assessment of project effects to rights-based harvesting include the following:

- We will work collaboratively with Indigenous communities to address the adverse impacts of our projects and operations.
- We will collaborate with Indigenous communities in order to understand and be guided by their Indigenous Knowledge as it related to our projects (Manitoba Hydro 2023).

Indigenous Knowledge shared through past self-directed studies by potentially affected First Nations and the Manitoba Métis Federation and feedback shared through project engagement has helped inform Manitoba Hydro's understanding of potential adverse impacts of the project on rights-based harvesting in this assessment.

9.1.2.3 The Forest Act

Administered by the MEDITNR Forestry Branch, *The Forest Act* (C.C.S.M. c. F150) was established to manage provincial Crown forests by setting forest harvest levels; monitor forest management activities; ensure forests are regenerated; provide protection from insects and disease; and collect revenue for use of Crown timber.

Permits are issued under the Act for activities such as commercial timber harvesting, general forestry and operating, Christmas tree cutting, personal use (fuelwood), timber permits and timber sale. It is Manitoba Hydro's intention to apply for a permit to cut down timber for the project on provincial Crown land under the Act. Approximately 15.5 km of the ROW traverses forested areas.

Manitoba Economic Development, Investment, Trade and Natural Resources' Forest Damage Appraisal and Valuation policy also applies to the project. It outlines the parameters for calculating financial compensation to the Crown for the (i) removal of timber and (ii) the effect on high value silviculture investments on productive Crown forestlands.

9.1.2.4 Trapping Areas and Zones Regulation

Administered by the MEDITNR Wildlife Branch, the Trapping Areas and Zones Regulation of *The Wildlife Act* (C.C.S.<. c. W130) outlines registered trapline districts and trapping areas and zones across the province. The proposed project's footprint wholly falls within the Split Lake section of the Northern Registered Trapline District.

9.1.2.5 Manitoba Hydro's Trapper Compensation Policy for New Transmission Line Development

Manitoba Hydro has a trapper compensation policy for new transmission line developments. Through the policy, Manitoba Hydro has developed a process of engaging potentially impacted registered trapline holders as part of the project engagement process. This process includes sharing project information, gathering feedback from trappers about potential affects, working to reduce project related effects, including the provision of compensation to registered trapline holders affected by the construction of transmission facilities that are 115 kV or greater once regulatory approval is received.

Under the policy, once a final preferred route has been determined for a transmission line, Manitoba Hydro provides further notification to registered trapline (RTL) holders whose RTLs are traversed by the final preferred route or are within 5 km of either side of the centre line of the transmission line's right-of-way. Through continued communication, information to be shared by Manitoba Hydro may include, but is not limited to:

- Reviewing project plans and routing information
- Gathering and recording trapping-related information from the Registered Trapline Holder (e.g., location of cabins, trails)
- Discussing the approach to calculating compensation, including compensation for lost income and compensation for damages to trapper property or infrastructure, if applicable
- Discussing any potential additional opportunities, as applicable (e.g., trapline improvements, cutting trail), and
- Explaining the timing of the project activities on the trapline.

9.1.2.6 The Mines and Minerals Act

Administered by the Mines Branch, *The Mines and Minerals Act* (C.C.S.M. c. M162) governs the disposition of mineral rights (permits, claims and leases), exploration, development and production of the province's non-fuel mineral resources and the rehabilitation of mines and quarries. A quarry permit or quarry lease is first obtained to commence production of a quarry mineral (including aggregate) that is on Crown property or private land.

Existing borrow areas / quarries are anticipated to be used for this project, therefore new permits should not be required. If Manitoba Hydro subsequently determines that new areas are required, applications will be made for relevant permits.

9.1.2.7 The Provincial Parks Act

Administered by the Parks Branch of MNRND, *The Provincial Parks Act* (C.C.S.M. c. P20) was established to protect natural lands and the quality of life; manage existing and future provincial parks so representative examples of natural and cultural heritage are conserved; and allow economic opportunities to contribute to the protection of the province's natural regions.

The Act provides for the designation and management of provincial parks as part of a system plan. The system plan sets out proposed boundaries, classifications, and land use categories of provincial parks. Provincial Park classifications include wilderness park, natural park, recreation park or heritage park. Land in provincial parks is categorized into one or more of the following land use categories: wilderness, backcountry, resource management, recreational development, heritage, or access. An access category can accommodate certain types of existing and future infrastructure, including transmission lines' rights-of-way. The proposed transmission line right-of-way does not traverse provincially protected areas.

9.1.2.8 The Manitoba Hydro Act

The purposes of the Act are to:

… provide for the continuance of a supply of power adequate to the needs of the province and to engage in and to promote economy and efficiency in the development, generation, transmission, distribution, supply and end-use of power and, in addition, are (a) to provide and market products, services and expertise related to the development, generation, transmission, distribution, supply and end-use of power, within and outside the province; and (b) to market and supply power to persons outside the province on terms and conditions acceptable to the board (*The Manitoba Hydro Act*, C.C.S.M. c. H190).

Section 23(1) of the Act allows Manitoba Hydro to construct, operate, and maintain its infrastructure anywhere on, under, over, across, or along public highways, streets, lanes, or other public places. This Act supersedes municipal level powers granted under legislation such as *The Planning Act* (C.C.S.M. c. P80) and *The Municipal Act* (C.C.S.M. c. M225).

9.1.2.9 The Planning Act and Provincial Planning Regulation

Administered in cooperation by Manitoba Municipal Relations and the associated municipal councils, *The Planning Act* (C.C.S.M. c. P80) provides a framework for land use planning strategies at the provincial, regional, and local scale. The Provincial Planning Regulation, M.R. 81/2011 provides a framework to guide development planning. Requirements of the Act and its regulations do not apply to the Crown or Crown agencies. Manitoba Hydro notes that, as a Crown Corporation, it is not directly subject to the legislative provisions and are generally exempt from them in terms of development planning.

9.1.2.10 Municipal

Municipal jurisdictions must adopt development plans and zoning bylaws to guide land and resource use planning decisions within their respective boundaries under *The Planning Act* (C.C.S.M. c. P80). A development plan is a bylaw that outlines the long-term vision and goals of a community to guide development within the planning area of a municipality or planning district. A zoning bylaw is a tool used by the planning authority to implement development plan policies and typically represents what is on the ground. Zoning bylaws are guided by and conform to the development plans. Zoning works by regulating the use of land and location of buildings and structures (Manitoba Municipal Relations 2023). Municipal jurisdictions have a variety of development controls in place along the proposed ROW. Land use development controls based on applicable development plans and zoning bylaws are described further in Section 6.3.2.1.

Manitoba Hydro is cognizant that neither *The Planning Act* (C.C.S.M. c. P80), nor its Regulations, apply to the Crown or Crown agencies. However, it does seek to work cooperatively with municipalities when planning, designing, constructing, and operating and maintaining its projects to limit the extent of possible interactions with their developments and plans.

9.1.2.11 Federal

The public right to travel on navigable waters is protected by law in Canada. This applies to all waters that the public may use for travel or transport, whether the water is on the list of scheduled waters of the *Canadian Navigable Waters Act* (R.S.C. 1985, c. N-22) (CNWA). Under the CNWA, owners of works who propose to construct, place, alter, rebuild, remove, or decommission works that are in, on, over, under, through or across any navigable water may be required to apply for an approval to Transport Canada (TC), or seek authorization through the public resolution process. The CNWA authorizes and regulates interferences with the public right to navigation. The primary purpose of the CNWA is to regulate works and obstructions that may interfere with navigation in Canada's navigable waters.

The *Minor Works Order* allows for specific works to be built, without review or approval, if they meet the criteria for the applicable class of works as well as specific terms and conditions. However, specific types of minor works require the owner to deposit information and publish a public notice. Aerial cables fall under this category.

As identified in Section 8, the R44H transmission line will cross several rivers and creeks including the Nelson River. If the watercourses are deemed navigable, requirements as set out in the *Minor Works Order* will be followed.

No federal lands are affected by the project.

9.1.3 Consideration of project engagement feedback

Project engagement (Chapter 3) actively sought to provide opportunities for concerned and interested parties to provide VC related feedback about the project.

Feedback raised during project engagement related to harvesting and recreation for the current project included the following:

- Participants shared that they were concerned about potential impacts to harvesting activities. Participants shared that they participate in hunting and trapping in the area. Participants shared concern for the interests of the current registered trapline holders whose yields may be affected.
- Participants shared concern that noise during construction may result in short-term disruptions to harvested wildlife species, including either scaring animals off or making them curious and drawing them into new areas with increased risks. Participants also shared concern about potential longer-term disruptions due to the presence of the project and its activities, including effects of herbicide use on vegetation and on wildlife species that pass through sprayed areas. Caribou and moose were identified as key species of concern for hunting. Another key concern shared is the potential disruption of bird travel routes or migration paths, including eagles, pelicans, swans, and other birds, with Long Spruce Dam identified as an important area for birds.
- During an August 2023 field tour of the project area, field tour participants commented that the transmission line corridor is used for snowmobiling.
- During an October 2023 meeting with Fox Lake Cree Nation, concerns about potential impacts to trappers were raised.

Recommendations about how to reduce project effects on harvesting and recreation were also provided through project engagement and are considered in this assessment.

This assessment of project effects to harvesting and recreation also draws information from engagement on past projects and a review of publicly available information about land and resource use and areas important to affected First Nations peoples and Red River Métis citizens throughout and sometimes beyond the regional assessment area.

Traditional activities and practices included within this chapter reflect traditional activities and practices that the Courts have expressly recognized would potentially be constitutionally protected under section 35 of the Canadian Constitution Act, 1982. The authors of this chapter did not try to distinguish whether activities, customs and practices shared by First Nations or the Manitoba Métis Federation met the test to be constitutionally protected. If an activity, practice, or custom was shared with Manitoba Hydro and understood to be important, it was considered relevant to this assessment.

9.1.4 Potential effects, pathways, and measurable parameters

The identified types of effects that the project may cause to harvesting and recreation are as follows:

- Change to harvested resources
- Change in access to harvesting and recreational areas
- Change to harvesting and recreational experiences

The potential project effects on harvesting and recreation, along with effects pathways and measurable parameters are outlined in Table 9-1.

Table 9-1: Potential effects, effects pathways, and measurable parameters for harvesting and recreation

Potential Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change to harvested resources	Direct loss or alteration to the availability of harvested wildlife, fish, traditional use plants, and/or medicines resulting from development and maintenance of the right-of-way Disrupted and altered movement of wildlife and bird species due to project activities and presence of the transmission line	Residual effect conclusions from the assessments on fish and habitat, wildlife and wildlife habitat, and vegetation. Qualitative assessment of predicted effects to harvested resources based on feedback from project engagement and past transmission line projects.
Change in access to harvesting and recreational areas	Direct loss of access to the footprint of transmission tower structures Direct loss of access to the right-of-way during construction, and intermittently through operations, due to access restrictions Increased or altered access to the area resulting from the presence of the cleared right-of-way	Presence of known harvesting areas and travel routes within or proximal to the PDA Duration of disruptions to access (e.g., length of construction period, frequency of maintenance activities) Qualitative assessment of predicted effects on access based on feedback from project engagement and past transmission line projects

Change to harvesting and recreational experiences	Direct loss or alteration of opportunities for the transmission of Indigenous Knowledge that occurs through harvesting Decreased preference or enjoyment of harvesting and undertaking recreational activities in the area	Qualitative assessment of predicted effects to harvesting and recreational experiences based on feedback from project engagement and past transmission line projects

Characterizing the potential effects of the project on harvesting and recreation will rely on the identified parameters in Table 9-2 to evaluate each type of predicted effect. Ideally, these parameters are measurable and quantifiable, but some effects on harvesting and recreation lack defined parameters to measure effects and are therefore evaluated qualitatively, or through a combination of quantitative and qualitative measures, based on understandings learned through project engagement, past transmission projects, and professional judgment.

Through engagement on this project and past transmission line projects, Manitoba Hydro has heard about the importance of considering the environment holistically when assessing project impacts. Manitoba Hydro has heard that traditional approaches to environmental assessment, primarily relying on Eurocentric science, can miss considering project effects related to important connections in the environment and the impacts that may result from these connections by separating the environment into small pieces and assessing them as if they function in isolation. This assessment of project effects on harvesting and recreation considers interconnectivity between different aspects of the environment by drawing from the residual effects conclusions of other valued components that directly influence harvesting and recreation, such as wildlife and wildlife habitat, fish and fish habitat, and vegetation, in the assessment of project effects on harvested resources.

9.1.5 Spatial boundaries

Three spatial boundaries are used to assess residual and cumulative environmental effects of the project on harvesting and recreation:

Project development area (PDA): the project footprint and anticipated area of physical disturbance during construction and operation and maintenance of the project.

Local assessment area (LAA): includes all components of the PDA and consists of a 1 km buffer around the PDA, which is intended to capture the area within which direct effects to harvesting and recreation may occur because of project activities (Map 9-1).

Regional assessment area (RAA): includes the PDA and LAA and consists of a 15 km buffer around the PDA (Map 9-1). It is used to provide regional context and is the area used for assessing the project's contribution to cumulative effects, if applicable, and is relevant to the assessment of any wider-spread effects of the project.

The spatial boundaries for the assessment of effects to harvesting and recreation are the same as those used for the assessment of effects to wildlife & wildlife habitat and vegetation, on which harvesting activities, and some recreational activities, are directly reliant.

9.1.6 Temporal boundaries

The primary temporal boundaries for the assessment of project effects on health and safety are based on the timing and duration of project activities as follows:

- Construction – Anticipated to start in December 2024 and be completed by July 2026. Station work to occur year-round, transmission line construction to occur under frozen conditions.
- Operations and maintenance – for the life of the project, estimated to be a 75-year design life.
- Decommissioning – estimated to be two years once the project has reached the end of its serviceable life.

Although project effects will be described in relation to the project lifecycle, the assessment considers past, current, and future use of lands within the project's spatial boundaries. Current use is defined as occurring within the last 25 years, or one generation. The definition of past use is limited only by the living memory of knowledge holders who provided information considered in this assessment. Future use considers the ability for First Nations peoples and Red River Métis citizens to continue to occupy and use lands and resources for harvesting beyond the life of the project.

9.1.7 Residual effects characterization

Table 9-2 provides the definitions used to characterize the residual effects on harvesting and recreation that remain after mitigation measures have been implemented.

Table 9-2: Characterization of residual effects on harvesting and recreation

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Positive –** a residual effect that moves measurable parameters in a direction beneficial to harvesting and recreation relative to baseline. **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to harvesting and recreation relative to baseline. **Neutral –** no net change in measurable parameters for harvesting and recreation relative to baseline.
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**No Measurable Change** – no measurable change to harvesting and recreation is predicted **Low** – a noticeable change to harvesting and recreation is predicted in which the experience may be altered, but there is no predicted disruption to the ability to undertake harvesting and recreational activities **Moderate** – a noticeable change to harvesting and recreation is predicted in which there will be disruptions to the ability to undertake harvesting and recreational activities but a long-term reduction or elimination of the ability to undertake harvesting

Table 9-2: Characterization of residual effects on harvesting and recreation

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
		and recreational activities in the RAA is not predicted **High** – a change to harvesting and recreation predicted to result in a long-term reduction or elimination in the ability to undertake harvesting and recreational activities in the RAA
Geographic Extent	The geographic area in which a residual effect occurs	**PDA –** residual effects are restricted to the PDA **LAA –** residual effects extend into the LAA **RAA –** residual effects extend into the RAA
Duration	The time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Short-term –** the residual effect is restricted to the construction phase **Medium-term –** the residual effect extends beyond the construction phase **Long-term -** the residual effect extends for the life of the project (including operation and decommissioning)
Frequency	Identifies how often the residual effect occurs and how often during the project or in a specific phase	**Single event** **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously

Table 9-2: Characterization of residual effects on harvesting and recreation

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and reclamation **Irreversible –** the residual effect is unlikely to be reversed

9.1.8 Significance definition

The severity of the project's residual effects on harvesting will be experienced differently by different affected nations and individuals. Different nations, communities, and individuals use the land differently, have different connections to different places, and view future use of the area differently.

Recognizing the above-noted variation, for this assessment, adverse residual effects on harvesting and recreation are considered significant if the proposed project results in a long-term loss of availability of harvested resources, to a point where use and/or access to such resources as well as harvesting and recreational experiences are critically diminished or eliminated.

It is important to note that even if effects to individual components of the environment are deemed not significant, there could still be effects to harvesting and recreation because of the presence of the project and due to perceived effects or stress caused by the project.

This assessment conservatively assumes that rights-based harvesting has the potential to occur within the project region, even if participating First Nations peoples and Red River Métis citizens did not specifically identify harvesting activities and areas as occurring in the project area. In assessing potential effects on harvesting, this assessment uses a conservative approach that recognises that a lack of information regarding harvesting for a specific area or activity does not necessarily represent a lack of cultural use for that area, especially where no project-specific information is available. The assessment also assumes that harvested species identified as being present in the project region could be hunted, trapped, fished, or gathered by First Nations peoples and Red River Métis citizens.

The evaluation of residual effects to harvesting and recreation largely relies on qualitative assessments, which consider indicators of the potential effect, literature reviews, engagement feedback, and professional judgment to consider if adverse residual effects are significant.

9.2 Project interactions with harvesting and recreation

Table 9-3 identifies, for each potential effect, the physical activities that might interact with harvesting and recreation and result in the identified effect.

Table 9-3: Project interactions with harvesting and recreation

Project activity	Change to harvested resources	Change in access to harvesting and recreational areas	Change to harvesting and recreational experiences
Transmission Line Construction			
Mobilization and staff presence	✓	-	✓
Vehicle and equipment use	✓	✓	✓
Access development	✓	✓	✓
Right-of-way clearing	✓	✓	✓
Borrowing sites (assumed to be previously disturbed sites)	✓	-	✓
Watercourse crossings	✓	✓	✓
Marshalling / fly yards	✓	✓	✓
Transmission tower construction	✓	✓	✓
Implodes	✓	✓	✓
Helicopter use	✓	-	✓
Clean-up and demobilization	✓	✓	✓
Station Modification			
Mobilization and staff presence	✓	-	✓
Vehicle and equipment use	✓	✓	✓
Marshalling / fly yard	✓	✓	✓
Clean-up and demobilization	✓	✓	✓
Transmission Line and Station Operation and Maintenance			
Transmission line and station presence	✓	✓	✓
Vehicle and equipment use	✓	✓	✓
Inspection and maintenance	✓	✓	✓
Vegetation management	✓	✓	✓
Decommissioning			

Table 9-3: Project interactions with harvesting and recreation

Project activity	Change to harvested resources	Change in access to harvesting and recreational areas	Change to harvesting and recreational experiences
Mobilization and staff presence	✓	-	✓
Vehicle and equipment use	✓	✓	✓
Removal of transformers, disassembled towers, foundations, conductors, and associated equipment	✓	✓	✓
Rehabilitation	✓	✓	✓
Clean-up and demobilization	✓	✓	✓

✓ = Potential interaction
– = No interaction

Most project activities are understood to introduce potential effects pathways for harvesting and recreation except for activities that may occur entirely within the Radisson and Henday converter stations and are not anticipated to result in the creation of noise outside of the stations. All other project activities are anticipated to affect resources on which harvesting is directly reliant (e.g., wildlife, fish, vegetation), affect access to areas used for harvesting and recreation, or alter the experience of harvesting.

9.3 Existing conditions

Manitoba Hydro has a presence across Manitoba – on Treaty 1, Treaty 2, Treaty 3, Treaty 4 and Treaty 5 lands – the original territories of the Anishinaabe, Anishininew, Cree, Dakota, and Dene peoples and the homeland of the Red River Métis. We acknowledge these lands and pay our respects to the ancestors of these territories.

Manitoba Hydro acknowledges that the Radisson to Henday transmission line is located on Treaty 5 territory and on the traditional territories of the Cree peoples and the Red River Métis.

Baseline information for this assessment was primarily gathered through a detailed review of available desktop data as well as information gathered during project engagement. The RAA includes:

- two Fox Lake Cree Nation treaty land entitlement sites

- portions of the Split Lake and Fox Lake Resource Management Areas (RMAs)
- portions of the Split Lake and Limestone sections of the Northern Registered Trapline District, and
- the Fox Lake Cree Nation Community Interest Zone (CIZ)

Land use and development control in the project area is provided by the Town of Gillam Development Plan By-law No. 715-2012.

On Tataskweyak Cree Nation's website they provide context about the historical and enduring use of the land within their traditional territory, stating that "Centuries of occupation and use of the lands and waters enabled the identification and selection of the most useful and fruitful areas for residence and harvesting, in keeping with the rhythms of the seasons." (Tataskweyal Cree Nation n.d.)

First Nations peoples and Red River Métis citizens continue to practice a variety of traditional and cultural activities, including rights-based harvesting, on lands in the regional assessment area even though the physical landscape and access permissions have changed over time. Section 5.5 outlines our understanding of historical and cultural setting for the project area, including a timeline visual (see Figure 5-3) that provides an overview of past events that have affected the land and Indigenous peoples in and around the project area. The events described in the timeline visual help provide context relevant to understanding the lived experience of Indigenous nations and peoples within and around the project area.

Rights-based harvesting activities that occur in the RAA include hunting, fishing, trapping, and gathering traditional use plants and medicines. The potential for disturbance to these activities, or the loss of access and resources that support these activities, are concerns frequently shared by First Nations peoples and Red River Métis citizens when new transmission lines are planned.

Non-rights based harvesting activities in the RAA can include domestic, licensed, and recreational fishing, hunting, and berry-picking, and commercial trapping.

Baseline information for this assessment was gathered through a detailed review of engagement feedback on this project and past projects in the area, self-directed studies conducted by First Nations and the Manitoba Métis Federation, and a literature review including, but not limited to, technical memos assessing wildlife and wildlife habitat and vegetation in the project area (see Appendix B and Appendix C)

The existing conditions described in this section focus on:

- Hunting
- Gathering including traditional plant harvesting, medicines and berry picking
- Fishing

- Trapping
- Protected areas
- Forestry
- Other commercial resource use and activities, e.g., quarry leases
- Outdoor recreation and Snoman trails

9.3.1 Hunting

During project engagement on this project and past projects, Fox Lake Cree Nation, Tataskweyak Cree Nation, York Factory First Nation, War Lake First Nation, and the Manitoba Métis Federation have reported hunting in the RAA. Licensed, domestic and traditional hunting usually occur at areas accessible by road, water, and trail.

Based on project engagement, Manitoba Hydro understands that caribou are a key species for hunting in the project area. The Pen Island coastal caribou herd occupy the project area mainly in winter, but individuals have been observed in summer, some of which calved in the area.

Moose are also understood to be important to rights-based harvesters in the area.

Participants in the project engagement process also shared concerns about various bird species in the area with Long Spruce Dam being identified as an important area for birds. Fox Lake Cree Nation shared that bird-focused engagement activities are of interest to community members and would be one way that Manitoba Hydro could make engagement efforts in the area more meaningful to Fox Lake Cree Nation.

During field tours that took place in August and September 2023 with representatives from Fox Lake Cree Nation, York Factory First Nation, War Lake First Nation, the Split Lake Resource Management Board, and registered trappers, participants made the following observations relevant to hunting: presence of caribou habitat, trails used by wildlife such as moose, and potential nest sites.

During engagement on the Keeyask generation project, we heard that Fox Lake Cree Nation members “hunt for moose and caribou in the areas around Stephens Lake.” Cache Lake, the Butnau, Moswakot and Kettle rivers were also identified as important domestic resource use areas for Fox Lake Cree Nation (Keeyask Hydropower Limited Partnership 2012).

As captioned in the Keeyask transmission project environmental assessment report, “Birds are a key food source for the Keeyask Cree Nations, with spring and fall hunts being important community events. For Fox Lake Cree Nation, the spring goose hunt has become increasingly important, both for the food harvested and as a tradition that welcomes and celebrates the spring season (Fox Lake Cree Nation 2012).

Tataskweyak Cree Nation and War Lake First Nation members indicate that the activity of hunting, as an affirmation of the traditional way of life, is more important than the actual game harvested (Cree Nation Partners 2012). York Factory First Nation community members travel to the coastal area for their spring goose hunt (YFFN 2012)." (Manitoba Hydro 2012). The Keeyask Cree Nations include Tataskweyak Cree Nation and War Lake First Nation (acting as the Cree Nation Partners), York Factory First Nation, and Fox Lake Cree.

Citizens of the Manitoba Métis Federation abide by the Laws of the Harvest as well as provincial regulations concerning hunting seasons. The Métis Laws of the Harvest are focused on being conservation minded and include the right to harvest food (rather than commercial purposes) accompanied by rules about how to do so appropriately. Given that the project area falls outside of the Métis Recognized Harvesting Area, Red River Métis harvesters must purchase relevant provincial licenses and follow provincial regulations to harvest in the area (Manitoba Metis Federation 2013).

The Manitoba Métis Federation's, Manitoba Métis Traditional Use, Values and Knowledge of the Bipole III Project Study Area report, included mapped locations in the Gillam area where Red River Métis citizens have undertaken hunting for small animals (rabbit, coyote, wolf, beaver, waterfowl, upland birds) and large animals including moose (Manitoba Metis Federation 2011). The mapped locations overlap the project PDA, LAA, and RAA, demonstrating that there is contemporary use of the area for Red River Métis hunting that has the potential to be affected by project activities.

9.3.2 Gathering

Before European contact, the RAA provided a variety of plants and medicines harvested by First Nations peoples.

During engagement on the Bipole III and Keeyask transmission projects, locations used for berry harvesting and medicines, as well as information about the medicinal and cultural uses of specific plants were shared.

During engagement on this project and past projects, Fox Lake Cree Nation members shared that they typically harvest berries and medicines in areas that have not been disturbed by humans (i.e., not under transmission lines).

Based on engagement on past projects and previous self-directed studies completed by Fox Lake Cree Nation, Tataskweyak Cree Nation, and the Manitoba Métis Federation, Manitoba Hydro understands that the project area supports a variety of traditional use plants including species of trees, shrubs, herbs, and other plants used for sustenance and in traditional cultural practices.

During the 2022 and 2023 vegetation field surveys along the PDA, at least 36 plants known to have traditional uses for First Nations peoples or Red River Métis citizens were observed over a combination of developed and undeveloped areas. The greatest cover of traditional use plants was found in forested areas, but traditional use plants were identified in all community types, both upland and wetland. The most frequently observed traditional use species in the area included black spruce and tamarack trees as well as low shrub species like Labrador tea, bog cranberry, small cranberry, cloudberry, and bog whortleberry.

Chapter 6.0 (Vegetation) includes more detailed information about the presence of traditional use plants in the vicinity of the project area and provides an assessment of potential project effects to traditional use plants. A technical report further detailing the vegetation field studies undertaken in 2022 and 2023 and the findings are included in Appendix B.

During engagement for this project, Fox Lake Cree Nation members also shared that community members visit the area near Long Spruce to collect eagle feathers and that eagles are a key species of concern due to their cultural significance. Eagle feathers are used in ceremonies by many Indigenous cultural groups given that eagles, flying highest and closest to the Creator, are considered sacred (CBC 2021).

9.3.3 Fishing

Per the Government of Manitoba (no date)'s lake information for anglers, Stephens Lake, which partly falls within the RAA, has numerous fish species. Known species (including historical) found in the lake are yellow perch, cisco, sauger, white sucker, burbot, walleye, freshwater drum, common carp, cisco, mooneye, lake whitefish, and northern pike.

Fishing in the RAA has been negatively affected by the hydroelectric development, which has resulted in disruption of traditionally harvested waterways and increases in methyl-mercury levels in fish. Currently, there are no license holders for commercial fishing on Stephens Lake. Recreational and domestic fishing usually occur at areas accessible by road and trail. Ice fishing shacks have been observed on Stephens Lake.

During engagement on this project, Tataskweyak Cree Nation shared that people in the south are under the impression that northern Manitoba is pristine land and waters and don't see the contamination that has occurred to the water and how the livelihoods of community members are affected negatively.

First Nations peoples in the area continue to practice their right to fish in the project area, but in many cases have changed how and where they fish. As presented in the Keeyask Environmental Evaluation report prepared by Tataskweyak Cree Nation and

War Lake First Nation, programs to enable fishing that can safely feed community members have been developed. War Lake First Nation's Community Fish Program and Tataskweyak Cree Nation's Healthy Food Fish Program are both focused on providing wholesome fish to members "in order to replace fish that may no longer be safe to consume as a result of increased methyl-mercury levels…" through the provision of resources such as snow machines, boats, nets, and wages for fishers from the community to fish certain specific lakes (Cree Nation Partners, 2012).

The Manitoba Métis Federation's, Manitoba Métis Traditional Use, Values and Knowledge of the Bipole III Project Study Area report, included mapped locations in the Gillam area where Red River Métis citizens have undertaken fishing including sites at Stephens Lake and Limestone River (Manitoba Métis Federation 2011). Some of these locations overlap the project LAA and RAA, demonstrating that there is contemporary use of the area for Red River Métis fishing that has the potential to be affected by project activities.

9.3.4 Trapping

Manitoba has a registered trapline (RTL) system for managing commercial fur harvest through which registered trapline holders have the exclusive opportunity to trap fur bearing animals within a certain defined RTL area. "The system ensures sustainable fur bearing animal populations by controlling the number of trappers in that area and recognizes the line holder as the steward of the resource." (Province of Manitoba 2023). Prior to European contact, Indigenous peoples did not practice commercial trapping as it is presently done. "Trapping as it is understood today did not exist before traders arrived in our land. The taking of animals such as beaver, muskrats, martin, and lynx was just part of hunting. It wasn't until Europeans introduced a market for fur that trapping became an economic activity separate from hunting." (Cree Nation Partners 2012)

During project engagement, engaged First Nations shared feedback about the importance of engaging the potentially affected trappers and considering their knowledge about the project area.

During field tours held in August 2023, participants shared that an area near Limestone is an important area for trapping, where foxes are abundant. The project PDA and LAA are wholly within the Split Lake section of the Northern Registered Trapline (RTL) District (see Map 9-2). The RAA is largely in the Split Lake section but a small portion of it extends into the Limestone section of the Northern RTL District (see Map 9-2). Four RTLs are traversed by the LAA and PDA (i.e., RTLs 10, 17, 18, and 65) while several more RTLs fall within the RAA (see Map 9-2).

As previously mentioned in Section 9.1.2, Manitoba Hydro Trapper's Compensation Policy for New Transmission Development considers registered trapline holders whose RTLs are traversed by the final preferred route or are within 5 km of either side of the centre line of the transmission line's right-of-way. In addition to the four RTLs that are traversed by the PDA (i.e., RTLs 520-10, 520-17, 520-18, and 520-65), one additional RTL (i.e., RTL 520-64) falls within the 5-km buffer of the PDA. As a result, the holders of these five RTLs were engaged on the project (see Chapter 3.0 Project engagement).

The most harvested species in northern Manitoba include marten, lynx, muskrat, mink, beaver, wolverine, timber wolf (Zolkewich 2022).

In December 2023, Manitoba Hydro initiated a monitoring program working with trappers from Fox Lake Cree Nation on the community trapping line (i.e., RTL 520-65) and a currently vacant trapping line within the 5-km buffer but outside the LAA (i.e., RTL 520-64), in pursuit of getting a baseline understanding of trapping resources and Indigenous Knowledge (also referred to as Aboriginal Traditional Knowledge) in the area. This monitoring work is anticipated to continue though construction and post-construction.

9.3.5 Protected areas

There are no provincial parks within the RAA.

The Churchill Wildlife Management Area (WMA) is approximately 5 km east of Henday converter station at its closest point, and partly falls within the RAA (see Map 9-2).

There are two areas of special interest (ASIs) that also partly fall within the RAA, namely the Stephens Lake ASI as well as an area that surrounds the Churchill WMA and is proposed for protection (see Map 9-2). Areas of special interest are candidate protected areas that are selected to represent the enduring features found within an ecoregion that still need to be captured in Manitoba's protected areas network.

9.3.6 Forestry

The RAA falls within two forestry management units (FMUs), namely FMU 78 and FMU 79 (see Map 9-3). Most of the transmission line right-of-way along with Henday converter station are in FMU 78 while the southern third of the transmission line right-of-way and Radisson converter station are in FMU 79.

There is no reported forest productivity data for FMUs 78 and 79.

9.3.7 Other commercial resource use and activities

There are currently no operating mines or areas associated with a mineral exploration licence within the RAA.

There are no quarry lease areas traversed by the PDA. A couple of quarry lease areas are located within the LAA southwest of Radisson converter station and several quarry lease areas fall within the RAA but are outside the LAA. Eight quarry leases are clustered south of the built town area, a couple are north of the Fox Lake Cree Nation (Bird) community, and one is located north of the Kettle generating station, near PR 280 (see Map 9-3).

A boat tour company, Nelson River Adventures, operates out of Gillam, and provides boat tours, canoe pick up, and transportation to historic sites in the broader area.

9.3.8 Outdoor recreation and Snoman trails

During field tours that took place in August 2023 with representatives from some engaged First Nations, the Split Lake Resource Management Board, and registered trapline holders, participants shared that the corridor is used for snowmobiling.

Outdoor recreational activities that are conducted in the RAA including fishing, hunting, and snowmobiling. Recreational hunting and fishing usually occur at areas accessible by road and trail.

Several residents of Gillam and members of Fox Lake Cree Nation have cabins on Stephens Lake. The Gillam Marina acts as a staging point for access to cabins, with people travelling on Stephens Lake by boat in open water conditions, and by snowmobile in winter. Recreational snowmobiling occurs on trails around Gillam. Five Snoman trails traverse the western half of the RAA. While portions of two trails (i.e., PT14 and CT430) are within the LAA, a portion of one trail (i.e., PT14) is crossed by the PDA (see Map 9-3).

9.4 Assessment of effects

While effects to harvesting could occur during construction, operation, and decommissioning, they are anticipated to be most pronounced during construction and include the following:

- Change to harvested resources
- Change in access to harvesting and recreational areas
- Change to harvesting and recreational experiences

The assessment draws on information shared by rights-bearing nations and individuals during project engagement, in self-directed studies and engagement on past Manitoba Hydro projects in the RAA, and residual effects on other valued components assessed throughout this report with connections to harvesting and recreation.

The following sections assess the pathways for each effect, describe mitigation measures to reduce potential effects, and characterize residual effects following the application of mitigation measures.

9.4.1 Change to harvested resources

Harvested resources refer to wildlife, birds, fish, plants, medicines, and other natural materials that may be acquired through harvesting activities like hunting, trapping, fishing, and gathering. The pathways through which harvested resources may be affected by the project include:

- Direct loss or alteration to the availability of harvested wildlife, fish, traditional use plants, and/or medicines due to development and maintenance of the transmission line right-of-way
- Disrupted and altered movement of wildlife and bird species due to project activities and presence of the transmission line

The project has the potential to change harvested resources available in the project area during construction, operation, and decommissioning.

During construction, activities like mobilization, vehicle use, clearing of the right-of-way, tower assembly, and conductor stringing (e.g., implosive connectors, helicopter use), and the associated sensory disturbances (e.g., noise, dust) may result in wildlife and bird species important to harvesters avoiding the area, altering their movement, or altering breeding patterns. Wildlife tend to avoid areas where active construction is taking place, subsequently influencing their abundance and availability in preferred and/or predictable harvesting locations.

During engagement on the project, Manitoba Hydro heard concerns related to disruptions to wildlife due to noise during construction. Fox Lake Cree Nation members shared concerns that project activities may either scare off animals or make them curious and draw them into new areas or situations of higher risk and vulnerability.

Through engagement on this project, caribou was raised as a key species of interest. Manitoba Hydro understands that engaged First Nations visit the area to hunt caribou when present. The Split Lake Resource Management Board shared the understanding that portions of uncleared vegetation in the existing corridor were left as buffers for caribou and asked if these buffers will be maintained. Manitoba Hydro will limit the vegetation clearing to the amount required to meet access and legal electrical safety requirements for the project. The 70 m uncleared portion of the right of way corridor between Radisson converter station and Long Spruce generation station will be maintained and will continue to provide a vegetative buffer. After initial project vegetation clearing the entire project right of way will be maintained to allow a patchwork of shrubs, willows, grasses, mosses, and other short growing vegetation.

As discussed in Chapter 6.0 (Vegetation), vegetation clearing and grubbing to establish the right-of-way is the primary pathway to a direct and measurable change to vegetation in the PDA, including traditional use plants and medicines. Clearing the right-of-way will disrupt and remove traditional use plants and medicines along the right-of-way.

Equipment and vehicle movement during mobilization and demobilization and the establishment of marshalling yards can cause physical damage to or decrease the quality of traditional use plants.

These activities also have the potential to introduce or spread invasive and non-native plant species, causing changes in vegetation community composition within the project area.

Invasive and non-native species can aggressively invade disturbed areas and may outcompete native plant species, including traditional use plants. Heavy equipment and vehicle use on access roads may alter vegetation communities due to soil compaction, rutting, and admixing. The areas and types of vegetation and habitat that will be cleared are described in Chapters 6.0 (Vegetation) and 7.0 (Wildlife and wildlife habitat).

During operations, the primary pathway to effect on harvested resources will be during periods of inspection and maintenance of the transmission line.

Clearing and grubbing to establish the right-of-way will result in the removal of bird and wildlife habitats in certain portions of the PDA, altering habitat availability.

Habitat alteration has potential to affect wildlife movement, e.g., between mating areas, overwintering grounds, and dispersal corridors. This alteration of habitat will continue through operations.

Increasing the corridor width may present a barrier for some species that reduce their risk of predation by avoiding open areas.

Wildlife and birds with harvesting values may be affected by the presence of the transmission line and the right-of-way through operations and maintenance. For example, the presence of the transmission line may lead to an increase in the mortality of some birds and small mammals in the local area as transmission lines provide perching areas for predatory birds. The transmission line may also result in an increased risk of bird mortality due to bird-wire collisions.

Operation and maintenance will continue to have an influence on wildlife and wildlife habitat through bird collisions, periodic disturbances associated with maintenance activities, including noise and activity associated with vegetation management. Fox Lake Cree Nation members shared concerns with the presence of transmission lines impacting birds, in particular diverting travel routes or migration paths.

The creation of new right-of-way can affect different species in different ways, potentially increasing movement and presence along the PDA for species that prefer shorter vegetation and increasing avoidance of the PDA by others. With alterations to wildlife movement, there is potential to increase the spread of diseases.

Changes in environmental conditions (e.g., light, soil moisture) along the right-of-way resulting from the removal of trees and tall shrubs will also alter the abundance of plants important to First Nations and Red River Métis citizens. Some plants will decrease in abundance and others will increase. Indirect loss of plants of importance to First Nations and Red River Métis citizens may also occur from the introduction or establishment of regulated weeds and non-native invasive species.

The ongoing presence of the right-of-way and transmission line itself may affect certain harvested wildlife and bird species.

During operations and maintenance, traditional use plants and medicines have the greatest potential to be affected during periodic vegetation management activities. Manitoba Hydro's integrated vegetation management approach aims to reduce impacts to the environment during maintenance events.

Herbicides are used to target tall growing species, leaving shorter species to flourish. They are not applied indiscriminately. By encouraging lower growing plants, taller trees are less likely to grow and affect the transmission line.

The alteration of vegetation cover through operations may also affect the balance of predator and prey relationships.

The pathways discussed above draw from the predicted residual effects to the following valued components, which we understand to be connected and relevant to a holistic discussion about impacts through its predicted effects on interconnected components of the environment:

- Wildlife and wildlife habitat
- Fish and fish habitat

- Vegetation

During project engagement, Fox Lake Cree Nation shared mitigation recommendations related to harvested resources including to revegetate cleared areas and to transplant shrubs and berries. Fox Lake Cree Nation also recommended that project activities be respectful of sensitive timing windows for moose.

9.4.2 Change in access to harvesting and recreational areas

The project has the potential to affect access to harvesting and recreational areas during construction, operation, and decommissioning, which may limit harvesting and recreational activities in certain locations at certain times. Access, in this context, refers to whether and how people can physically visit an area.

The pathways through which access to harvesting and recreational areas may be affected by the project include:

- Direct loss of access to the footprint of transmission tower structures
- Direct loss of access to the right-of-way during construction, and intermittently through operations, due to access restrictions
- Increased or altered access to the area resulting from the presence of the cleared right-of-way

Effects on access will primarily occur during construction because access to the right-of-way (PDA), which may include harvesting and recreational areas and access points, is prohibited for the duration of active construction in the area. This access restriction is intended to protect human health and safety while construction activities are underway. Physical barriers (i.e., gates, fences) may be in place during this time to deter access to the area.

Project activities at water crossings are not anticipated to restrict travel along waterways as in-water works are not planned. Therefore, the project is not anticipated to disrupt access to downstream fishing locations accessed by boat. Shore fishing may be suspended in locations close to water crossings when the right-of-way is being developed and the towers on either side of the crossing are installed.

The presence of harvesting areas and travel routes mentioned in Section 9.3 (Existing conditions) within or proximal to the PDA illustrates that restrictions to access may directly affect the ability to practice rights-based activities during construction.

Based on engagement on this project and past projects, the temporary loss of access to harvesting areas along the right-of-way during construction may result in First Nations peoples and Red River Métis citizens having to travel further and spend more time and energy to access locations where they can practice rights-based activities.

The access restrictions may also interrupt opportunities for Indigenous Knowledge transmission that occurs through harvesting.

There is the possibility that there could be temporary traffic disruptions that affect areas adjacent to the right-of-way, within the LAA, during construction.

Through the operations phase of the project, the area of the footprints of tower structures will be permanently inaccessible for harvesting and recreational activities because the footprints will be occupied by the towers throughout operations.

There will be intermittent localized access restrictions to the right-of-way, during maintenance activities and vegetation maintenance, resulting in temporary disruptions to access in areas along the PDA. These restrictions are intended to protect human health and safety when crews are actively performing work on the transmission line or right-of-way. Periodic access restrictions during maintenance activities have the potential to contribute to alienation from the land in the PDA and disrupt opportunities for Indigenous Knowledge transmission that occurs through harvesting.

Aside from these localized temporary periods, access permissions on the PDA (right-of-way) during operations will return to those in existence prior to construction. In other words, if an area traversed by the project was previously accessible for harvesting and/or recreational activities, it will again be accessible during operations and maintenance.

During operations, another pathway through which access may be altered by the project is through increased access to the area by people who may not have previously visited the PDA resulting from the presence of the cleared project right-of-way.

Based on feedback shared during engagement on past projects, Manitoba Hydro understands that, from the perspective of rights-based harvesters, increased or easier access can be positive for community members, but viewed negatively in relation to increased access by non-local people (Northern Lights Heritage Services Inc. 2011).

The project may create opportunities for First Nations peoples and Red River Métis citizens to practice rights-based harvesting in areas that were previously more difficult to access, while increased access by non-Indigenous peoples can negatively affect the practice of rights-based activities and increase the competition for harvested resources in the area, and potentially illegal hunting. Increased access by new harvesters and recreationalists are anticipated to be small given that the project is proposed in an existing developed corridor.

Other changes to access of the area includes routine inspections and maintenance resulting in periodic increases in access to the PDA by Manitoba Hydro crews. Further, an increase in the use of the ATVs and other recreational vehicles in the PDA may result in the erosion of travel ways and tranquility along access routes.

Such concerns related to increased access were shared in relation to many areas along the Bipole III transmission project route during its Clean Environment Commission hearing. "Members of Fox Lake Cree Nation (FLCN) expressed the concern that growing numbers of newcomers to the Gillam region will lead to increased pressure on populations of fish and wildlife and on other resources. In their presentation to the hearings, representatives of FLCN said three decades of uncontrolled hunting and fishing by construction workers has contributed to the depletion of brook trout and sturgeon from several local rivers and streams. FLCN's plan for future management of resources in the region calls for new resource officers, representing FLCN, and limits on harvesting by outsiders." (Manitoba Clean Environment Commission 2013)

9.4.3 Change to harvesting and recreational experiences

The project has the potential to affect harvesting and recreational experiences during construction, operations, and decommissioning. Experiences, in this context, refer to how the area looks, sounds, and feels to different individuals and communities.

It is important to acknowledge that changes to harvested resources and access to harvesting and recreational areas discussed above in Sections 9.4.1 and 9.4.2 inherently effect harvesting and recreational experiences. This section focuses on additional pathways through which experience and enjoyment may be affected by the project including:

- Decreased preference or enjoyment of harvesting and undertaking recreational activities in the area
- Direct loss or alteration of opportunities for the sharing of Indigenous Knowledge that occur through harvesting

Decreased preference and enjoyment while harvesting and undertaking recreational activities could result from project activities that cause noise, changes to visual aesthetics, and stress about the presence of the project.

First Nations peoples and Red River Métis citizens have shared that these alterations to the land and sensory disturbances, both visual and auditory, can change traditional harvesting experiences and decrease preference for harvesting on lands around transmission line developments.

Project effects on harvesting and recreational experiences are anticipated to be most pronounced during construction.

Throughout construction, there will be an increase in noise or change in the types of noise in the project area resulting from activities like mobilization of equipment, right-of-way clearing, installation of tower foundations, developing and using access routes, creating and using marshalling/fly yards, and transmission tower construction.

Vegetation clearing and grubbing of the right-of-way is the primary pathway for a direct and measurable change in visual aesthetics.

Dust generated during construction activities may also diminish the experience and enjoyment of undertaking harvesting and recreational activities near the PDA. Dust generation is expected to be minimal, localized, and short-term in nature. While dust may have a temporary physical effect on vegetation close to the construction area (via smothering), dust is not considered to be a meaningful pathway for a change in traditional food quality.

During operations and maintenance, the noise generated is expected to be less compared to the construction phase. Noise associated with maintenance activities will be intermittent and temporary and contained mostly within the PDA. During maintenance activities, increased traffic, noise, and other sensory and environmental conditions will change experience and enjoyment of place.

During engagement on the project, Fox Lake Cree Nation shared a concern about the noise that comes off the line (i.e., noise due to corona discharge), and expressed need for understanding its impacts, and how the noise of multiple lines in the same corridor compares to just one line.

The auditory experience in areas very close to the transmission line may be changed because of the project due to the potential for the presence of corona discharge, which is a hissing or crackling noise that sometimes occurs with high voltage transmission lines. Some individuals may choose to no longer use a harvesting area because they find the sound unpleasant, as some prefer to harvest "where it is quiet … where there is no development" (Manitoba Metis Federation 2017).

The visual experience in the project area will change due to the presence of a new cleared right-of-way and the transmission line. Following construction, the right-of-way will be reclaimed. However, vegetation will be maintained in a different state compared to pre-construction so there will be an ongoing change to the appearance of the area through operations and maintenance.

The presence of guyed wires, which will be present on most of the towers, may result in alterations to travel routes within the PDA and may heighten safety concerns for individuals who travel along the right-of-way by snowmobile or ATV because the guyed wires introduce new physical obstacles.

Changes to aesthetic conditions may affect First Nations peoples and Red River Métis citizens sense of place, defined as peaceful enjoyment of lands and waters without sensory disturbances, stress, or harassment, and their emotional and spiritual attachment to culturally important places. To experience a sense of place it is critical to have the ability to enjoy the surroundings without sensory disturbances, stress, or harassment (Cedar 2022).

The experience of the area for those visiting the area for harvesting or recreational purposes may also be altered by changes to real or perceived health concerns and stress associated with the presence of the project.

During engagement on the project, Fox Lake Cree Nation shared concerns about herbicide use including potential impacts to wildlife when species pass through areas of habitat that have been sprayed with chemicals and understanding whether contamination may remain from chemicals that may have absorbed into the land through herbicide use on past projects. Herbicide use for right-of-way maintenance is a common area of concern Manitoba Hydro hears during engagement about transmission lines. Manitoba Hydro understands that concerns about herbicide use may result in avoidance of the transmission line right-of-way for harvesting due to concern about the safety and the quality of the harvested resources in areas in which herbicides may be applied for vegetation management.

Manitoba Hydro's integrated vegetation management plan outlines the use of herbicides. Manitoba Hydro's vegetation management goal is the establishment of a self-sustaining, low-growing plant community along the right-of-way. Herbicides used by Manitoba Hydro on rights-of-way are formulated to target woody vegetation and broad-leafed plants while leaving grasses largely unaffected. In addition to the planned limited and infrequent use of herbicides. Manitoba Hydro has established several other herbicide uses and application practices that will limit the potential for herbicides to enter the food chain and alter the quality of traditional foods. These include not treating environmentally sensitive sites with herbicides, such as those used for gathering berries and harvesting other types of traditional plant and animal country foods, that have been identified through project related engagement or Indigenous knowledge reports.

In addition to the restrictions and mitigation measures outlined on the product labels. If specific location of concern is shared, we can consider specific protection measures under the Environmental Protection Plan to protect locations, features, areas, activities, or facilities that are ecologically, socially, or culturally important or sensitive sites from herbicide use.

Some people also choose to not use the immediate area under transmission lines due to their understanding that corona discharge (i.e., the sound created by transmission lines) is unsafe. A similar change in individual preferences may occur with harvesters who share concerns related to electromagnetic fields (EMF) or a change in the visual landscape.

Loss or diminishment of harvesting experiences may have long-term implications on cultural vitality because of loss or diminished opportunity for the intergenerational transmission of cultural and Indigenous Knowledge that occurs through harvesting.

In the Clean Environment Commission's hearing report related to the Bipole III transmission project, the Commission stated that "It is important to realize that many activities carried out in the environment, such as trapping, hunting, fishing and resource harvesting, are as much cultural practices as they are economic activities. As a result, then, anything that disrupts these activities also disrupts culture." (Manitoba Clean Environment Commission 2013)

The Keeyask transmission project environmental assessment (Manitoba Hydro 2012) includes that "Both TCN and FLCN view the ability to engage in resource use activities as a fundamental means of cultural expression and transmission. Therefore, adverse effects to domestic resource use are also expected to lead to adverse effects on culture and spirituality for TCN and FLCN. It is understood, however, that effects on culture and spirituality extend beyond effects to domestic resource use activities and that aspects of these effects may be intangible and difficult to predict with certainty. This does not diminish their importance." (Manitoba Hydro 2012)

Fox Lake Cree Nation's monitoring reports related to the Keeyask generation project describe community activities that are being undertaken to support knowledge transmission through cultural activities such as organized berry harvesting events with community members, a waterway canoe project, and a variety of cultural camps (youth goose hunting, sturgeon, ice fishing, spring equinox) (Fox Lake Cree Nation 2021); (Fox Lake Cree Nation 2023).

As discussed in Chapter 13 (Health and safety), connections to the land and environmental stewardship are determinants for Indigenous peoples' health. Therefore, potential diminishment of harvesting experiences and enjoyment of place, and any decrease in access to a functioning ecosystem that supports rights-based harvesting, can have health implications for First Nations peoples and Red River Métis citizens.

9.4.4 Mitigation measures

Potential project effects on harvesting and recreation have been reduced by selecting a transmission line route within an existing developed corridor adjacent to existing linear features (transmission lines).

During engagement on the project, we heard feedback about the project area being already disturbed from Tataskweyak Cree Nation and the Split Lake Resource Management Board. During helicopter and vehicle field tours in the summer of 2023, participants shared that locating the line in an already disturbed/impacted area is preferable to putting a new line outside of the corridor. Engaged registered trapline holders echoed feedback that they were in favour of the new transmission line being routed within a corridor with other existing transmission lines.

This section describes mitigation measures that have been identified to reduce effects on harvesting and recreation.

9.4.4.1 Mitigation measures related to harvested resources

In addition to the project being in an already developed corridor with other existing transmission lines, mitigation measures to reduce project-related effects to harvested resources include:

- Transmission line construction activities will occur under frozen ground conditions when plants are dormant and less sensitive to activity, to reduce project effects on vegetation and wildlife habitat.
- Manitoba Hydro will provide notifications to engaged First Nations, the Manitoba Métis Federation and relevant interested parties prior to starting construction and prior to starting implosive connector use, given the potential for temporary disturbance of wildlife.
- Engaged First Nations and the Manitoba Métis Federation will be given opportunities to identify sensitive sites to help inform the environmental protection program for the project.
- Sensitive locations specifically identified in the environmental protection plan may be subject to special mitigations such as avoidance of herbicide use at specific locations used for gathering berries and harvesting other types of traditional use plants and medicines.
- Areas identified for selective clearing (e.g., buffer zones, sensitive sites) will be flagged prior to clearing.
- Bird diverters will be installed on the transmission line in areas of high collision risk to reduce impacts to birds and associated harvesting activities.

- Preconstruction surveys for stick nests, mineral licks, and den sites will be conducted to identify areas for setbacks and buffers.
- To reduce potential disturbance to wildlife and traditional hunting practices the use of helicopters for construction during non-frozen ground conditions will be minimized. If helicopter during non-frozen ground conditions is required, Manitoba Hydro will provide notification to engaged First Nations and the Manitoba Métis Federation.
- Clearing activities will not be carried out during the reduced risk timing windows for wildlife species without additional mitigation measures such as pre-clearing nest searches.

9.4.4.2 Mitigation measures related to access to harvesting and recreation areas

The primary mitigation measure for reducing adverse effects to access to harvesting and recreation areas was the routing of the transmission line in an already developed corridor with other existing transmission lines which reduced the creation of new access routes.

Additional mitigation measures to reduce project-related effects to access to harvesting and recreation areas include:

- Contractors will be restricted to established roads and trails and cleared construction areas in accordance with the Access Management Plan.
- Through ongoing engagement processes, engaged First Nations and the Manitoba Métis Federation and relevant interested parties will be notified about when/where construction is occurring.
- Existing access roads, trails or cut lines will be used to the extent possible. Permission to use existing resource roads will be obtained, where accessible.
- Hunting and harvesting of wildlife, or possession of firearms by project staff will not be permitted while working on project sites.
- Manitoba Hydro will contact local resource users to the extent feasible and practical prior to project start-up.

9.4.4.3 Mitigation measures related to harvesting and recreational experiences

The project's location alongside existing and operational transmission lines helps concentrate activity, and noise, into one area as opposed to disrupting other areas that may experience a lower level of sensory disturbance. Other mitigation measures to reduce project-related effects to harvesting and recreational experiences include:

- Manitoba Hydro will provide notification to engaged First Nations and the Manitoba Métis Federation and relevant interested parties prior to construction start and prior to starting implosive connector use.
- Mud, dust, and vehicle emissions will be managed in a manner that will allow safe, continued activities near construction sites.
- Herbicides will not be used for right-of-way clearing. For maintenance of the right-of-way, an integrated vegetation management program will be used. Manitoba Hydro will consider nonchemical vegetation management in clearly identified sensitive sites that contain plants that are of importance to rights-based harvesters.
- Information signs and the placement of warning markers will be used to identify the active construction site where it intersects a known recreational trail.
- Except for reflective bird diverters at areas of high bird-wire collision potential, non-reflective galvanized tower materials are used to reduce the visual contrast with background.
- Passive or active techniques e.g., construction of barriers or noise cancellation in areas of prolonged noise generation, will be used to the extent feasible.

Manitoba Hydro understands that harvesting is an integral part of First Nations' and Red River Métis cultures. Cultural awareness training for project staff and the inclusion of ceremony in the project, are identified as mitigation in Chapters 10 (Important sites) and Chapter 13 (Health and safety) but will also respond to potential impacts to cultural continuity and experience that are discussed in this chapter.

9.4.5 Characterization of residual effects

This section describes the residual project effects to harvesting and recreation that are predicted to remain after the application of mitigation measures. Table 9-2 describes the factors used to characterize the residual effects on harvesting and recreation.

9.4.5.1 Residual effects on harvested resources

Following the implementation of mitigation measures, predicted residual effects on change to harvested resources include:

- Changes in the abundance and types of harvesting resources available due to residual effects of the project on wildlife, birds, fish, and vegetation.

- A potential decline in harvesting success rate and an increase in the amount of time and effort by harvesters due to changes in the abundance and composition of harvested resources.
- Potential social and economic effects on harvesters due to changes in the availability of harvested resources.

Following the implementation of mitigation, the residual effects of the project on harvested resources are characterized as:

- Direction: Adverse
- Magnitude: Moderate (during construction and decommissioning) and low (during operations)
- Geographic extent: PDA, LAA (depending on location of harvested resources)
- Duration: Long-term
- Frequency: Irregular events to continuous
  - There will be an alteration to the types and presence of harvested resources in the right-of-way through operations due to vegetation maintenance
  - Construction activities and maintenance activities, performed at irregular times, may result in more pronounced periods of effects related to noise and direct disturbance
- Reversibility: Irreversible

9.4.5.2 Residual effects on access to harvesting and recreational areas

Following the implementation of mitigation measures, predicted residual effects on access to harvesting areas include:

- Restricted localized access to the PDA during construction resulting in temporary suspension of harvesting and recreational activities in affected areas.
- Intermittent localized access restrictions to the PDA during maintenance activities resulting in temporary suspension of harvesting and recreational activities in affected areas.
- Creation of new access or alteration to existing access routes resulting in increased traffic to the area.
- The need for harvesters to travel further and spend more time and energy to access harvesting locations and recreational areas, particularly during construction.
- Interruption in opportunities for Indigenous Knowledge transmission that occurs through harvesting, during periods of time when access to some harvesting locations would be affected.

Following the implementation of mitigation, the residual effects of the project on access to harvesting and recreational areas are:

- Direction: Adverse
- Magnitude: Moderate (during construction and decommissioning) and low (during operations)
- Geographic extent: PDA, LAA (depending on location of affected access to harvesting or recreational area)
- Duration: Short-term (access restrictions to the PDA during construction, maintenance activities, and decommissioning) and long-term (for access changes related to the presence of the transmission line)
- Frequency: Irregular events (maintenance activities) and continuous (during construction, decommissioning, and during operations due to presence of the line)
- Change: Reversible

9.4.5.3 Residual effects on harvesting and recreational experiences

Following the implementation of mitigation measures, predicted residual effects on harvesting and recreational experiences include:

- Changes to the visual appearance of the project area.
- Increased noise during construction, maintenance, and decommissioning activities.
- Decreased preference for and/or diminished enjoyment of harvesting and recreation due to the presence of the line, past experiences with other hydroelectric developments in the area, and perceived health risks of the project (e.g., EMF, herbicide use, and the safety of foods harvested in the PDA).
- Potential effects to Indigenous Knowledge transmission and cultural continuity resulting from disruptions to right-based harvesting.

Following the implementation of mitigation, the residual effects of the project on harvesting and recreational experiences are characterized as:

- Direction: Adverse
- Magnitude: Low
- Geographic extent: PDA, LAA, RAA (depending on location of harvested resources and/or location of access to harvesting and recreational areas)
- Duration: Long-term
- Frequency: Continuous
- Change: Irreversible

- o While sensory related impacts (i.e., noise and visual) could be considered reversible, Manitoba Hydro realizes that potential impacts to Indigenous Knowledge transmission and cultural continuity may not be reversible.

9.4.5.4 Summary of residual effects on harvesting

Most effects to harvesting are anticipated to occur during construction due to direct and indirect disruption to the availability and/or quality of harvested resources and restrictions to access throughout construction.

Table 9-4 characterizes the residual effect on harvesting and recreation.

Table 9-4: Project residual effects on harvesting and recreation

Residual Effects Characterization						
Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility
Change to harvested resources						
Construction	Adverse	Moderate	LAA	Long-term	Irregular; Continuous	Irreversible
Operation	Adverse	Low	LAA	Long-term		Irreversible
Decommissioning	Adverse	Moderate	LAA	Long-term		Irreversible
Change in access to harvesting and recreational areas						
Construction	Adverse	Moderate	LAA	Short-term	Continuous	Reversible
Operation	Adverse	Low	LAA	Long-term	Irregular; Continuous	Reversible
Decommissioning	Adverse	Moderate	LAA	Short-term	Continuous	Reversible
Change to harvesting and recreational experiences						
Construction	Adverse	Low	RAA	Long-term	Continuous	Irreversible
Operation	Adverse	Low	RAA	Long-term	Continuous	Irreversible
Decommissioning	Adverse	Low	RAA	Long-term	Continuous	Irreversible

9.4.6 Cumulative effects

The assessment of cumulative effects is initiated with a determination of whether two conditions exist:

- the project has residual effects on the VC and

- a residual effect could interact with residual effects of other past, present, or reasonably foreseeable future physical activities.

If either condition is not met, further assessment of cumulative effects is not warranted because the project does not interact cumulatively with other projects or activities. For harvesting and recreation, the two conditions are both present. The project is anticipated to have adverse residual effects on harvested resources, access to harvesting and recreational areas, and harvesting and recreational experiences. Each of the residual effects could interact with residual effects of other past, present, or reasonably foreseeable future physical activities.

The RAA and broader surrounding region have changed substantially since colonialism in terms of the physical landscape and the ability of First Nations peoples and Red River Métis citizens to practice rights-based activities in the area.

Past and ongoing projects and activities including the development of hydroelectric dams and transmission lines, roads, railway, and resource extraction in the RAA have drastically altered the landscape and caused disruptions to the ways in which rights-based harvesting occurs in the area. Among the projects and activities that have occurred since European contact is the introduction of non-rights based harvesting and recreational activities.

As noted in the Clean Environment Commission (CEC) review of the regional cumulative effects assessment (Government of Manitoba and Manitoba Hydro 2015), community members in the region shared that hydroelectric development is seen as the source of many, if not most, of the adverse impacts experienced by communities over the last 60 years (Manitoba Clean Environment Commission 2013). Indigenous communities that participated in the CEC review shared that hydroelectric development has reduced their ability to provide for themselves through a decrease in the quantity, quality, and safety of traditionally harvested foods.

Through engagement on this project, the need to understand potential cumulative effects was identified as an area of concern and interest. Specific areas of concern related to cumulative effects shared by Fox Lake Cree Nation included understanding the cumulative effects of corona discharge resulting from the presence of multiple transmission lines in one area and understanding the potential cumulative effects of years of herbicide application in the area. The concern was raised that herbicide product formulations used have likely changed over time and that there may be residual contamination.

Manitoba Hydro understands that views on how to understand and describe cumulative effects may differ based on cultural backgrounds and preferences. Different nations, or individuals may place different values on different rights-based activities, and it would not be appropriate to assume that the residual effects will impact all First Nations peoples and Red River Métis citizens in a similar manner.

9.4.6.1 Project residual effects likely to interact cumulatively

Table 9-5 shows the project and physical activities inclusion list which identifies other projects and physical activities that might act cumulatively with the project to impact harvesting and recreation. Where residual effects from the project act cumulatively with residual effects from other projects and physical activities, a cumulative effects assessment is carried out.

Table 9-5: Potential cumulative effects on harvesting and recreation

Other Projects and physical activities with potential for cumulative environmental effects	Potential cumulative environmental effects		
	Change to harvested resources	Change in access to harvesting and recreational areas	Change to harvesting and recreational experiences
Existing/ongoing projects and activities			
Domestic Resource Use (hunting, trapping, fishing)	-	-	-
Recreational Activities (Canoeing, Snowmobiling, Hiking)	-	-	-
Commercial resource use (e.g., fishery, forestry)	✓	✓	✓
Infrastructure (i.e., provincial trunk highways, provincial roads,	✓	✓	✓
Generating and converter stations	✓	✓	✓
Transmission lines	✓	✓	✓
Vale nickel mine	✓	✓	✓
Future projects and activities			
Kivalliq Hydro-Fibre Link	✓	✓	✓
Project 6 – All-season road linking Manto Sipi Cree Nation, Bunibonibee Cree Nation and God’s Lake First Nation	-	-	-

Table 9-5: Potential cumulative effects on harvesting and recreation

Other Projects and physical activities with potential for cumulative environmental effects	Potential cumulative environmental effects		
	Change to harvested resources	Change in access to harvesting and recreational areas	Change to harvesting and recreational experiences
✓ = Other projects and physical activities whose residual effects are likely to interact cumulatively with project residual environmental effects. – = Interactions between the residual effects of other projects and those of the project residual effects are not expected.			

Existing activities and projects in the RAA have been underway since prior to 1610 until present day and include domestic resource use; establishment of settlements; European contact and the fur trade; recreational activities; rail, road, and highway infrastructure; commercial resource harvesting (e.g., forestry and quarrying) and hydroelectric generating and converter stations, and transmission lines. As shown in Figure 4-1 (see Section 4.4.1) and Figure 5-3 (see Section 5.5), hydroelectric development in the RAA began in 1957 with the construction of the Kelsey generating station, and the existing hydroelectric transmission lines in the RAA were built between 1960 and 2019.

Past and current projects and activities in the RAA (Table 9-5) have contributed to changes to harvested resources, access to harvesting and recreational areas, and harvesting and recreational experiences in the RAA. Of the identified two potential future projects and activities, the Kivalliq Hydro-Fibre Link (KHFL) a transmission project which is anticipated to partly fall within the RAA of the project, has the potential to interact cumulatively with the project through changes to harvested resources, access to harvesting and recreational areas, and harvesting and recreational experiences.

9.4.6.2 Change to harvested resources

Pathways for cumulative effect

The construction, operation, and decommissioning of the Kivalliq Hydro-Fibre Link could adversely affect harvested resources if that project's activities result in the removal or alteration of a harvested resource through:

- Loss or disruption of harvested wildlife, fish, traditional use plants, and/or medicines resulting from direct removal or alteration of native vegetation and habitat.
- Altered movement or displacement of wildlife and bird species due to development activities causing sensory disturbance and due to the presence of the project.

Depending on the mitigation strategies adopted for the Kivalliq Hydro-Fibre Link project, there could be a cumulative adverse effect on harvested resources.

9.4.6.3 Change in access to harvesting and recreational areas

<u>Pathways for cumulative effect</u>

Similar to the proposed project, the construction, operation, and decommissioning of the Kivalliq Hydro-Fibre Link could adversely affect access to harvesting and recreational areas if that project's activities result in:

- Direct loss of access to areas previously used for harvesting and recreation.
- Increased or altered access to the area resulting from the presence of the project.

Depending on the mitigation strategies adopted for the Kivalliq Hydro-Fibre Link project, there could be a cumulative adverse effect on access to harvesting and recreational areas.

9.4.6.4 Change to harvesting and recreational experiences

<u>Pathways for cumulative effect</u>

Similar to the proposed project, the construction, operation, and decommissioning of the Kivalliq Hydro-Fibre Link could adversely affect harvesting and recreational experiences if that project's activities result in:

- Decreased preference or enjoyment of harvesting and undertaking recreational activities in the area.
- Direct loss or alteration of opportunities for the transmission of Indigenous Knowledge that occurs through harvesting.

Depending on the mitigation strategies adopted for the Kivalliq Hydro-Fibre Link project, there could be a cumulative adverse effect on harvesting and recreational experiences.

9.4.6.5 Mitigation measures

Mitigation measures proposed to reduce cumulative effects on harvesting and recreation include the following:

- Manitoba Hydro has considered the existing setting of the project and cumulative effects assessment to include all effects to harvesting since prior to colonialism (i.e., the historical temporal limit of the assessment has been expanded to provide a more robust historical and cultural context that traditional assessments).
- Manitoba Hydro will continue to consider feedback related to mitigation for how the project contributes cumulatively to changes to harvesting in the RAA.
- Based on project engagement, Manitoba Hydro will further discuss interests in monitoring.

9.4.6.6 Residual cumulative effects

Residual cumulative effects on harvested resources are predicted to be adverse in direction. Magnitude is predicted to be moderate (during construction and decommissioning) and low (during operations) assuming the KHFL project will be similarly routed within an existing transmission line corridor in the RAA. Geographic extent of predicted cumulative effects would be the RAA while duration would be long-term. Frequency is assessed as irregular event(s) or continuous, with irreversible effects.

Residual cumulative effects on access to harvesting and recreational areas are predicted to be adverse in direction. Magnitude is predicted to be moderate (during construction and decommissioning) and low (during operations) assuming the KHFL project will be similarly routed within an existing transmission line corridor in the RAA. Geographic extent of predicted cumulative effects would be the RAA while duration would be short-term for access restrictions to the PDA during construction, maintenance activities, and decommissioning, and long-term for access changes related to the presence of the transmission line. Frequency is assessed as irregular event(s) or continuous, with reversible effects.

Residual cumulative effects on harvesting and recreational experiences are predicted to be adverse in direction. Magnitude is predicted to be low assuming the KHFL project will be similarly routed within an existing transmission line corridor in the RAA. Geographic extent of predicted cumulative effects would be the RAA while duration would be long-term. Frequency is assessed as continuous, with reversible sensory related effects and irreversible effects to Indigenous Knowledge transmission and cultural continuity.

9.4.7 Determination of significance

With mitigation and environmental protection measures, the residual effects and the cumulative effects on harvesting and recreation are predicted to be not significant.

With this variation in mind, the project is not anticipated to affect harvesting and recreation to a point where use and/or access of the area for harvesting and recreation is critically reduced or eliminated based on qualitative assessments of indicators of the potential effects, literature review, engagement feedback, and professional judgment.

Although the project's residual effects and contribution to cumulative effects are predicted to be not significant, Manitoba Hydro acknowledges that individuals and communities may experience effects to harvesting and recreation. Therefore, effects may be felt to different magnitudes depending on the individual, some of which may deem such effects as substantive. We also realize that when rights-based harvesting is impacted through developments, it may contribute towards loss of cultural continuity.

9.4.8 Prediction confidence

Prediction confidence in the assessment of effects on harvesting and recreation is moderate.

This prediction confidence assignment reflects the available information regarding rights-based harvesting by engaged First Nations peoples and Red River Métis citizens during project engagement and a review of publicly available literature containing information about rights-based and non-rights-based harvesting in the project area. Although feedback provided through engagement on this project was limited, past self-directed studies conducted by First Nations and the Manitoba Métis Federation have informed this assessment. Manitoba Hydro is aware that there is likely also harvesting activity occurring throughout the RAA that we are not aware of and have considered this assumption in this assessment.

This prediction confidence assignment also reflects the understanding of applicable mitigation measures and reliance on assessments of other VCs of relevance to harvesting and recreation. Given the qualitative and subjective nature of assessing potential effects to harvesting and recreation, specifically to the experience of harvesting and enjoyment of place, the views of First Nations peoples and Red River Métis citizens may differ from the findings of this assessment.

9.4.9 Follow-up and monitoring

Manitoba Hydro will continue to work with interested First Nations and the Manitoba Métis Federation to mitigate the above noted effects. The environmental protection program (EPP; described in Chapter 17.0) is a framework for implementation, management, monitoring and evaluation of protection activities in keeping with environmental effects identified in environmental assessments, regulatory requirements, and public expectations. The EPP prescribes measures and practices to avoid and reduce adverse environmental effects (e.g., wildlife reduced risk timing windows, setbacks, and buffers for sensitive habitat).

Manitoba Hydro will provide opportunities for First Nations and the Manitoba Métis Federation to identify additional sensitive sites to help inform the EPP.

During engagement on the project, Fox Lake Cree Nation, the Split Lake Resource Management Board, and the Manitoba Métis Federation expressed interest in participating in project monitoring.

The monitoring program initiated by Manitoba Hydro in December 2023, working with trappers from Fox Lake Cree Nation in pursuit of getting a baseline understanding of trapping resources in the project area, is anticipated to continue though construction and post- construction.

Due to monitoring results from other similar projects and the well-established mitigation measures that will be implemented for the project, additional monitoring related to harvesting and recreation specific to this project is not proposed.

9.4.10 Sensitivity to future climate change scenarios

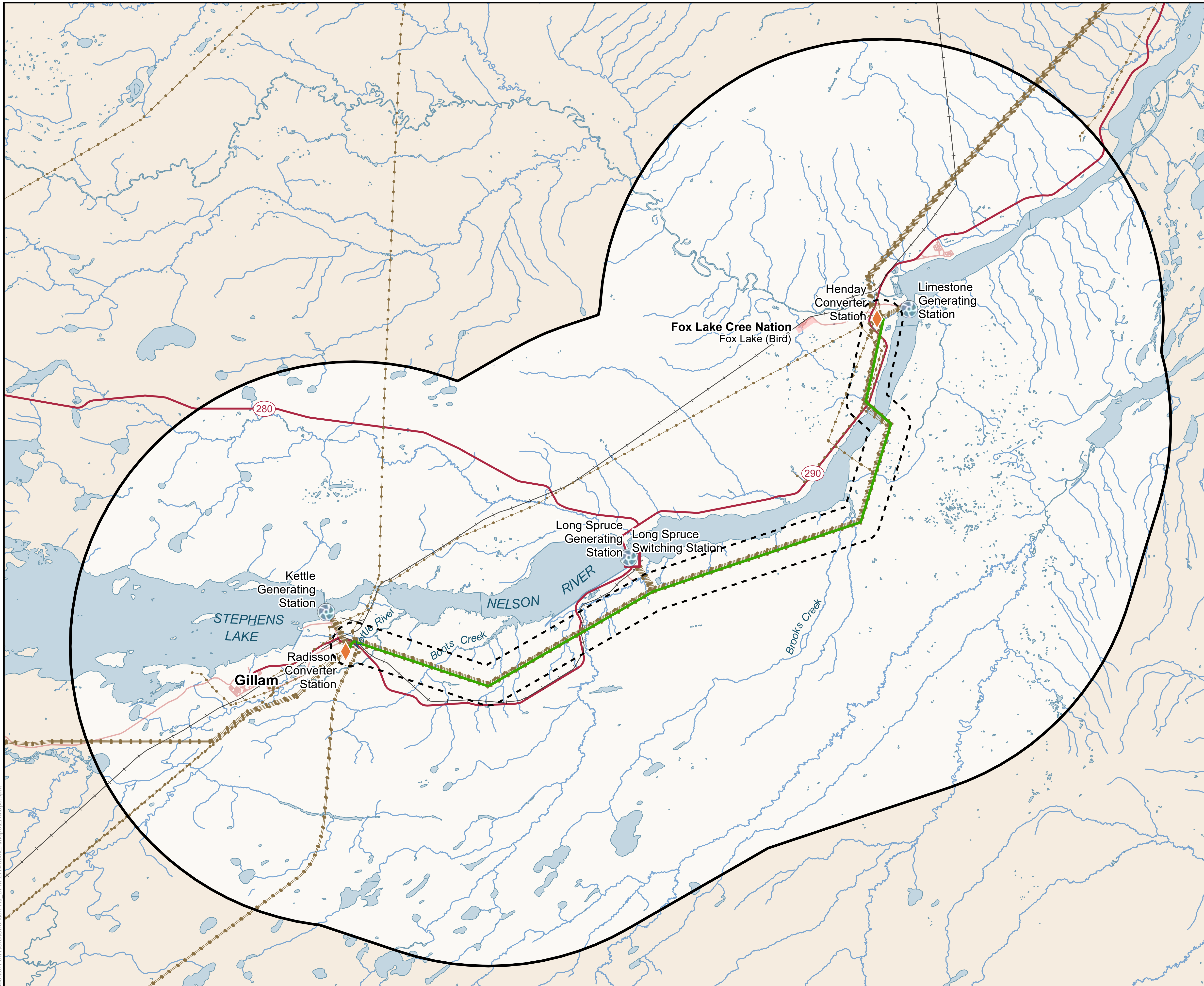
Effects of climate change on harvesting are expected to relate to the anticipated increase in temperature, changes in precipitation patterns, and associated extreme weather events (e.g., flooding) and their impacts on harvested resources (e.g., vegetation, fish, and wildlife and wildlife habitat) and the experiences of harvesters and recreational land users in the RAA.

Harvested wildlife may be affected through reductions in permafrost and changes to the frequency and impact of wildfires, which in turn can change habitat and affect access to food. Warmer temperatures may also result in more numerous insects and disease outbreaks affecting the health of some wildlife such as caribou (Environment and Climate Change Canada 2023). Increases in maximum water temperatures could exceed the lethal threshold for some fish species.

Vegetation composition, including distribution of harvested plants and medicines and the age distribution of forests, may be altered by changes in the prevalence or severity of wildfires resulting from climate change. Wetland vegetation communities may experience increased pressure with increased flooding that may result from melting permafrost and increased precipitation. Retaining and restoring wetland areas, which provide flood mitigation benefits, is important in anticipation of these climate change scenarios.

Changes to harvested resources resulting from climate change may result in changes to the ways harvesting takes place. As First Nation and Red River Métis harvesters adjust their harvesting practices in a changing environment there may be disruptions to cultural vitality and knowledge transmission that occurs through harvesting.

Emotional responses to climate change (i.e., climate anxiety) can be the result of physical changes to the landscape (such as an increase in severe weather patterns) and the perception of climate change, including the dread associated with negative environmental information or feelings that environmental challenges are very difficult to manage (Clayton 2020). Climate anxiety may affect individuals who undertake harvesting and recreational activities in the RAA.



R44H Transmission Line

Project Infrastructure
- Final Preferred Route

Assessment Areas
- Harvesting LAA (1km PDA Buffer)
- Harvesting RAA (15km PDA Buffer)

Existing Infrastructure
- Converter Station
- Electric Station
- Generating Station
- Existing ≥69kV Transmission Line

Landbase
- Community
- Railway
- Provincial Highway
- Provincial Road
- Local Road
- First Nation Lands
- Provincial Park

Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023

N

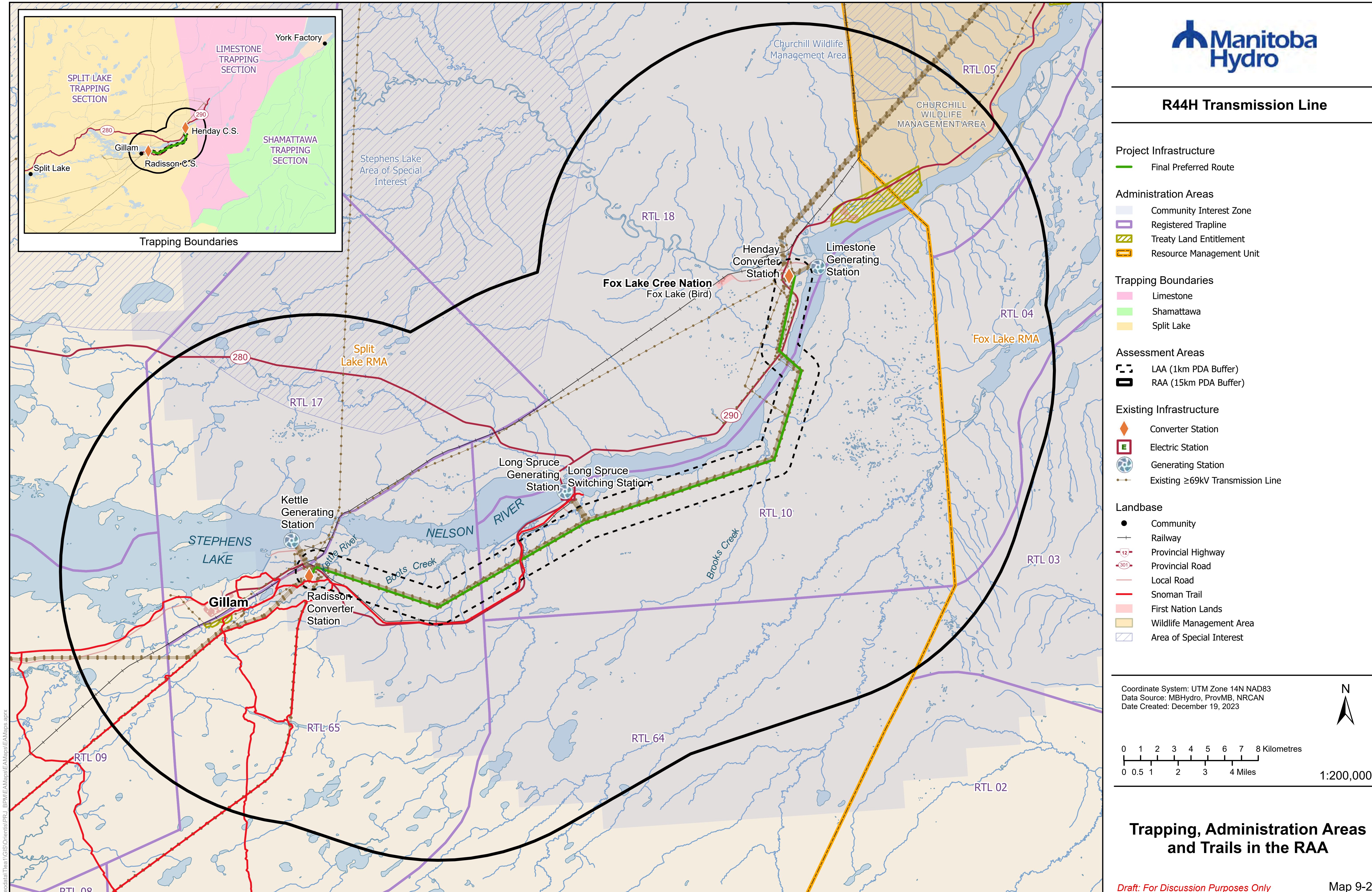
0 1 2 3 4 5 6 7 8 Kilometres
0 0.5 1 2 3 4 Miles

1:200,000

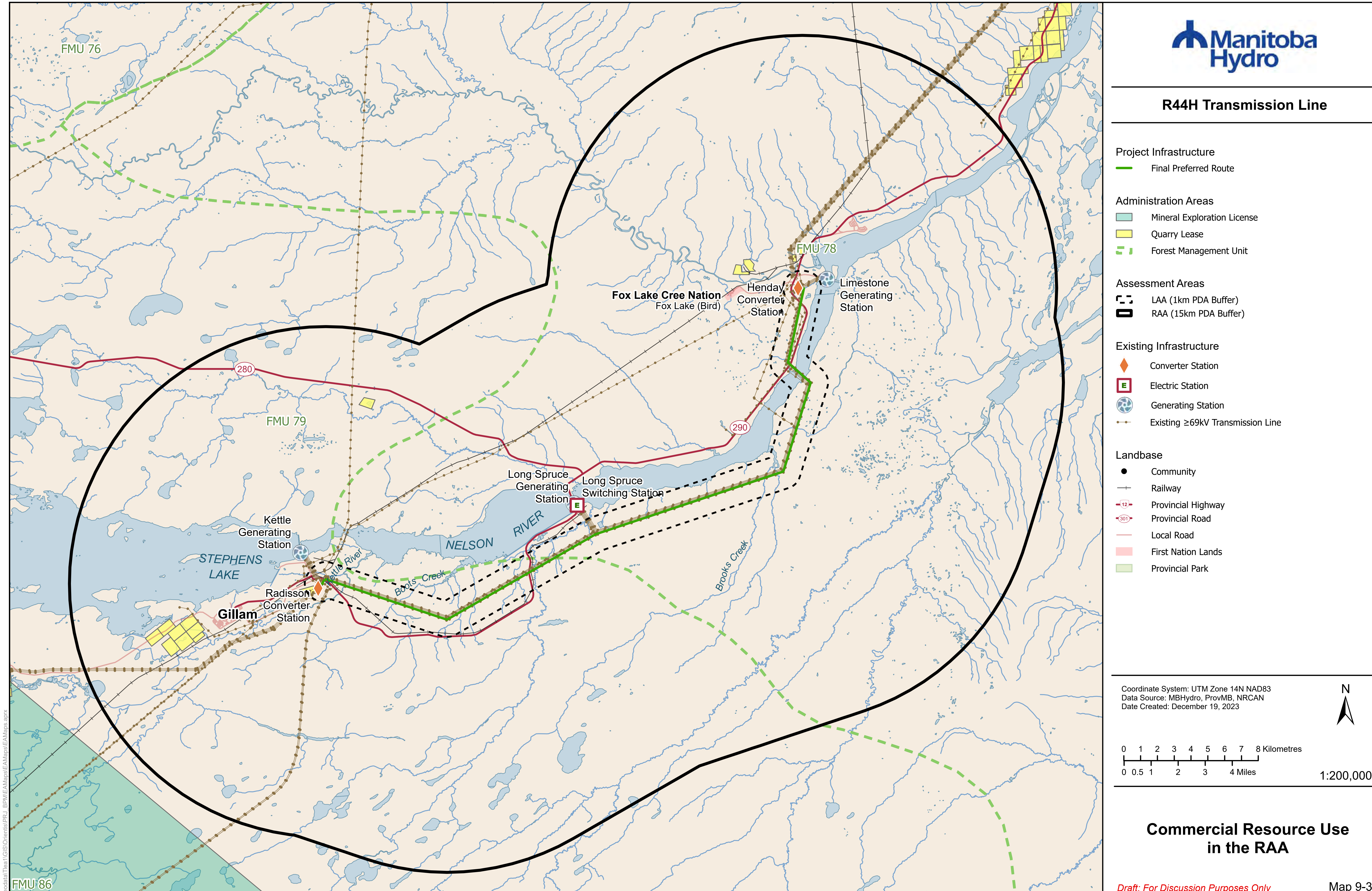
Harvesting Spatial Boundaries

Draft: For Discussion Purposes Only

Map 9-1



Manitoba Hydro
R44H Transmission Line
Project Infrastructure
Final Preferred Route
Administration Areas
Community Interest Zone
Registered Trapline
Treaty Land Entitlement
Resource Management Unit
Trapping Boundaries
Limestone
Shamattawa
Split Lake
Assessment Areas
LAA (1km PDA Buffer)
RAA (15km PDA Buffer)
Existing Infrastructure
Converter Station
Electric Station
Generating Station
Existing ≥69kV Transmission Line
Landbase
Community
Railway
Provincial Highway
Provincial Road
Local Road
Snoman Trail
First Nation Lands
Wildlife Management Area
Area of Special Interest
Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023
N
0 1 2 3 4 5 6 7 8 Kilometres
0 0.5 1 2 3 4 Miles
1:200,000
Trapping, Administration Areas and Trails in the RAA
Draft: For Discussion Purposes Only
Map 9-2
Trapping Boundaries
York Factory
LIMESTONE TRAPPING SECTION
SPLIT LAKE TRAPPING SECTION
SHAMATTAWA TRAPPING SECTION
Henday C.S.
Gillam
Radisson C.S.
Split Lake
Churchill Wildlife Management Area
CHURCHILL WILDLIFE MANAGEMENT AREA
Stephens Lake Area of Special Interest
Split Lake RMA
Fox Lake RMA
RTL 05
RTL 18
RTL 17
RTL 04
RTL 10
RTL 03
RTL 65
RTL 64
RTL 09
RTL 02
RTL 08
Henday Converter Station
Limestone Generating Station
Fox Lake Cree Nation
Fox Lake (Bird)
Long Spruce Generating Station
Long Spruce Switching Station
Kettle Generating Station
STEPHENS LAKE
NELSON RIVER
Kettle River
Boots Creek
Brooks Creek
Gillam
Radisson Converter Station
280
290



Manitoba Hydro
R44H Transmission Line
Project Infrastructure
Final Preferred Route
Administration Areas
Mineral Exploration License
Quarry Lease
Forest Management Unit
Assessment Areas
LAA (1km PDA Buffer)
RAA (15km PDA Buffer)
Existing Infrastructure
Converter Station
Electric Station
Generating Station
Existing ≥69kV Transmission Line
Landbase
Community
Railway
Provincial Highway
Provincial Road
Local Road
First Nation Lands
Provincial Park
Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023
N
0 1 2 3 4 5 6 7 8 Kilometres
0 0.5 1 2 3 4 Miles
1:200,000
Commercial Resource Use in the RAA
Draft: For Discussion Purposes Only
Map 9-3
FMU 76
FMU 78
FMU 79
FMU 86
Fox Lake Cree Nation
Fox Lake (Bird)
Henday Converter Station
Limestone Generating Station
280
290
Long Spruce Generating Station
Long Spruce Switching Station
NELSON RIVER
Kettle Generating Station
STEPHENS LAKE
Kettle River
Boots Creek
Brooks Creek
Radisson Converter Station
Gillam

10.0 Important sites

Important sites refer to sites and features important to heritage and culture in the project area.

For the purpose of this assessment, important sites considers heritage resources as defined and protected by Manitoba's *Heritage Resources Act* as well as a broad range of cultural sites and features understood to be important to Indigenous nations and peoples in the area.

Heritage resources refer to physical, cultural, and natural elements considered valuable and are preserved for their historical, cultural, scientific, or aesthetic significance. Heritage resources include tangible remains of human endeavor that have survived through time and provide evidence of past activity.

Cultural sites and features important to Indigenous peoples include both tangible sites and intangible cultural heritage. Tangible important sites include sites or objects of cultural, historical, spiritual, or sacred importance. Intangible cultural heritage is defined by UNESCO to include traditions and living expressions transmitted from one generation to the next (UNESCO 2023). This assessment, therefore, also considers the practice of ceremony and the places ceremony may occur.

Important sites was selected as a valued component (VC) because the project has the potential to destroy, damage or alter important sites.

Taking a broad approach to assessing project effects on heritage and culture aligns with the Manitoba Clean Environment Commission's (Manitoba Clean Environment Commission 2013) comment related to culture and heritage in the Bipole III Transmission Project report on public hearing which stated the following:

> "With regard to heritage resources, it is important to keep in mind that these are by no means limited to those resources, such as archaeological sites, that have already been identified. In many cases, heritage resources are only identified because there has previously been some disturbance, such as building of roads, that has turned up artifacts. It is also important to remember that the landscape itself is a heritage resource, providing visual cues for storytelling and memory. Alteration of the landscape can, by itself, have an impact on heritage."

10.1 Scope of the assessment

This section assesses the effects of project activities during construction, operation and decommissioning on important sites from project activities. An assessment of cumulative effects is also presented (if applicable).

This assessment was influenced by engagement feedback and Manitoba Hydro's experience with other recent transmission line projects in Northern Manitoba (e.g., the Bipole III Transmission Project (2011) and the Keeyask Transmission Project (2012)). The assessment considers the following:

- Disturbance of heritage resources from their in-situ context
- Disturbance of cultural sites or features important to Indigenous peoples

Where appropriate and permitted, understandings from studies completed for previous transmission projects have been included in this chapter.

10.1.1 The project

The scope of the project consists of the construction, operation, and decommissioning of a new and approximately 42-km long, 230-kV transmission line that would terminate at the Radisson and Henday converter stations, within an existing transmission line corridor.

A new transformer associated with the project would be added at Radisson converter station. There will not be footprint expansions at either converter station as modifications would be done within existing station properties.

10.1.2 Regulatory and policy setting

10.1.2.1 The Heritage Resources Act (1986)

Heritage resources are non-renewable resources which provide a tangible cultural link between the past and present. Heritage resources are protected under Manitoba's *The Heritage Resources Act* (1986) and are "…a heritage site, a heritage object, and any work or assembly of works of nature or of human endeavor that is of value for its archaeological, palaeontological, pre-historic, historic, cultural, natural scientific or aesthetic features, and may be in the form of sites or objects or a combination thereof".

Heritage sites are recorded in a provincial registry and are managed by the Historic Resources Branch of the Department of Sport, Culture and Heritage. This registry includes the following categories:

- Archaeological sites
- Provincial sites
- Municipal sites
- Commemorative plaques
- Cemeteries

The provincial registry does not specifically recognize cultural sites and therefore does not offer protection for cultural sites understood to be important to Indigenous peoples unless they can be captured and registered as an archaeological site. Examples of cultural sites that may be registered as an archaeological site include culturally modified trees or trees with prayer flags.

If it is in the opinion of the Minister that heritage resources may be affected by development, the Minister can order an archaeological study or other protection measures.

10.1.2.2 The Constitution Act section 35, Part II (1982)

Section 35 of *The Constitution Act*, 1982, recognizes and affirms the existing Aboriginal and treaty rights of the Indigenous peoples of Canada. These affirmed rights include rights relevant to important sites including rights to practice one’s culture and spiritual traditions as well as rights to lands, territories, and resources recognized as inherent Aboriginal rights by Canadian courts (Government of Canada 2018).

Traditional activities and practices included within this chapter reflect traditional activities and practices that the courts have expressly recognized would potentially be constitutionally protected under section 35 of the Canadian Constitution Act, 1982. The authors of this chapter did not try to distinguish whether activities, customs and practices shared through project engagement met the test to be constitutionally protected. If an activity, practice, or custom was shared with Manitoba Hydro and understood to be important to a potentially affected First Nation or the Manitoba Métis Federation, it was considered relevant to this assessment.

10.1.3 Consideration of feedback shared during engagement

Project engagement (Chapter .0) actively sought to provide opportunities for concerned and engaged audiences to provide VC related feedback about the project.

Feedback related to important sites included the following comments:

- During a field tour of the project area, Fox Lake Cree Nation representatives shared that there is one location of cultural significance that has been disturbed (ribbons have been removed) and needs to be remarked; on the eskers.
- During a meeting with Fox Lake Cree Nation, a concern about the potential for unmarked graves, potentially from York Factory First Nation’s relocation, was raised. Participants also shared that community members visit the area near Long Spruce to collect eagle feathers. Additionally, Fox Lake Cree Nation provided feedback about how to bring ceremony into the project including

blessings before construction begins, at river crossings, monthly sweats for project workers and community members, and cultural awareness training.

- During a meeting with the Manitoba Métis Federation, they shared that along the Nelson River would have been a major travel area that Red River Métis citizens would have used and that there is potential heritage in the area. The MMF expressed interest in learning from the work of the archaeologists and requested to be informed about what the archaeologists find. Potential effects, pathways, and measurable parameters

10.1.4 Potential effects, pathways, and measurable parameters

Potential effects, effects pathways, and the measurable parameters used to characterize and assess effects on important sites are provided in Table 10-1.

Table 10-1: Potential effects, effects pathways, and measurable parameters for important sites

Potential Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Disturbance of heritage resources from their *in-situ* context	Ground disturbance through construction, installation, and maintenance activities Impacts to surface structures through vegetation clearing	Number of heritage resources altered/lost because of project activities.
Disturbance of cultural sites or features important to Indigenous peoples	Potential disruption of known or unknown cultural sites or features/objects during construction, particularly during activities involving ground disturbance Potential disruption to aspects of intangible cultural heritage or cultural experiences due to changes in access, aesthetics, and sense of place resulting from the project	Instances of encountering heritage resources and other cultural resources during pre-construction field work or construction activities. Qualitative assessment of feedback related to potential project impacts to important cultural and heritage sites shared through project engagement. Qualitative assessment of aesthetic conditions.

Heritage resources and objects are non-renewable and once disturbed can never be returned to their original context. A potential adverse effect on heritage sites is disturbing them from their in-situ condition.

Disturbance may range from displacement from the original context to complete destruction. If a disturbed heritage resource gets displaced from its in-situ context, some to all information about the heritage object can been lost. A heritage resource disturbed to a minor extent can retain information such as typology and association with a complex or culture if it is diagnostic. However, detailed information such as association with other heritage objects from the area and stratigraphic deposition can be lost.

At the extreme, disturbing a heritage object can result in the destruction of the object. When a heritage resource is destroyed, no further information can be collected.

For tangible cultural sites and features important to Indigenous peoples, the potential range of adverse effects is aligned with the range identified for heritage resources, from loss of integrity and/or information about the site or object to complete destruction.

Where intangible cultural heritage or cultural experiences may be disrupted, the potential adverse effects are expected to vary broadly based on the unique relationships that different Indigenous nations and individuals have with the area in terms of cultural practices, experiences, and perspectives.

10.1.5 Spatial boundaries

Three spatial boundaries are used to assess residual and cumulative environmental effects of the project on important sites:

Project development area (PDA): the project footprint and anticipated area of physical disturbance during construction, operation, and decommissioning of the project.

Local assessment area (LAA): includes all components of the PDA and consists of a 1 km buffer on either side of the right of way and around stations, which is deemed inclusive of important sites that could be encountered during project activities.

Regional assessment area (RAA): includes the PDA and LAA and encompasses the area where project specific environmental effects could overlap with those of past, present, and reasonably foreseeable future projects and activities. It is used to provide regional context and is the area used for assessing the project's contribution to cumulative effects. It consists of 5 km from the centreline on either side of the right of way and around stations. A 5 km buffer also reflects the anticipated area beyond which the presence of a 230 kV transmission line is not anticipated to strongly attract visual attention based on a literature review ((Sullivan, et al. 2014); (Palmer 2016)).

10.1.6 Temporal boundaries

The primary temporal boundaries for the assessment of project effects on important sites are based on the timing and duration of project activities as follows:

- Construction – If a licence is received, it is anticipated to start in December 2024 and be completed by July 2026. Station work to occur year-round, transmission line construction to occur under frozen conditions.

- Operations and maintenance – for the life of the project, estimated to be a 75-year design life.
- Decommissioning – estimated to be two years once the project has reached the end of its serviceable life.

To understand existing conditions related to important sites, the assessment also considers information from the existing database of previously recorded sites, general cultural chronologies, and the living memories of knowledge holders who have shared feedback about important sites through project engagement and on past projects.

10.1.7 Residual effects characterization

Table 10-2 provides the definitions used to characterize the residual effects on important sites.

Table 10-2: Characterization of residual effects on important sites

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Positive** – a residual effect that moves measurable parameters in a direction beneficial to important sites relative to baseline. **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to important sites relative to baseline. **Neutral** – no net change in measurable parameters for important sites relative to baseline.
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**No Measurable Change –** no disturbance to important sites is predicted. **Low -** a noticeable change to important sites is predicted in which cultural experience is likely to be altered but there is no predicted disruption to the ability or preference to visit important sites or undertake cultural activities

Table 10-2: Characterization of residual effects on important sites

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
		Moderate – a noticeable change to important sites predicted to result in disruptions to the ability to access important sites or have cultural experiences **High** – a change to important sites that is predicted to result in long-term elimination or reduction of access to important sites or the ability to have cultural experiences in the RAA
Geographic Extent	The geographic area in which a residual effect occurs	**PDA –** residual effects are restricted to the PDA **LAA –** residual effects extend into the LAA **RAA** – residual effects extend into the RAA

Table 10-2: Characterization of residual effects on important sites

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Duration	The time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	Not applicable for heritage resources or other tangible important sites for which impacts cannot be undone. For other effects (e.g., to intangible cultural heritage, cultural experiences): **Short-term –** the residual effect is restricted to the construction phase **Medium-term –** the residual effect extends beyond the construction phase **Long-term –** the residual effect extends for the life of the project (including operation and decommissioning)
Frequency	Identifies how often the residual effect occurs and how often during the project or in a specific phase	**Single event** **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and reclamation **Irreversible –** the residual effect is unlikely to be reversed

10.1.8 Significance definition

For this assessment, adverse residual effects on heritage resources are considered significant if the proposed project results in an impact to standing or collapsed structures (e.g., old cabins or foundations) or any ground disturbance that compresses or exposes the occupation layer at an archaeological site. The occupation layer is any soil horizon that contains artifacts, bones, or heritage features. In addition to irreversible damage to the heritage resource, such an adverse effect could result in substantive penalties under *The Heritage Resources Act* (1986). Longer term, such an adverse effect will affect the cultural history of the affected communities.

In relation to cultural sites and features understood to be important to Indigenous nations and individuals in the project area as well as intangible cultural heritage, the evaluation of residual effects rely on qualitative assessments, which consider indicators of the potential effect, literature reviews, engagement feedback, and professional judgment to consider if adverse residual effects are significant.

The severity of the project's residual effects on important sites will vary between cultural groups. Every nation is different and has different connections to different places and cultural practices. Recognizing the variation, residual adverse effects will be considered significant if there is a predicted long-term loss of availability and access to important sites to a point where use, access, or cultural experiences are critically reduced or eliminated.

10.2 Project interactions with important sites

Table 10-3 identifies the physical activities that might interact with the VC and result in the identified effect.

Table 10-3: Project interactions with important sites

Project activity	Disturbance of heritage resources from their in-situ context	Disturbance of cultural sites or features important to Indigenous peoples
Transmission Line Construction		
Mobilization and staff presence	✓	✓
Vehicle and equipment use	✓	✓
Right-of-way clearing	✓	✓
Watercourse crossings	✓	✓

Table 10-3: Project interactions with important sites

Project activity	Disturbance of heritage resources from their in-situ context	Disturbance of cultural sites or features important to Indigenous peoples
Marshalling / fly yards	✓	✓
Transmission tower construction	✓	✓
Implosive connectors	–	✓
Helicopter use	–	✓
Clean-up and demobilization	✓	✓
Station Modification		
Mobilization and staff presence	✓	✓
Vehicle and equipment use	✓	✓
Marshalling / fly yard	✓	✓
Site preparation	✓	-
Clean-up and demobilization	✓	✓
Transmission Line and Station Operation and Maintenance		
Transmission line and station presence	–	✓
Vehicle and equipment use	✓	✓
Inspection and maintenance	–	✓
Vegetation management	✓	✓
Decommissioning		
Mobilization and staff presence	✓	✓
Vehicle and equipment use	✓	✓
Removal of transformers, disassembled towers, foundations, conductors, and associated equipment	✓	✓
Rehabilitation	✓	✓
Clean-up and demobilization	✓	✓
✓ = Potential interaction – = No interaction		

Most project activities have the potential to introduce pathways that may affect important sites. Heritage resources and other tangible cultural sites or features present in the soil or on the landscape in the project area are primarily vulnerable to project activities involving ground disturbance. Intangible cultural heritage and cultural experiences could be affected by project activities that generate noise, alter access, or alter the aesthetics of the area through generation of noise or changes to the visual landscape.

10.3 Existing conditions

Understanding archaeological resources necessitates placing them within a framework of both the physical and cultural environments. The physical environment is composed of climate, landscape, soils, hydrology, local and regional topographic relief, and the geological processes that created the landscape. Culture is a suite of learned human behaviours such as language, values, belief systems, and material culture shared by a society. These can be demonstrated materially in archaeological sites, place names, existing settlements, and communities.

Baseline information for this assessment was gathered through a detailed review of the provincial heritage site registry, literature, past self-directed studies undertaken by engaged Indigenous nations, feedback from project engagement. The existing conditions described in this section focus on:

- Environmental characterization
- Cultural history
- Existing registered archaeological sites
- Land-based attributes
- Cultural sites, features, and contemporary cultural land use

10.3.1 Cultural history

The heritage resources temporal boundary spans a timeframe of approximately 6,500 to 75 years before present ((Nielsen, et al. 1996); (Teller 1984)). This timeframe corresponds to the period when glacial Lake Agassiz drained northward into Hudson Bay, and the environment became conducive to human habitation.

As the lake drained and receded and river systems were established, the newly exposed landscape offered additional areas of exploration and exploitation.

Coastal Manitoba also saw physical changes as the final breach of ice-jammed corridors caused sea levels across the Atlantic Ocean to rise appreciably. The basin now referred to as Hudson Bay flooded inland to create the Tyrrell Sea with its maximum extent just north of Gillam (Figure 10-1) (Dredge 1992). Prior to this, the area was covered by the Laurentide ice sheet. The upper historical temporal boundary specific to the project area was selected to be seventy-five years ago, because this is the upper temporal limit recognized by the Historic Resources Branch (HRB) for a site to be recorded in the provincial inventory.

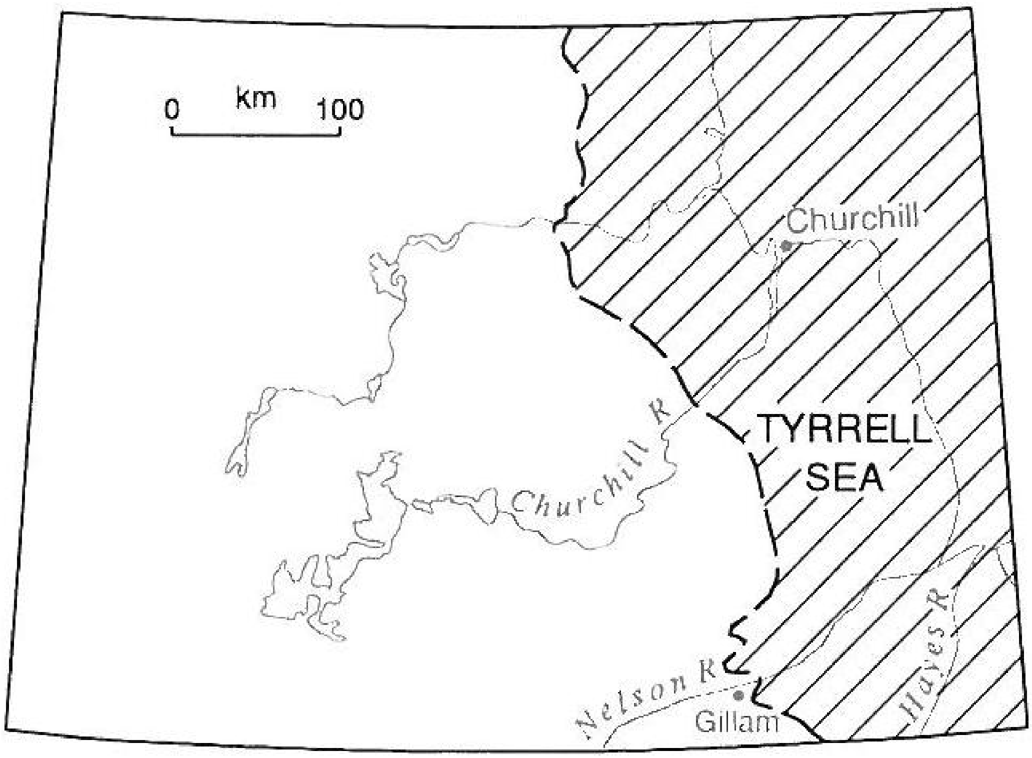


Figure 10-1: Map of extent of Tyrell Sea in northern Manitoba (Dredge 1992)

The project area is associated within traditional territory linked to ancient, historic, and recent Cree land use and occupancy. The pre-European contact (Precontact) period represents time before the initial contact between Indigenous peoples and Europeans. Generally, this period begins with evidence of the first people who explored the region during the post-glacial emergence of habitable lands. This occurred at different geographic and temporal locations. The Precontact period is divided into three categories which are based on association with hallmark technologies: the Palaeo/Plano Period (ca. 12,000-6,500 B.P.); the Archaic (Western Intensive Diversification) Period (ca. 6,500 to 2,500 B.P.); and the Woodland Period (ca. 2,000 – 300 B.P.).

The earliest evidence of human occupation has been found on nearby Gull Lake on the Nelson River. Two large projectile points recovered from the north shore of Gull Lake suggest affiliation to the Middle Pre-European Contact Period (6,500 – 2,000 years ago) based on their size and manufacture. Northern archaeological evidence from the Gull Lake area and lower Nelson River suggested that by 5,000 years ago the Nelson River system had developed into a well-established travel route supporting small bands of seasonally subsistent people. Projectile point forms suggest that there may have been movement of human populations from the northwest (Southern Keewatin area) into the Canadian Shield around the same time that people from the Plains and Boreal Forest were extending their range of movement northwards (Northern Lights Heritage Services Inc. 2011).

Human remains have also been recovered from Gull Lake and provided a radiocarbon date of 4,800 BP (Northen Lights Heritage Services 2011a). The Woodland Tradition (2,000 to 800 years ago), associated with the first appearance of clay ceramic technology, has been found along the shores of the Nelson River as well as on nearby smaller inland lakes. Similar interior brushing technique found on sherds recovered from both the Nelson River and Fox/Atkinson Lake may suggest familial seasonal rounds based on resource procurement (Northern Lights Heritage Services 2003).

Explorers and fur traders were the earliest Europeans to arrive in the project area. Henry Kelsey made the first recorded European voyage to the interior of Manitoba from Hudson Bay in 1690. He ascended the Hayes River in the company of the Cree, branched off to the Fox River and eventually made his way onto the Nelson River system via an ancient connecting waterway through Fox Lake, the Cyril River and into the Landing (Aiken) River to Split Lake. From there he continued up the Saskatchewan River and onto the prairie ((Kelsey 1929); (Badertscher 1982)). Following Kelsey's historic journey, in the 18th century, several Hudson Bay Company surveyors such as Samuel Hearne, Peter Fidler, and David Thompson explored areas along the Nelson, the Burntwood, the Saskatchewan, and the Assiniboine Rivers. Several fur trade posts were established through these early explorations.

In 1908, an adhesion to Treaty 5 was signed by the Split Lake Band (now Tataskweyak Cree Nation) and Nelson House Band (now Nisichawayasihk Cree Nation). On August 10th, 1910, the adhesion to Treaty 5 was also signed at York Factory by the Homeguard Cree's Chief Charles Wastasekoot and two councillors, Robert Beardy and Sandy Beardy. In 1947, two different groups of York Factory Band Members formed the Shamattawa and Fox Lake Bands (York Factory First Nation 2010). Fox Lake Cree Nation was formally recognized as a distinct nation by the Government of Canada in 1947 (Fox Lake Cree Nation 2023).

Several historic period sites are situated along the Nelson River in the region of Gull Rapids. Cabins, teepees, tent frames, and portages demonstrate the continued presence of Cree people throughout the region. Evidence of current resource use can be found throughout the study area in the form of trapping and hunting sites, as well as construction work camps found along the Keeyask Generation Outlet Transmission Line ((Northern Lights Heritage Services 2012); (Intergroup Consultants Ltd. 2016)).

10.3.2 Land-based attributes

It is assumed that ancient peoples had preferences for certain types of environments and selected certain land-based features over others for habitation, resource procurement, or protection. Evaluation of land-based attributes for the proposed project route required analysis of many inputs including the following:

- Manitoba's Historic Resources Branch Heritage Site Inventory
- Shapefile of Manitoba Hydro's proposed route
- LiDAR imagery
- Other geo-spatial datasets (e.g., drainage, elevation, waterways)

The occurrence of several land-based features relative to the proposed transmission line footprint was evaluated using contemporary predictive models ((Petch, et al. 2001); (Historic Resources Branch 2015)). The land-based features included:

- Proximity to known archaeological sites
- Proximity to waterways
- Terrain (i.e., elevated ridges, level ground)
- Land cover (i.e., well-drained soils)

The project crosses over several waterways including the Nelson River, Kettle River, Boots Creek, Wilson Creek, Brooks Creek and Moondance Creek, as well as other unnamed creeks. Each of these waterways has moderate potential based on standard archaeological predictive modelling. In total, there are eight (8) water crossings of heritage areas of concern that have been identified (see Map 10-1).

Post-glacial features for example, beach ridges associated with the former Tyrrell Sea and glacial Lake Agassiz, eskers and moraines would have provided early travel routes for both wildlife and humans. This has been shown by the discovery of two archaeological sites, HdKl-001 and HdKl-002, near Manitoba Hydro's Keewatinohk Converter Station (approx. 22 km northeast of the Henday Converter Station), situated on low gravel ridges above black spruce swamp likely associated with gravel beach ridges of the former Tyrrell Sea (Northern Lights Heritage Services Inc. 2011). The contour elevations and wetland datasets were reviewed in comparison to the proposed PDA. There are expansive wetlands covering the assessment area, and limited elevated areas in which an archaeological site is expected to occur.

A review of LiDAR data corroborates that there are limited terrain or soil features of interest on or adjacent to the proposed transmission line corridor.

No heritage resource sites are within the project area based on the compiled data. Additionally, the land-based desktop study shows that there are no areas of high heritage potential.

10.3.3 Existing registered archaeological sites

The provincial archaeological site inventory was reviewed for registered archaeological sites relative to the project area. To date, there are no reported archaeological sites within the proposed transmission line corridor (i.e., PDA). Dozens of archaeological sites have been recorded within the larger region, largely documented over 10 years of environmental and archaeological assessments related to the Keeyask Generating Station ((Keeyask Hydropower Limited Partnership 2012a); (Northern Lights Heritage Services Inc. 2009). Most archaeological sites are associated with ancient, historic, and recent Cree land use and occupancy. From a regional perspective, all known sites are located within 100 m of the present shoreline of the Nelson River (Keeyask Hydropower Limited Partnership 2012a). These studies also provided indication that most of the sites in the region have been affected by the creation of the Kettle, Long Spruce, and Limestone generating station forebays. New or yet undiscovered heritage resources in the PDA have enhanced importance for understanding local cultural history.

It is possible that the scarcity of archaeological sites along the proposed transmission line route may be a result of a lack of archaeological assessments in the area, as construction of the existing transmission lines in the same corridor as the proposed project predated *The Heritage Resources Act*.

10.3.4 Cultural sites, features, and contemporary cultural land use

Manitoba Hydro has a presence across Manitoba – on Treaty 1, Treaty 2, Treaty 3, Treaty 4 and Treaty 5 lands – the original territories of the Anishinaabe, Anishininew, Cree, Dakota, and Dene peoples and the homeland of the Red River Métis. We acknowledge these lands and pay our respects to the ancestors of these territories.”

Manitoba Hydro acknowledges that the Radisson to Henday transmission line is located on Treaty Five territory and on the traditional territories of the Cree peoples and the Red River Métis. We acknowledge the longstanding cultural and spiritual connections with the land and water throughout the territory and acknowledge the impacts of our projects and operations. The legacy of the past remains a strong influence on our relationships with Indigenous communities today. We are committed to having meaningful and mutually beneficial relationships, and to honour agreement commitments arising from Manitoba Hydro projects and operations. Let us reaffirm our relationship with one another. This is important as we move forward together in a spirit of truth and reconciliation.

Section 5.5 outlines our understanding of historical and cultural setting for the project area, including a timeline visual (Figure 5-3) that provides an overview of past events that have affected the land and Indigenous peoples in and around the project area. The events described in the timeline visual help provide context relevant to understanding the lived experience of Indigenous communities within and around the project area.

Through project engagement for this project and past projects, Manitoba Hydro understands that many known important sites in the regional area include areas along historic and contemporary trails and travel routes. In particular, the Kischi Sipi (Nelson River) and its tributaries, are historical travel routes of Fox Lake Cree Nation members. Through engagement for this project, the Manitoba Métis Federation have indicated that the Nelson River would have been a major travel area that Red River Métis citizens would have used and that there is potential heritage in the area.

During the ongoing project engagement, Fox Lake Cree Nation shared concern about the potential for unmarked graves to be discovered along the proposed route, particularly relative to York Factory First Nation's relocation. York Factory First Nation was forced to relocate by the federal government from the York Factory trading post inland to present day York Landing, in 1957 (York Factory First Nation n.d.).

Fox Lake Cree Nation members also informed Manitoba Hydro of areas of cultural importance in the project area, one being an area that could partially fall within the LAA, near Long Spruce and is visited by members for the collection of eagle feathers. Another culturally important site, outside the PDA but potentially within the RAA, was previously marked by ribbons during a ceremony on a past transmission project. A Fox Lake Cree Nation member shared that ribbons have since been removed from the site and need to be replaced.

Manitoba Hydro recognises that a lack of information regarding important sites does not necessarily represent a lack of cultural use or importance of the area. Even where specific important sites were not shared through project engagement, Manitoba Hydro assumes that they are potentially present within the project region. Further, Manitoba Hydro understands that the area is of broad cultural importance to engaged Indigenous nations who have maintained enduring relationships with the land in the area for generations.

10.4 Assessment of effects

Considering that the project area has been previously disturbed through adjacent transmission line clearing and construction, the potential for unknown archaeological sites, heritage resources, or human remains being discovered during clearing and construction is low but possible.

While effects to important sites could occur during construction, operation, and decommissioning, they are anticipated to be most pronounced during construction and include the following:

- Disturbance of heritage resources from their in-situ context, and
- Disturbance of cultural sites or features important to Indigenous peoples

Discussion of effect pathways for each of these two effects are presented below followed by mitigation measures identified to reduce effects, and the characterization of residual effects on important sites.

10.4.1 Disturbance of heritage resources from their in-situ context

The generalized project-effect pathways that may lead to disturbance of heritage resources are as follows:

- The movement of staff, equipment, vehicles, and materials during mobilization and construction, as well as right-of-way clearing have the potential to disturb heritage resources predominantly at the surface and displace them from their original context.
    - The effect on heritage resources would relate to the potential loss of built structures such as cabins (standing or collapsed), the loss of markers at cemeteries, and the disruption of trails.
- Large standing boulders or prayer flags might be altered during vegetation clearing. Many northern sites are shallow and any activity that disturbs the mineral soil can affect heritage resources. Construction adjacent to waterways with noted high archaeological potential has a greater probability to disturb heritage resources.
- Construction activities including the development of access, construction of marshalling and fly yards, and construction of transmission towers have the potential to disturb heritage resources both at the surface and subsurface.
- Maintenance activities requiring ground disturbances can alter heritage resources at both the surface and subsurface.

- Decommissioning activities such as asset removal and reclamation of disturbed areas requires ground disturbances, however, such effects would be limited to previously undisturbed areas.

10.4.2 Disturbance of cultural sites or features important to Indigenous peoples

The pathways through which cultural sites or features important to Indigenous peoples may be affected by the project include:

- Potential disruption of unknown cultural sites or features/objects during construction, particularly during activities involving ground disturbance
- Potential disruption to aspects of intangible cultural heritage or cultural experiences due to changes in access, aesthetics, and sense of place resulting from the project

During construction, the primary project activities that may result in disruption of unknown cultural sites or features that are tangible are those that involve ground disturbance or clearing of vegetation including the use of vehicles and equipment, right-of-way clearing, access routes, marshalling/fly yards, and transmission tower construction.

During engagement on past transmission line projects, we have heard feedback on the importance of having specific plans in place that indicate how heritage findings must be addressed if found during construction.

There is concern that work crews constructing the project may not be able to identify or notice heritage resources or other cultural sites if they see them and may damage them unknowingly.

During construction, the project may affect intangible cultural heritage and the experience of important sites through project activities that cause noise, changes to visual aesthetics, and changes to access.

During construction, access to the right-of-way is prohibited. This restriction directly prevents access to important sites or access points that may be along the right-of-way for the duration of active construction in an area. Physical barriers (e.g., gates, fences) may be in place during this time to prevent and deter access to the area. While such access restrictions are intended to protect human health and safety while construction activities are underway, they do preclude use of the affected area for cultural and spiritual use.

Throughout construction, there will be an increase in noise or change in the types of noise in the project area resulting from activities such as the mobilization and staff presence, vehicle and equipment use, right-of-way clearing, access routes, marshalling/fly yards, transmission tower construction, helicopter use, and implosive connectors. Sensory disturbances from construction activities are expected to be short-term and localized to the area under active construction.

During construction, the primary pathway for a direct and measurable change to visual qualities is vegetation clearing and grubbing of the right-of-way.

During operations, the potential for the project to disturb unknown cultural sites or features is substantially diminished because ground disturbance is anticipated to be low. Potential effects during operations are generally related to maintenance activities, including vehicle and equipment use for transmission line repairs and vegetation management.

Although the area of tower footprints will be permanently inaccessible due to physical occupation by the towers, access permissions on the PDA during operations will be like those in place prior to construction. In other words, if an area traversed by the project was previously accessible to rights-holders (e.g., Crown land), it will again be accessible during the operational phase. However, during maintenance activities, there may be intermittent and typically short-term localized access restrictions to the right-of-way for safety purposes.

Although the PDA is already accessible because it is within an existing corridor, the presence of the new cleared right-of-way area may result in additional access to the area by people who may not have previously visited the PDA. This increased access may include foot traffic as well as the use of ATVs and snowmobiles. The use of ATVs and other recreational vehicles could accelerate the wear of travel ways and diminish tranquility along access routes as well as increase the potential for disturbance of important sites along access routes.

During operations, noise generated by the project is expected to be less compared to the construction phase. Noise associated with maintenance activities would be intermittent, temporary, and contained mostly within the PDA.

Through operations, the auditory experience at important sites very close to the transmission line may be altered from their current state due to the potential presence of corona discharge, which causes a hissing or crackling noise that sometimes occurs with high voltage transmission lines. Audible noise from corona discharge along the edge of the right-of-way is expected to be approximately 23 dBA during medium to fair-weather conditions (Exponent 2015). This is less than the typical ambient noise level of 45 dBA for a quiet rural area (Health Canada 2017). Therefore, corona discharge is only anticipated to potentially alter noise in areas underneath or very close to the transmission line.

Following construction, the right-of-way will be reclaimed. However, vegetation will be maintained in a different state than before construction so there will be a continuous change to the appearance of the area throughout project operation.

The visual experience in the vicinity of the project will also change due to the presence of new cleared right-of-way and the transmission line. Based on published literature, presence of a new 230 kV transmission line is not anticipated to strongly attract visual attention beyond the RAA identified for important sites ((Sullivan, et al. 2014); (Palmer 2016)).

Because the project will be in a developed right-of-way alongside other transmission lines, its visual presence should cause a less noticeable alteration to the viewscape than would be experienced if the transmission line was to be in a previously undeveloped landscape.

Changes to aesthetic conditions resulting from the project may affect Indigenous peoples' sense of place, defined as peaceful enjoyment of lands and waters without sensory disturbances, stress, or harassment, and their emotional and spiritual attachment to culturally important places. To experience a sense of place it is critical to have the ability to enjoy the surroundings without sensory disturbances, stress, or harassment (Cedar LNG Partners LP 2022).

The experience of the area for Indigenous peoples visiting important sites may also be altered by real or perceived health concerns and stress associated with the presence of the project, which is discussed in greater detail in Chapter 13.0. Indigenous peoples may choose to avoid important sites near the project because of concerns about safety related to corona discharge, herbicide use, and EMF associated with transmission lines, which has the potential to affect cultural continuity and knowledge transfer.

Areas intersected by the PDA may be altered in a way that impacts access to an area for use, or the appropriateness of the area for cultural activities. A loss or diminishment of experience of important sites, through the pathways described, may have long-term implications on cultural vitality of Indigenous peoples due to diminished opportunity for the intergenerational transmission of cultural and Indigenous Knowledge that occurs through participating in cultural practices (i.e., intangible cultural heritage).

Through project engagement on the current project and on past projects, Manitoba Hydro has learned about the importance of incorporating ceremony into projects to show respect to the land and spirits that will be affected as well as the importance of implementing measures to increase Indigenous cultural awareness and understanding of non-locals who come to the area to work on projects. Through project engagement, Fox Lake Cree Nation shared the following mitigation recommendations:

- Ceremony must take place prior to commencement of project work (i.e., before the land or vegetation are disturbed).
- Indigenous Cultural Awareness Training must be provided to staff who will work on the project and the training should be provided by the community.

10.4.3 Mitigation measures

This section describes mitigation measures that have been identified to reduce effects on important sites including heritage resources in their in-situ context and cultural sites or features important to Indigenous peoples.

10.4.3.1 Mitigation measures related to heritage resources in their in-situ context

Potential effects can be avoided through implementation of effective mitigation measures including general environmental protection measures, beneficial management practices, standard operating procedures, environmental protection plans, and environmental restoration plans.

It is standard practice for Manitoba Hydro to implement a cultural and heritage resource protection plan (CHRPP Section 17.7.4.4) as mitigation. Mitigation measures include the following:

- Implementation of a cultural heritage resources protection plan (CHRPP) during pre-construction, construction, and operation activities of the project.
- Completion of a pre-construction archaeological assessment.
- All archaeological finds discovered during site preparation and construction will be left in their original position until the project archaeologist is contacted and provides instruction.
- Manitoba Hydro will work to notify engaged First Nations and the Manitoba Métis Federation about any archaeological finds.
- Orientation information for project workers will include an overview of heritage resource materials and reporting procedures.
- The contractor(s) will report heritage resource materials immediately to the Construction Supervisor who would cease construction activities in the immediate vicinity until the project archaeologist is contacted and prescribes instruction.
- Relevant measures within the CHRPP will be adhered to during construction and operations phases of the project.

The Heritage Resources Impact Assessment (HRIA) conducted prior to construction activities is meant to identify heritage resources within the PDA and then mitigate the potential effect through salvage excavation or monitoring. The implementation of the CHRPP during the construction phase within areas of high archaeological potential is meant to mitigate any heritage resources disturbed during that phase of the project. These are standard measures applied to other Manitoba Hydro projects and have been successful in avoiding the significance threshold.

Manitoba Hydro submitted a heritage screening request to the Historic Resources Branch to determine if there were heritage concerns for the project. A response was provided on April 8, 2022 (heritage screening #AAS-21-18054) deeming there was low heritage potential in the area and no concerns with the Project.

10.4.3.2 Mitigation measures related to cultural sites or features important to Indigenous peoples

Potential project effects on important sites have been reduced by selecting a transmission line route within an existing developed corridor adjacent to existing linear features (transmission lines), avoiding large areas not previously disturbed.

In addition to the mitigation measures identified to reduce project effects on heritage resources and where the transmission line was routed, mitigation measures to reduce project-related effects to cultural sites and features important to Indigenous peoples include:

- Engaged Indigenous audiences will continue to be given opportunities to identify sensitive sites to help inform the Environmental Protection Program for the project.
- Identified cultural and heritage sites will be marked for protection prior to construction.
- Existing access roads, trails or cut lines will be used to the extent possible.
- Indigenous Cultural Awareness Training will be required for project workers (i.e., both Manitoba Hydro staff and contractors) before their participation in project work. Manitoba Hydro will invite Fox Lake Cree Nation to participate in the delivery of this training.
- Manitoba Hydro will reach out to engaged Indigenous audiences prior to start of construction to arrange for a ceremony or ceremonies at times that would work for those interested in participating.

Mitigation measures identified in the health and safety assessment (Chapter 13.0) will also reduce project effects on intangible cultural heritage and the experience of important sites.

10.4.4 Characterization of residual effects

Following the application of mitigation, the project's residual effects may include a decrease in the number of heritage resources in the PDA by causing ground disturbances. There is the potential for the project to encounter important sites (including heritage resources and cultural sites and features) during development throughout the PDA, whether locations of concern have been shared through engagement or past self-directed studied undertaken by potentially affected Indigenous nations. Additional residual effects include changes to intangible cultural heritage and experiences at important sites resulting from access restrictions, the creation of new access, and alterations to noise and the visual landscape resulting from the development of the PDA and ongoing presence of the project.

Following the implementation of mitigation, the residual effects of the project on important sites have been characterized as follows:

- Direction: Adverse
- Magnitude: Low for heritage resources throughout the project and for cultural sites and features during operations and decommissioning, but moderate for cultural sites and features during construction due to access restrictions and heightened alteration to noise in the PDA
- Geographic extent: PDA for heritage resources, RAA for cultural sites and features because impacts to aesthetics and sense of place may extend throughout the RAA
- Duration: Long-term in relation to impacts to intangible cultural heritage and the experience at important sites; not applicable for tangible important sites for which impacts are permanent
- Frequency: Multiple irregular events for most effects, but effects to intangible cultural heritage and the experience at important sites may be continuous through operations due to the ongoing presence of the project
- Reversibility: Irreversible

Table 10-4 summarizes the residual effects on important sites.

Table 10-4: Project residual effects on important sites

	Residual Effects Characterization					
Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility

Disturbance of heritage resources from their in-situ context						
Construction	Adverse	Low	PDA	N/A	Irregular	Irreversible
Operation	Adverse	Low	PDA		Irregular	Irreversible
Decommissioning	Adverse	Low	PDA		Irregular	Irreversible
Disturbance of cultural sites or features important to Indigenous peoples						
Construction	Adverse	Moderate	RAA	Long-term/ N/A	Irregular	Irreversible
Operation	Adverse	Low	RAA		Irregular/ Continuous	Irreversible
Decommissioning	Adverse	Low	RAA		Irregular	Irreversible

10.5 Cumulative effects on important sites

The assessment of cumulative effects is initiated with a determination of whether two conditions exist:

- the project has residual effects on the VC and
- a residual effect could interact with residual effects of other past, present, or reasonably foreseeable future physical activities.

If either condition is not met, further assessment of cumulative effects is not warranted because the project does not interact cumulatively with other projects or activities.

For important sites, both conditions are present.

Past and ongoing project and activities including the development of hydroelectric dams and transmission lines, roads, railway, and resource development in the RAA have drastically altered important sites since European contact first occurred. A more detailed history of activities that have altered the cultural landscape and Indigenous connections to land in the project area is included in Chapter 5.0 (Project setting).

Most of the reported archaeological sites in the region are within 100 m of the present shoreline of the Nelson River and most have been affected by the creation of the Kettle, Long Spruce, and Limestone Generating Station forebays (Keeyask Hydropower Limited Partnership 2012a). Because of the cumulative impact of these hydroelectric developments in conjunction with other development projects and activities that have occurred in the region, heritage resources that remain in the PDA and LAA have enhanced importance for understanding local cultural history.

Table 10-5 presents the project and physical activities inclusion list which identifies other ongoing and reasonably foreseeable future projects and physical activities that might act cumulatively with the project on important sites.

Table 10-5: Potential cumulative effects on important sites

Other Projects and physical activities with potential for cumulative environmental effects	Potential cumulative environmental effects	
	Disturbance of heritage resources from their in-situ context	Disturbance of culture sites or features important to Indigenous peoples
Existing/ongoing projects and activities		
Domestic Resource Use (hunting, trapping, fishing)	-	-
Recreational Activities (Canoeing, Snowmobiling, Hiking)	✓	✓
Commercial resource use (e.g., fishery, forestry)	✓	✓
Infrastructure (i.e., provincial trunk highways, provincial roads,	✓	✓
Generating and converter stations	✓	✓
Transmission lines	✓	✓
Vale nickel mine	✓	✓
Potential future projects and activities		
Kivalliq Hydro-Fibre Link	✓	✓
Project 6 – All-season road linking Manto Sipi Cree Nation, Bunibonibee Cree Nation and God's Lake First Nation	-	-

✓ = Other projects and physical activities whose residual effects are likely to interact cumulatively with project residual environmental effects.
– = Interactions between the residual effects of other projects and those of the project residual effects are not expected.

As shown in Table 10-5, most of the past and ongoing projects and activities in the RAA have contributed to changes to important sites in the RAA.

The project has the potential to interact cumulatively to effects on important sites with ongoing and reasonably foreseeable projects that involve ground disturbance, alteration to native vegetation, noise, alterations to the visual landscape, and actions that may compromise cultural continuity or disregard cultural protocols (e.g., ceremony, cultural awareness) of potentially affected First Nations and the Manitoba Métis Federation.

10.5.1 Mitigation for cumulative effects to important sites

Manitoba Hydro has considered the existing setting of the project and cumulative effects assessment to include all effects to important sites since prior to colonialism (i.e., the historical temporal limit of the assessment has been expanded to provide a more robust historical and cultural context than traditional assessments).

Manitoba Hydro will continue to consider feedback related to mitigation for how the project contributes cumulatively to effects to important sites in the RAA.

For Manitoba Hydro projects and activities occurring in the same geographic area, Manitoba Hydro will make efforts to coordinate access requirements to reduce the need to construct additional access roads.

Other proponents in the project area are also responsible for reporting project activities to Manitoba Environment and Climate Change and the Historic Resources Branch. These regulators can inform Manitoba Hydro if it appears that there are unanticipated adverse cumulative effects occurring. The Historic Resources Branch also reviews land-based developments through the heritage resource impact assessment program as mandated by The Heritage Resources Act. Therefore, additional mitigation for cumulative effects is addressed by the provincial regulators as they determine whether future projects will require heritage investigations.

10.5.2 Determination of significance

The adverse residual effects and cumulative effects on the heritage resources are predicted to be not significant. The Heritage Resources Impact Assessment (HRIA) conducted prior to construction activities is meant to identify heritage resources within the PDA and then mitigate the potential effect through salvage excavation or monitoring. The implementation of the CHRPP during the construction phase within areas of high archaeological potential is meant to mitigate any heritage resources disturbed during that phase of the project. These are standard measures applied to other Manitoba Hydro projects and have been successful in avoiding the significance threshold.

The adverse residual effects and cumulative effects on cultural sites and features important to Indigenous peoples are predicted to be not significant because the project is not predicted to result in long-term loss of availability and access to important sites to a point where their use and access, or the associated cultural experiences are critically reduced or eliminated base on qualitative assessments of indicators of the potential effects (e.g., aesthetic conditions), literature review, engagement feedback, and professional judgment.

Although the project's residual effects and contribution to cumulative effects are predicted to be not significant, Manitoba Hydro acknowledges that individuals and communities may experience effects to important sites, in particular to cultural sites and features including intangible cultural heritage, uniquely. Therefore, effects may be felt to different magnitudes depending on the individual, some of which may deem such effects as substantive. We also realize that when heritage resources are impacted through developments, there is a potential loss of history which contribute towards loss of cultural continuity.

10.5.3 Prediction confidence

Prediction confidence in the assessment of effects on heritage resources is moderate. The desktop study indicates that most of the PDA have low potential to contain heritage sites. However, as mentioned in Section 10.3., it is possible that the scarcity of archaeological sites near the proposed transmission line route may be a result of a lack of archaeological assessments in the area since construction of existing transmission lines in the same corridor predated *The Heritage Resources Act*.

Prediction confidence in the assessment of effects on cultural sites and features understood to be important to Indigenous peoples is low. This prediction confidence assignment reflects the available information regarding cultural sites and features from potentially affected First Nations and the Manitoba Métis Federation through project engagement and a review of publicly available literature containing information about important sites in the project area. We are aware that there are likely important sites throughout the RAA that we are not yet aware of and have considered this assumption in this assessment.

Given the qualitative and subjective nature of assessing effects on cultural sites and features, specifically the unique and diverse experiences of important sites and enjoyment of place, the views of First Nations peoples and Red River Métis citizens may differ from the findings of this assessment.

10.6 Follow-up and monitoring

If required by the Historic Resources Branch, there may be limited monitoring around specific heritage concerns. Such monitoring would be completed with the knowledge of interested First Nations and the Manitoba Métis Federation.

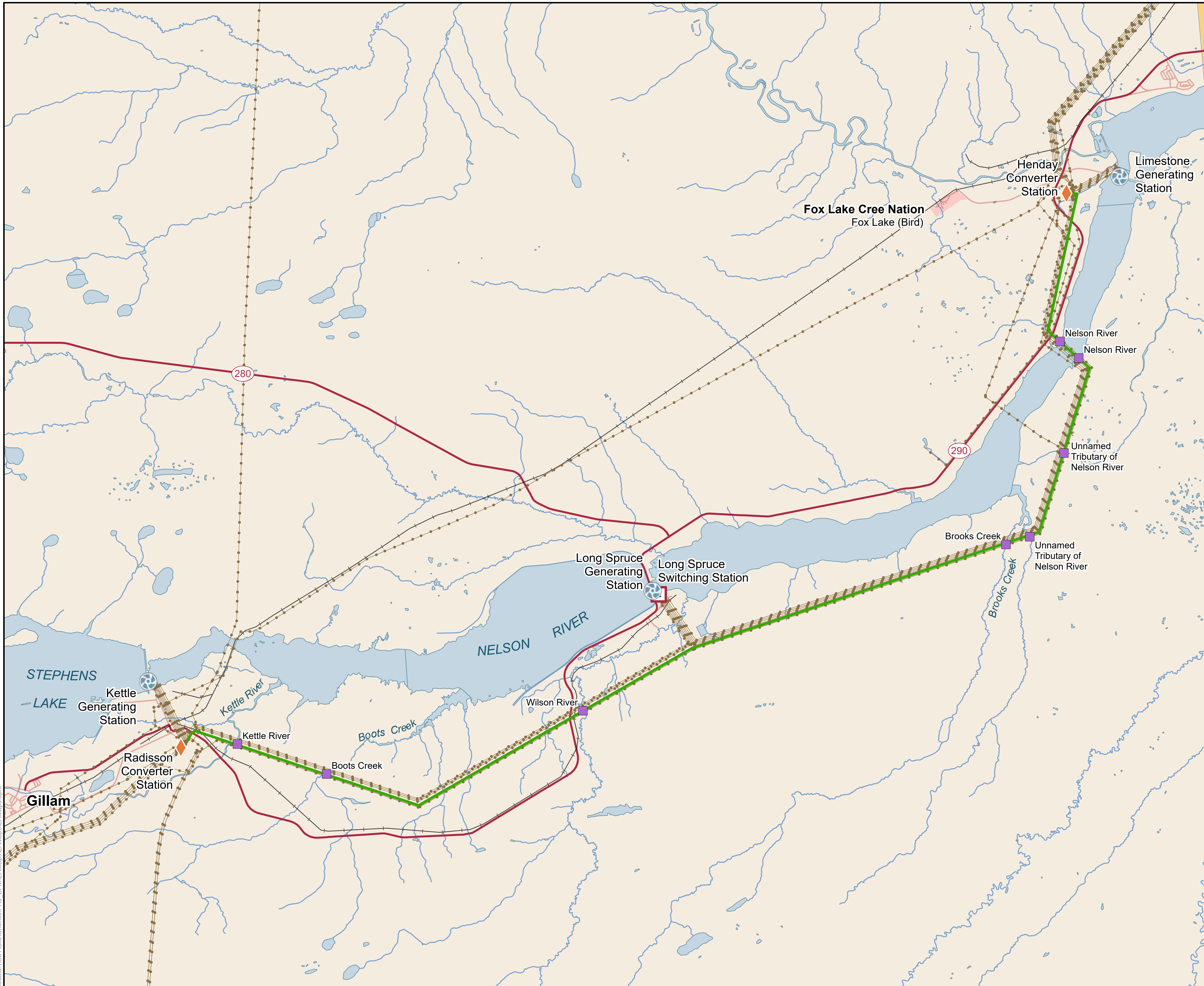
The environmental protection program (EPP) is a framework for implementation, management, monitoring and evaluation of protection activities in keeping with environmental effects identified in environmental assessments, regulatory requirements, and public expectations. The EPP prescribes measures and practices to avoid and reduce adverse environmental effects (e.g., wildlife reduced risk timing windows, setbacks, and buffers for sensitive habitat). Manitoba Hydro will provide opportunities for engaged First Nations and the Manitoba Métis Federation to identify additional sensitive sites to help inform the EPP.

10.7 Sensitivity to future climate change scenarios

Effects of climate change on important sites are expected to relate to the anticipated increase in temperature, changes in precipitation patterns, and the impact on local vegetation communities. Climate change could impact the cultural landscape for communities in northern Manitoba due to the strong connection among traditional activities (e.g., hunting, fishing, and gathering), food security, cultural practices, and historical ties to the land.

If heritage resources or cultural sites and features are located on the surface, the major risk is forest fires. Hotter and drier spring and summer weather will contribute to this. Subsurface heritage resources are less effected by fires. However, since charcoal from fires can diffuse into soil, fires may contaminate soil and make dating of subsurface heritage resources difficult.

Droughts could expose previously underwater heritage resources, cultural sites, or features, while flooding could result in the disappearance of previously exposed heritage resources, cultural sites, or features.



Manitoba Hydro

R44H Transmission Line

Project Infrastructure
- Final Preferred Route

Important Sites
- Heritage Area of Concern

Existing Infrastructure
- Converter Station
- Electric Station
- Generating Station
- Existing ≥69kV Transmission Line

Landbase
- Community
- Railway
- Provincial Highway
- Provincial Road
- Local Road
- First Nation Lands
- Ecological Reserve
- Wildlife Management Area
- Provincial Park

Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023

N

0 1 2 3 4 Kilometres
0 0.5 1 2 Miles

1:120,000

Areas of Heritage Concern

Draft: For Discussion Purposes Only

Map 10-1

11.0 Infrastructure and community services

Infrastructure and community services refer to the physical structures and facilities (e.g., highways, railways, water, and wastewater) and services (e.g., emergency response and health care) needed for the operation of communities. Infrastructure and community services was selected as a valued component (VC) because the project has the potential to increase the demand for, or interfere with, local and regional infrastructure and services, which could directly affect communities, community residents, Indigenous people, and the public.

11.1 Scope of the assessment

This chapter assesses the effects of project activities during construction, operation and decommissioning on infrastructure and community services. An assessment of cumulative effects on infrastructure and services is also presented.

This assessment was influenced by engagement feedback and Manitoba Hydro's experience with other recent transmission line projects in Northern Manitoba (e.g., the Bipole III Transmission Project (Manitoba Hydro 2011) and the Keeyask Transmission Project (Manitoba Hydro 2012). The assessment considers changes in the following:

- Short-term accommodations
- Traffic and transportation
- Health and emergency response services
- Solid waste management facilities

11.1.1 The project

The scope of the project consists of the construction, operation, and decommissioning of a new and approximately 42-km long, 230-kV transmission line terminating at the Radisson and Henday converter stations, within an existing transmission line corridor.

A new transformer associated with the project would be added at Radisson converter station. There will not be footprint expansions at either converter station as modifications would be done within existing station properties.

11.1.2 Regulatory and policy setting

As previously indicated, the project requires a provincial licence for a Class 2 development under *The Environment Act* (Manitoba). The project footprint mostly falls on provincial Crown land. Manitoba Hydro will apply for work permits from Manitoba

Economic Development, Investment, Trade and Natural Resources (MEDITNR) for project activities occurring on provincial Crown lands.

The following provincial legislation, regulations, policies, and agreements considered in the assessment of effects for infrastructure and services include:

- *The Manitoba Hydro Act* (R.S.M. 1987, c. H190)
- *The Traffic and Transportation Modernization Ac*t (S.M. 2018, c. 10)
- *The Dangerous Goods Handling and Transportation Act* (C.C.S.M. c. D12)
- *The Planning Act* (C.C.S.M. c. P80)
- Applicable municipality by-laws

11.1.2.1 The Manitoba Hydro Act

The purposes of *The Manitoba Hydro Act* are to:

> "…provide for the continuance of a supply of power adequate to the needs of the province and to engage in and to promote economy and efficiency in the development, generation, transmission, distribution, supply and end-use of power and, in addition, are (a) to provide and market products, services and expertise related to the development, generation, transmission, distribution, supply and end-use of power, within and outside the province; and (b) to market and supply power to persons outside the province on terms and conditions acceptable to the board" (*The Manitoba Hydro Act*, C.C.S.M. c. H190).

Section 23(1) of the Act allows Manitoba Hydro to construct, operate, and maintain its infrastructure anywhere on, under, over, across, or along public highways, streets, lanes, or other public places. This Act supersedes municipal level powers granted under legislation such as *The Planning Act* (C.C.S.M. c. P80) and *The Municipal Act* (C.C.S.M. c. M225).

11.1.2.2 The Traffic and Transportation Modernization Act

The Traffic and Transportation Modernization Act is administered by Manitoba Transportation and Infrastructure and regulates provincial highway and road infrastructure and traffic, roadway speed limits, vehicle registration and license plates, license requirements for highway driving, vehicles and equipment standards, and prohibitions, offences, and penalties. Through this Act:

- Manitoba Transportation and Infrastructure reviews all applications for development permits on provincial roadways, and reviews speed limit changes on all provincial roadways.

- Local governments (i.e., municipalities and First Nations) can change speed limits on municipal and First Nation roads.

11.1.2.3 The Dangerous Goods Handling and Transportation Act

The Dangerous Goods Handling and Transportation Act and associated regulations outline the conditions and standards relating to the generation, handling, storage, transport and disposal of dangerous goods or hazardous waste. This Act and regulations will be applicable to the transportation and disposal of project hazardous wastes.

11.1.2.4 The Planning Act and Provincial Planning Regulation

Administered in cooperation by Manitoba Municipal Relations and the associated municipal councils, *The Planning Act* (C.C.S.M. c. P80) provides a framework for land use planning strategies at the provincial, regional, and local scale. The Provincial Planning Regulation, M.R. 81/2011 provides a framework to guide development planning. Requirements of the Act and its regulations do not apply to the Crown or Crown agencies. Manitoba Hydro notes that, as a Crown Corporation, it is not directly subject to the legislative provisions and are generally exempt from them in terms of development planning.

Municipal jurisdictions must adopt development plans and zoning bylaws to guide land and resource use planning decisions within their respective boundaries under The Planning Act (C.C.S.M. c. P80). A development plan is a bylaw that outlines the long-term vision and goals of a community to guide development within the planning area of a municipality or planning district. A zoning bylaw is a tool used by the planning authority to implement development plan policies and typically represents what is on the ground. Zoning bylaws are guided by and conform to the development plans. Zoning works by regulating the use of land and location of buildings and structures (Manitoba Municipal Relations 2023). Municipal jurisdictions have a variety of development controls in place along the proposed ROW. Land use development controls based on applicable development plans and zoning bylaws are described further in Section 6.3.2.1.

Manitoba Hydro is cognizant that neither The Planning Act (C.C.S.M. c. P80), nor its Regulations, apply to the Crown or Crown agencies. However, it does seek to work cooperatively with the municipalities when planning, designing, constructing, and operating and maintaining its projects to limit the extent of possible interactions with their developments and plans.

Statutes of interest in the project region include:

- Town of Gillam: *Order-in-Council No. 541/66*: Establishment of the Local Government District (LGD) of Gillam (now the Town of Gillam).

11.1.3 Consideration of feedback from project engagement

Project engagement (Chapter .0) actively sought to provide opportunities for concerned and interested parties to provide infrastructure and community services related feedback about the project.

Regarding infrastructure and community services, Tataskweyak Cree Nation raised a concern about how Manitoba Hydro's development of work camps to accommodate workers on Manitoba Hydro projects does not provide more suitable housing in the community. This concern reflects an ongoing concern in many Northern Manitoba communities regarding the limited availability of good quality, affordable housing.

11.1.4 Potential effects, pathways, and measurable parameters

The potential project effects on infrastructure and community services, along with effects pathways and measurable parameters are outlined in Table 11-1.

Potential effects can be both direct and indirect. Direct effects involve a direct cause-effect relationship between the project and particular infrastructure and community services. For example, there may be an increased demand for short-term accommodation from project workers. Indirect effects involve a pathway through an intermediate pathway component. For example, an indirect effect is the potential limited availability of short-term accommodation for tourists and visitors in the area due to increased demand from project workers.

Table 11-1: Potential effects, effects pathways, and measurable parameters

Potential Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Reduced availability of accommodations	Influx of workers during construction and operations may increase demand for accommodations in the regional area, affecting inventory levels for residents and tourists May have positive effects for accommodation owners who can rent during the low tourist season	Availability of accommodations (e.g., inventory levels for hotels, motels) Vacancy rates
Increased traffic and strain on transportation infrastructure	Construction and operation of the project may increase demand on traffic infrastructure in the region, including road and air, potentially increasing travel times, affecting road conditions, and causing (or being involved in) collisions	Current capacity of local and regional highways and roads Daily road traffic volume, incidents, and air traffic volumes Change in conditions of roads and highways due to heavy loads carried by trucks
Strain on health and emergency response services	Demand for health services and emergency response services may be affected by project activities and project-related influx of workers, especially during construction	Number of workers for each phase (construction, operations, and decommissioning) Capacity of health care and emergency response services
Strain on solid waste management facilities	Increased pressure on solid waste facilities that may be caused by project activities	Tonnage of waste materials generated by the project that will be disposed in local / regional facilities

11.1.5 Spatial boundaries

Three spatial boundaries are used to assess residual and cumulative environmental effects of the project on infrastructure and community services (see Map 11-1 and Map 11-2).

Project development area (PDA): the project footprint and anticipated area of physical disturbance during construction, operation, and decommissioning of the project.

Local assessment area (LAA): includes all components of the PDA and encompasses the area within a 10-km buffer around the PDA. This LAA includes Gillam and Fox Lake Cree Nation, the two communities nearest to the project and likely to experience effects (positive or adverse) of direct project demand for infrastructure and community services and effects of project-related population influx.

Regional assessment area (RAA): The RAA includes all components of the PDA and LAA and encompasses the area within a 225-km buffer around the Town of Gillam. This RAA includes communities with the greatest potential to experience effects (positive or adverse) of direct project demand for infrastructure and community services and effects of project-related changes in population (i.e., influx of workers). The City of Thompson, a key service provider for Gillam that is directly connected with Gillam via PR 280, is also within the RAA.

11.1.6 Temporal boundaries

The primary temporal boundaries for the assessment of project effects on infrastructure and community services are based on the timing and duration of project activities as follows:

- Construction – Anticipated to start in December 2024 and be completed by July 2026. Station work to occur year-round, transmission line construction to occur under frozen conditions.
- Operations and maintenance – for the life of the project, estimated to be a 75-year design life.
- Decommissioning – estimated to be two years once the project has reached the end of its serviceable life.

11.1.7 Residual effects characterization

Table 11-2 provides the definitions used to characterize the residual effects on infrastructure and services.

Table 11-2: Characterization of residual effects on infrastructure and community services

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Positive** – a residual effect that moves measurable parameters in a direction beneficial to infrastructure and community services relative to baseline. **Adverse** – a residual effect that moves measurable parameters in a direction detrimental to infrastructure and community services relative to baseline **Neutral** – no net change in measurable parameters for infrastructure and community services relative to baseline
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Negligible** – no measurable change in the effect can be noted **Low** – a measurable change in infrastructure and services capacity, but services can take place at similar levels as under baseline conditions **Moderate** – measurable change in infrastructure and services capacity that is greater than low, but services can take place at similar levels as under baseline conditions **High** – measurable change in infrastructure and services capacity, such services and capacity cannot take place at similar levels as under baseline conditions

Table 11-2: Characterization of residual effects on infrastructure and community services

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Geographic Extent	The geographic area in which a residual effect occurs	**PDA –** residual effects are restricted to the PDA **LAA –** residual effects extend into the LAA **RAA –** residual effects extend into the RAA
Duration	The time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Short-term** – the residual effect is restricted to the construction phase **Medium-term** – the residual effect extends to more than the construction phase and through operation phase **Long-term** – the residual effect extends beyond the life of the project
Frequency	Identifies how often the residual effect occurs and how often during the project or in a specific phase	**Single event** – occurs once **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and reclamation **Irreversible –** the residual effect is unlikely to be reversed

11.1.8 Significance definition

An adverse residual effect on infrastructure and community services is considered significant if, even with the application of mitigation and management measures, it widely disrupts, restricts, or degrades present infrastructure and community services to a point where activities cannot continue at or near baseline levels.

11.2 Project interactions

Table 11-3 identifies, for each potential effect, the physical activities that might interact with infrastructure and community services and result in the identified effect.

Table 11-3: Project interactions with infrastructure and community services

Project activity	Reduced availability of short-term accommodation	Increased traffic and strain on transportation infrastructure	Strain on health and emergency response services	Strain on solid waste management facilities
Transmission Line Construction				
Mobilization and staff presence	✓	✓	✓	✓
Vehicle and equipment use	–	✓	–	–
Right-of-way clearing	–	–	–	✓
Clean-up and demobilization	–	–	–	✓
Station Modification				
Mobilization and staff presence	✓	✓	✓	✓
Vehicle and equipment use	–	✓	–	–
Site preparation	–	–	–	✓
Installation of electrical equipment	–	–	–	–
Clean-up and demobilization	–	–	–	✓
Transmission Line and Station Operation and Maintenance				
Transmission line and station presence	–	–	–	–
Vehicle and equipment use	–	✓	–	–
Inspection and maintenance	✓	✓	✓	✓
Decommissioning				

Table 11-3: Project interactions with infrastructure and community services

Project activity	Reduced availability of short-term accommodation	Increased traffic and strain on transportation infrastructure	Strain on health and emergency response services	Strain on solid waste management facilities
Mobilization and staff presence	✓	✓	✓	✓
Vehicle and equipment use	–	✓	–	–
Removal of transformers, disassembled towers, foundations, conductors, and associated equipment	–	–	–	✓

✓ = Potential interaction
– = No interaction

11.3 Existing conditions

Baseline information for this assessment was gathered through a detailed review of available desktop data. The existing conditions for infrastructure and services described in this section focus on:

- Communities within the LAA and RAA
- Short-term accommodations
- Transportation infrastructure
- Healthcare, emergency, and social services
- Waste management

11.3.1 Communities

The RAA falls within portions of Division No. 22 and Division No. 23 census divisions. The City of Thompson (Thompson) falls within Division No. 22 while the Town of Gillam, PDA, and LAA fall within Division No. 23. Map 11-1 and Map 11-2 show the communities in the RAA and LAA.

11.3.1.1 Town of Gillam

Established in 1966 (initially as the Local Government District of Gillam) to facilitate the development of hydroelectricity on the lower Nelson River, Gillam is on the Nelson River, between Thompson and the Town of Churchill (Churchill).

Many residents of Gillam are employed at one of Manitoba Hydro’s many facilities in and near the town. Four hydroelectric power generation dams (i.e., Kettle Generating Station, Long Spruce Generating Station, Limestone Generating Station, and Keeyask Generating Station) are in Gillam along with the Radisson, Henday, and Keewatinohk converter stations. The project will be wholly contained within Gillam as well.

Although Gillam is the nineth largest town in Manitoba by area, most of the town’s area is largely uninhabited and undeveloped, with many lakes, rivers, and large forests of pine trees. Gillam is also the home of Fox Lake Cree Nation. Most of the members of Fox Lake Cree Nation live in the town or on Reserve Land in the nearby community of Bird, which is also within the Gillam town limits.

According to Statistics Canada, in 2021, the enumerated population of Gillam (Town), was 1,007, which represents a decline of 16.2% compared to 2016. In 2021, there were 352 private dwellings occupied in Gillam (Town), which represent a decline of 15.0% from 2016. The land area of Gillam (Town) is 1,994.44 square kilometres and the population density was 0.5 people per square kilometre.

11.3.1.2 Fox Lake Cree Nation

Fox Lake Cree Nation has reserve land within the LAA and RAA. According to Crown-Indigenous Relations and Northern Affairs Canada (Crown-Indigneous Relations and Northern Affairs Canada 2021), Fox Lake Cree Nation’s land base consists of several land parcels, shown in Table 11-4 and on Map 11-3.

Many Fox Lake Cree Nation members live in Gillam and on the adjacent A Kwis Ki Mahka reserve and on reserve land in the nearby community of Bird (i.e., Fox Lake 2), also located within the LAA. The other Fox Lake Cree Nation lands, namely, Fox Lake 1 and Fox Lake 3, are outside of the LAA but within the RAA.

Table 11-4: Fox Lake Cree Nation lands

No.	Name	Location	Area (ha)
09886	A Kwis Ki Mahka Indian Reserve	Not provided	1.3
06471	Fox Lake 1	192 km NE of Thompson	561.7
06744	Fox Lake 2	All portions of unsurveyed Township 86, Range 21 east of the prime meridian (EPM)	39.5
06472	Fox Lake West 3	Township 77 and 78, Ranges 4 and 5, EPM	1,138.8
10217	Makesew Sakahikan Aski	Not provided	1.2

Source: (Crown-Indigneous Relations and Northern Affairs Canada 2021)

According to Statistics Canada, in 2021, the enumerated population of Fox Lake Cree Nation (i.e., combined population of A Kwis Ki Mahka Indian Reserve and Fox Lake 2 communities) was 184, which represents a decrease of 16% compared to 2016's reported population of 220. In 2021, there were 76 occupied private dwellings in Fox Lake Cree Nation lands.

11.3.1.3 Tataskweyak Cree Nation

The community of Split Lake which is the reserve community for Tataskweyak Cree Nation (formerly known as Split Lake Cree Nation) is in the RAA, roughly halfway between Thompson and Gillam, and connected directly to both via PR 280.

According to Statistics Canada, in 2021, the enumerated population of Tataskweyak Cree Nation was 2,230, which represents an increase of about 9% compared to 2016's reported population of 2,040. In 2021, there were 410 dwellings occupied in Tataskweyak Cree Nation lands, which represents an increase of about 15% compared to 2016's reported 355 dwellings.

11.3.1.4 City of Thompson

Originally founded in 1956 as a mining town, is the largest city in the northern region of Manitoba and is along the Burntwood River. The city provides goods and services such as healthcare and retail trade to the surrounding communities, including Gillam, hence its nickname "Hub of the North".

According to Statistics Canada, the enumerated population of Thompson in 2021 was 13,035, which represents a decline of 4.7% from 2016. In 2021, there were 4,676 private dwellings occupied in Thompson, which represent a decline of 4.8% from 2016.

The land area of Thompson is 16.62 square kilometres, and the population density was 784.3 people per square kilometre.

11.3.1.5 Other communities

Table 11-5 outlines additional First Nation and northern Manitoba communities that fall within the RAA.

Table 11-5: Other First Nations and northern communities within the RAA

Community	Location relative to project	Description
Ilford	Within the RAA, almost 70 km southwest of the PDA	The community originated as a construction and service centre during the building of the Hudson Bay Railway. It later served as a marshalling point for prospectors during the Island Lake gold rush and then as a similar marshalling point for the network of winter freight roads going east from Ilford. War Lake First Nation is the adjacent reserve. Most of the community boundary was transferred to reserve status in November 2017.
Bunibonibee Cree Nation	Within the RAA, approximately 160 km south of the PDA	The community is located along the eastern shore of Oxford Lake at the mouth of Hayes River, 950 km north of Winnipeg. There is no year-round road access to a service centre hence the reliance on air transportation for travel to service centres (i.e., Winnipeg/Thompson).
Gods Lake	Within the RAA, approximately 200 km south of the PDA	Two communities share the name Gods Lake, the community, and the adjacent God's Lake First Nation reserve. The community is located along the lakeshore of the narrow portion of Gods Lake 224 km southeast of Thompson and 547 km northeast of Winnipeg. Gods Lake lies within the Precambrian Shield region, heavily forested with many small lakes. Whitefish in Gods Lake have been downgraded to cutters and not economical to harvest, so

Table 11-5: Other First Nations and northern communities within the RAA

Community	Location relative to project	Description
		there is no commercial fishing. Relatively small amounts of fish are taken from outlying lakes. Trapping occurs in the Gods Lake Registered Trapline Zone. Local lodges are providing residents with seasonal guiding jobs.
Manto Sipi Cree Nation	Within the RAA, approximately 170 km south of the PDA	Manto Sipi Cree Nation is located on Gods Lake at the point of outflow of the Gods River. The community can be reached by winter road or by air via Gods Lake Airport.
Pikwitonei	Within the RAA, approximately 180 km southwest of the PDA	Pikwitonei is located on the Hudson Bay Railway which reached the community in 1914 serving as a division point until 1972. The community is 304 km by rail northeast of The Pas and 48 km southeast of Thompson. The railway provides the only all-weather surface linkage. A logging road and winter road link the community to the all-weather road network for about six to eight weeks.
Shamattawa First Nation	Within the RAA, approximately 142 km southeast of the PDA	Shamattawa First Nation is located on the banks of Gods River where the Echoing River joins as a right tributary. Winter roads connect the community to the all-weather provincial road networks in Manitoba and Ontario for part of the year. It can also be reached via Shamattawa Airport which operates year-round.
Thicket Portage	Within the RAA, approximately 225 km southwest of the PDA	Thicket Portage is located on the Hudson Bay Railway between Landing Lake to the south and Wintering Lake to the north.The railway provides the only all-year surface transportation linkage. A winter road is established for six to eight weeks every year. The community is 48 km south of Thompson and 256 km northeast of The Pas.

Table 11-5: Other First Nations and northern communities within the RAA

Community	Location relative to project	Description
War Lake First Nation	Within the RAA, approximately 70 km southwest of the PDA	War Lake First Nation is located at Ilford, Manitoba. Ilford is located along the Hudson Bay Railway, 144 air km northeast of Thompson, 416 km northeast by rail from The Pas and 688 air km north of Winnipeg. The community originated as a construction and service centre during the building of the Hudson Bay Railway. Later it served as a marshalling point for prospectors during the Island Lake gold rush, and then as a similar marshalling point for the network of winter freight roads going east from Ilford.
York Factory First Nation	Within the RAA, approximately 97 km southwest of the PDA	York Factory's main reserve is York Landing which is located along the eastern bank of the Nelson River, roughly halfway between Lake Winnipeg and Hudson Bay, as well as located 116 kilometres east of Thompson.

Source: (Government of Manitoba 2023)
Note: Locations of communities relative to the project footprint are distances as the crow flies.

11.3.2 Short-term accommodation

A common concern regarding major projects like transmission line construction in remote locations is the potential for reduced availability of short-term accommodations near the project area due to influx of construction workers and contractors.

Given the project's proximity to Gillam, it will not be reasonable for workers/contractors to stay in Thompson and do daily commutes to and from the project site (one-way travel distance of approx. 248 km over approx. 3 hours and 50 minutes). However, Thompson will likely provide transient accommodation for workers/contractors enroute to or from Gillam.

The following options are available in Gillam and Thompson for short-term accommodations:

11.3.2.1 Kettle Camp

Manitoba Hydro's Kettle Camp, approximately 3 km north of Raddison Converter Station, has a current capacity of 189 rooms with cafeteria services and other amenities (e.g., laundry and recreational). Kettle Camp provides accommodation to Manitoba Hydro staff and contractors and is anticipated to accommodate project workers and contractors.

11.3.2.2 Hotels

Aurora Gardens Motel & Suites and Kettle River Inn & Suites are two local hotels available in Gillam (Table 11-6). There is a driving distance of approximately 7 km between both hotels and the Radisson Converter Station where the project will initiate.

Table 11-6: Hotels in Gillam

Hotel	Capacity (units)	Description
Aurora Gardens Motel & Suites	Eight (8)	Suites with kitchenettes for self-catering
	10	Regular rooms
	Four (4)	Trailers with three (3) or four (4) bedrooms and equipped with a kitchen and laundry facilities.
Kettle River Inn & Suites	11	Suites some of which have kitchenettes for self-catering
	16	Regular rooms
	One (1)	Trailer with three (3) bedrooms and equipped with a kitchen and laundry facilities

Note: Information on hotel rooms and types was obtained through phone calls made by Manitoba Hydro to individual hotels on September 14 and 15, 2023.

There are several hotels available for short-term accommodations in Thompson, some of which are outlined in Table 11-7.

Table 11-7: Hotels in Thompson

Hotel	Capacity (units)	Description
Quality Inn & Suites	72	Suites with kitchenettes for self-catering
Days Inn & Suites	12	Suites with kitchenettes for self-catering
	61	Regular rooms
Best Western Hotel & Suites	19	Suites with kitchenettes for self-catering
	61	Regular rooms
Thompson's Best Value Inn & Suites	61	Regular rooms
Burntwood Hotel	76	Regular rooms
Mystery Lake Hotel	96	Regular rooms
Waywatay Inn	25	Regular rooms
Meridian Hotel	46	Regular rooms

Note: Information on hotel rooms and types was obtained through phone calls made by Manitoba Hydro to individual hotels on October 18, 2023.

11.3.3 Road transportation

Provincial road (PR) 280, a two-lane secondary arterial road, is the main route into Gillam from the west. It is classified as a Class A1 Provincial Route with a weight restriction of 56,500 kg maximum gross vehicle weight (Manitoba Infrastructure 2017).

Portions of provincial road (PR) 280 and PR 290 traverse the immediate vicinity of the project footprint within the LAA. PR 280 is a gravel provincial road that runs from the intersection with PR 391, north of Thompson, to Gillam, and is the main road connecting Split Lake, Gillam, and Bird. PR 280 also continues to the intersection with PR 290 which runs to Bird.

Other PRs and provincial trunk highways (PTHs) traversing the RAA are:

- PTH 6: the most northern segment of the highway terminates in Thompson, in the eastern portion of the LAA/RAA
- PR 391: initiates in Thompson and continues northwest beyond the LAA/RAA to Lynn Lake where it terminates.

11.3.3.1 Road traffic volumes in the RAA

Volumes of traffic traversing the RAA and LAA at permanent count stations along provincial trunk highways and provincial roads in the RAA and LAA, in 2019 (University of Manitoba and Manitoba Infrastructure 2019) are outlined in Table 11-8.

Table 11-8: Recent traffic volumes in the LAA and RAA

Highway route	Highway section/ Location	Current volume of vehicles/day for annual average daily traffic
PTH 6	1.3 km south of Thompson Scale House	AADT 2,640 (in 2016)
PR 280	PR 280, 1.6 km northeast of PR 391	AADT 340 (in 2019)
PR 290	PR 290, 2.5 km East of PR 280	AADT 140 (in 2019)
Source: (University of Manitoba and Manitoba Infrastructure 2019)		

11.3.4 Rail transportation

The Hudson Bay Railway, owned by the railroad holding company Arctic Gateway Group, has a main line that spans between The Pas and Churchill via the communities of Wabowden, Thompson, Pikwitonei, Kelsey, Ilford, and Gillam.

Utilizing the Hudson Bay Railway's main line, VIA Rail provides passenger train service from Thompson to Churchill via Gillam three times a week. A rail station is located on the south side of Gillam. Between Gillam and Churchill, there are several train stations including Bird Station at Fox Lake Cree Nation.

11.3.5 Air transportation

As shown in Table 11-9, there are at least 10 airports, aerodromes, and airstrips that facilitate air transportation for communities in the RAA. Of the ten, one airport (Gillam Airport) is in the LAA.

Table 11-9: Airports, aerodromes, and airstrips within the RAA

Airport / aerodrome / airstrip name	Location relative to project	Services description
Gillam Airport (YGX)	Within the LAA, approximately 5.3 km west of the PDA	The YGX airport is operated by the Town of Gillam. Currently, Calm Air provides direct flights to Gillam from Thompson on Monday, Tuesdays, and Fridays. Direct flights between Winnipeg and Gillam are typically available on Mondays,

Table 11-9: Airports, aerodromes, and airstrips within the RAA		
Airport / aerodrome / airstrip name	Location relative to project	Services description
		Tuesdays and Fridays. Flights with connections in Thompson are available on Sundays and Fridays (Calm Air 2023).
Thompson Regional Airport (YTH)	Within the RAA, approximately 210 km southwest of the PDA	The YTH airport is operated by the Thompson regional Airport Authority. It has a catch basin of 37 towns and villages containing a population of approximately 43,000, many of which are accessible only by air during the warm months (Thompson Regional Airport Authority 2023). Calm Air provides direct daily flights from Thompson to Winnipeg (Calm Air 2023). Calm Air provides direct flights from Winnipeg to Thompson daily from Sunday through Friday. Perimeter Aviation provides flights to Winnipeg daily from Sunday through Friday (Perimeter Aviation 2023). The YTH airport also serves as a base for Custom Helicopters, Missinippi Airways, RCMP Air Division and Manitoba Government Air. During the fire-fighting season, Thompson is home to the Government Air water bombers.
Shamattawa Airport (ZTM)	Within the RAA, approximately 143 km southeast of the PDA	The ZTM airport is operated by the Government of Manitoba. It is served by Perimeter Aviation which has direct flights between the airport and Thompson as well as God's River.
Gods Lake Narrows Airport (YGO)	Within the RAA, approximately 207 km south of the PDA	The YGO airport is operated by the Government of Manitoba. It is served by Perimeter Aviation which has direct flights between the airport and Winnipeg as well as indirect flights to Thompson via Oxford House.
Gods River Airport (ZGI)	Within the RAA, approximately	The ZGI airport is operated by the Government of Manitoba. It is served by Perimeter Aviation which

Table 11-9: Airports, aerodromes, and airstrips within the RAA		
Airport / aerodrome / airstrip name	Location relative to project	Services description
	175 km south of the PDA	has direct flights to God's Lake Narrows, Shamattawa, and Oxford House.
Ilford Airstrip (ZBD)	Within the RAA, approximately 71 km southwest of the PDA	The ZBD airport is operated by the Government of Manitoba.
Oxford House Airport (YOH)	Within the RAA, approximately 164 km southwest of the PDA	The ZGI airport is operated by the Government of Manitoba. It is served by Perimeter Aviation which has direct flights to Winnipeg, Thompson, God's River, and God's Lake Narrows.
Pikwitonei (ZMN)	Within the RAA, approximately 181 km southwest of the PDA	The ZMN airport is operated by the Government of Manitoba.
Thicket Portage (ZLQ)	Within the RAA, approximately 226 km southwest of the PDA	The ZLQ airport is operated by the Government of Manitoba.
York Landing (ZAC)	Within the RAA, approximately 96 km southwest of the PDA	The ZGI airport is operated by the Government of Manitoba and is served by Perimeter Aviation which has direct flights to Thompson.
Sources: Calm Air (2023), Perimeter Aviation (2023), and Thompson Regional Airport Authority (2023).		

11.3.6 Healthcare and emergency services

Healthcare and emergency services are two distinct but interconnected systems that play crucial roles in ensuring the health, safety, and well-being of individuals and communities.

11.3.6.1 Healthcare services

Healthcare services encompass a wide range of medical, preventive, and therapeutic services provided to individuals to promote and maintain their health and well-being. The project RAA falls under the Northern Health Region, administered by the Northern Regional Health Authority.

11.3.6.2 Gillam Hospital

Gillam Hospital, in the developed portion of the town at 115 Gillam Drive (approximately 7 km west of the project footprint), is the sole hospital in the LAA and provides primary health care services to both Gillam residents and members of Fox Lake Cree Nation. Currently, per Pawlachuk (Pawlachuk 2023), the hospital's main services consist of:

- A clinic that provides clinic appointments and medical services to the community.
- An emergency room that sees approximately 300 patients each month, for varying levels of care from non-urgent to life-threatening situations in all age spans.
- Public health services for immunizations, community health and outreach, harm reduction supplies, sexually transmitted blood borne infection (STBBI) clinics, child health clinics, and prenatal and postpartum care, to Gillam and Fox Lake Cree Nation residents.
- Lab/X-ray services operated by Shared Health, i.e., X-ray, Lab services EKG and Holter Monitoring
- Telehealth services with a dedicated room for provision of virtual care and appointments

According to Pawlachuk (2023, pers comms), currently, Gillam Hospital is staffed with several local staff and many agency staff due to a very high vacancy rate. Agency and travel staff help supplement vacant positions so the hospital can continue to provide care to the communities of Gillam and Fox Lake Cree Nation as well as all the visitors and contractors to the community.

- Physicians: 100% Vacancy in local physicians. Have locum physicians who rotate through on varying schedules. One physician covers the emergency department, the clinic, patients, and on-call 24/7.
- Nurses: Emergency department has one position for a registered nurse filled. There are eight vacancies for registered nurses and critical staffing vacancy levels are filled with agency/travel staff nurses.

- Health Care Aide: 100 % vacancy rate
- Public Health: One nurse and two nurse vacancies
- Mental Health Worker position: Vacant.
- Families First Visitor: Vacant
- Reception, Facility Clerk, Clinical Care Assistant, and Office Coordinator Positions are filled.
- Dietary/housekeeping/laundry: Many vacancies
- Maintenance: 100% vacancy rate
- On Site Manager Health Services: filled.
- Various specialist services are offered throughout the year

As indicated by Pawlachuk (2023, pers comms), Gillam Hospital's operational hours for the various services are as follows:

- Clinic is open Monday-Friday 0830-1630 (closed on statutory holidays)
- The emergency room: open 24 hours every day
- Public health services: open Monday-Friday, 0800-1630
- Gillam Lab/X-Ray (operated by Shared Health): open Monday-Friday, 0800-1200 and 1300-1530. Certain laboratory services are not available on Friday, weekend, or holidays due to the transportation limitations of a remote community.
- Telehealth: available 24 hours every day

Gillam Hospital has three stretchers for emergency room care or stabilization and use while awaiting med-evacuation to Thompson or Winnipeg, and one observation room utilized for patients who may be undergoing a mental health crisis, until transportation to an appropriate facility can be arranged (Pawlachuk 2023, pers comms). There are also 10 acute care beds available (Pawlachuk 2023, pers comms). For services not available at Gillam Hospital, the hospital routinely transfers patients to the nearest medical facility that offers the service (typically, Thompson or Winnipeg).

Non-emergent transfers also occur through the Northern Patient Transportation Program, Keewatin Tribal Council Medical Transportation and Referral Unit, and Manitoba Hydro Medicals with train, plane or personal vehicles used for transportation. The hospital also arranges emergency medical technicians in certain situations for medical emergencies or emergent diagnostics. Routine procedures such as ultrasound, computed tomography (CT) scans, magnetic resonance imaging (MRI), surgical procedures and specialist appointments are also facilitated via the clinic and emergency room.

The John Wavey Health Centre opened in Split Lake in 2009 and provides primary care, emergency care, and transportation of patients by road to Thompson or helicopter to Thompson or Winnipeg. The facility has five rooms for seeing patients as well as two emergency beds and operates with a staff of up to six nurses at a time, one public health nurse, and two paramedics who transport patients using the centre's transporting vehicle (Clements 2023), pers. comms). For services not available at the John Wavey Health Centre, the centre routinely transfers patients to the nearest medical facility that offers the service (typically, Thompson or Winnipeg).

11.3.6.3 Thompson General Hospital

Thompson General Hospital is at 871 Thompson Drive South in Thompson and approximately, 250-km drive from Gillam Hospital. The hospital's healthcare facilities include 79 acute care beds and a 10-bed in-patient acute care adult psychiatric unit (Northern Health Region 2023).

11.3.6.4 Emergency medical, fire and law enforcement services

Emergency services refer to a range of organizations and professionals dedicated to providing immediate assistance during emergency situations, e.g., accidents, natural disasters, medical crises, and other urgent events. The Town of Gillam's website indicates they provide four types of emergency services, namely, fire, ambulance, RCMP, and Gillam Hospital.

The Gillam fire and ambulance service provides fire protection and emergency medical services to the Town of Gillam and Fox Lake Cree Nation (both Bird and A Kwis Ki Mahka communities).

The Gillam fire service currently has 26 volunteer firefighters including a chief and deputy chief ((Catalano 2023), pers. comms). The fire service has two full-size pumper trucks for use in response to fire incidents. The fire service also supports various emergency incidents in the area apart from fire, e.g., incidents involving hazardous materials, acute medical situations, search and rescue operations, and confined spaces (Catalano 2023, pers. comms).

Given the predominant presence of Manitoba Hydro infrastructure in the Gillam area, some of the incidents the fire service has responded to involved Manitoba Hydro assets and personnel.

The ambulance service in Gillam is administered and operated by Shared Health's emergency response services (North zone). Currently, the service has one ambulance, which operates 24/7 with two paramedics and provides services to the town and Fox Lake Cree Nation reserve communities (Baker 2023) pers. comm.).

The RCMP's Gillam detachment provides law enforcement and emergency-related services to the town as well as Fox Lake Cree Nation's A Kwis Ki Mahka and Bird communities. As indicated by Ellsworth ((Ellsworth 2023), pers. comms.), the detachment's priority is responding to calls for service, and to serve and protect. They conduct proactive policing, check stops via police motor vehicles, and ATV and snowmobile patrols, and engage in the community groups, schools, and other organizations where they aim for excellence in reconciliation (Ellsworth 2023, pers. comms.).

The detachment has four constables and a sergeant detachment commander, and lead issues prompting the need for their services in the community relate to criminal code charges and provincial sanctions / fines (Ellsworth 2023, pers. comms.).

The detachment participates in community well-being initiatives involving multi-interest parties, e.g., the sergeant detachment commander was a member of the Worker Interaction Subcommittee that was established for socioeconomic effects monitoring during construction of the Bipole III transmission project.

Currently, the detachment's members are engaged with the Wellness Action Working Group (Ellsworth 2023, pers. comms.). The Wellness Action Working Group is a wellness-focused initiative with members from Fox Lake Cree Nation, Town of Gillam, Manitoba Hydro, Northern Health Region, Fox Lake Health, Awasis Agency of Northern Manitoba, RCMP, Gillam School, and other community resource groups/organizations **McLeod 2023** pers. comms.). The Wellness Action Working Group meets monthly and discusses wellness-related aspects including traditional healing, wellness programing, community resources, as well as upcoming developmental projects and associated concerns for wellness (McLeod 2023, pers. comms.). The Wellness Action Working Group anticipates to next meet in January 2024 and plans to discuss the proposed project as part of that meeting's agenda to determine if there may be any wellness-related concerns about the project.

Split Lake has a volunteer fire crew of approximately 10 Members, headed by the Fire Chief and a Deputy Chief who are cross trained as paramedics. The Split Lake fire hall is equipped with a fire truck, water truck and ambulance (Keeyask Hydropower Limited Partnership 2012a). Split Lake has two full-time special constables who have completed training and acquired provincial accreditation; two full-time constables who have not yet acquired provincial accreditation; and seven to ten part-time, untrained constables. A Band Constable station was opened in early 2011 (Keeyask Hydropower Limited Partnership 2012a).

11.3.7 Water supply and waste management

The Town of Gillam municipal services consist of a water treatment plant and distribution, sewage treatment plant, and garbage collection and operation of the waste disposal ground (Town of Gillam 2023).

The Gillam Landfill is in legal land location NE 10-85-18 E1 and NW 11-85-18 E1 and is the closest waste disposal ground to the PDA. It is a Class 2 Waste Site which accepts most wastes except radioactive or toxic chemicals that cannot be landfilled ((Gaider 2023), pers. comms.).

11.4 Assessment of effects

While effects to infrastructure and community services could occur during construction, operation, and decommissioning, they are anticipated to be most pronounced during construction and include the following:

- Reduced availability of short-term accommodations due to influx of project-related workforce
- Increased traffic volumes and strain on transportation infrastructure
- Strain on health and emergency response services
- Strain on solid waste management facilities

11.4.1 Effects pathways

11.4.1.1 Reduced availability of short-term accommodation

The assessment of effects on accommodations considers change in the availability of accommodations in the LAA. The influx of project workers and contractors, particularly during construction may increase the demand for short-term accommodations through patronage and in so doing reduce the availability of temporary accommodations available for local and non-local individuals (e.g., tourists) in the LAA.

Considering the capacity of Manitoba Hydro's Kettle Camp (i.e., 189 rooms with cafeteria services and other amenities), and the up to 170 anticipated workers during peak construction, it is unlikely that the project will preclude availability of short-term accommodations in Gillam. A project-specific and temporary contractor's camp may also be constructed to house contractors working on the project, further reducing demand for short-term accommodations at hotels.

Should workers and contractors not be fully accommodated at Kettle Camp or contractor-specific camp, the availability of short-term accommodations, e.g., hotels, could be affected by the influx of workers during construction of the project as there is not a sufficient supply of skilled labour within the LAA to meet the project's needs. As indicated in Section 11.3.2, there are two hotels in Gillam, (i.e., Aurora Gardens Motel & Suites and Kettle River Inn & Suites) open to the public including Manitoba Hydro staff and contractors.

Assuming single occupancy, capacity at the two hotels is limited to at most 31 and 30 people at Aurora Gardens Motel & Suites and Gillam Hotel respectively, per night. These local hotels also provide short-term accommodations to up to 10 Gillam Hospital staff ((Conway 2023), pers. comms) and possibly other service providers in the LAA as well, an aspect that amplifies the additional strain that the project's workforce could have on local short-term accommodations.

11.4.1.2 Increased traffic and strain on transportation infrastructure

The assessment of potential project effects on traffic and transportation infrastructure focuses on the movement of workers, materials, and equipment to and from the project site along provincial roads (PRs). The following pathways may result in effects on traffic and transportation infrastructure during the construction phase:

- Project activities will generate road traffic which may cause congestion through increased volumes of vehicle traffic on PR 280 and PR 290
- Increased volumes of traffic and conveyance of construction materials and equipment may cause a deterioration in physical road conditions

The construction and operation of the project could increase demand on road traffic infrastructure in the region, potentially increasing travel times, adversely affecting road conditions, and causing (or being involved in) collisions.

During construction, it is anticipated that vehicles will originate from Gillam, Thompson, or other communities in the LAA and RAA. Given that PR 280 is the sole throughfare between Thompson and Gillam, it is likely that contractors will primarily use this road for project-related travel and increase traffic volumes. PR 280 also connects the community of Split Lake to both Thompson (approximately 144 km to the west) and Gillam (approximately 118 km to the east). PR 290 will likely also experience increased traffic volumes as it is the other road besides PR 280 within the LAA and connects the community of Bird and Fox Lake Cree Nation to Gillam. Portions of the PDA will cross PR 280 twice between Radisson and Long Spruce, and PR 290 twice between Long Spruce and Henday. Development permits (issued by Manitoba Transportation and Infrastructure pursuant to *The Traffic and Transportation Modernization Act*) may be required for construction of the project adjacent to PR 280 and PR 290.

There is potential for direct effects from an increase in road traffic due to up to 90 project-related vehicles (e.g., cars, vans, trucks) per day that will be needed to transport people (i.e., project workers/contractors and service providers), materials, and equipment. Adverse impacts on road infrastructure could occur due to:

- An increase in vehicles on the road from project-related traffic
- A change in the type and weight of vehicles that will be on the road (e.g., trucks with construction materials and equipment)
- An increase in utilization (e.g., wear and tear) of roads

Traffic safety and road conditions were some of the concerns raised during the construction of the recently constructed Bipole III Transmission Project, specifically regarding speeding, truck weights, convoys, road surface conditions (making travel difficult), vehicle damage and dust (Manitoba Hydro 2018).

11.4.1.3 Strain on health and emergency response services

The assessment of change in health services and emergency response focuses on the potential for an increase in the demand for and strain on the capacity of health and emergency response services. Such strain on health services and emergency response would result from the influx of project-related workers and project activities increasing the demand for local health and emergency response services.

There is potential for the presence of the temporary workforce to place additional demand on available capacity of local health and emergency response facilities in the RAA, particularly in Gillam. However, as some of the workforce will be hired locally (i.e., Gillam and nearby communities), such local workers would already be accessing local health care facilities and emergency response services and would not create an additional strain on these services. According to Catalano 2023 (pers. comms.), the construction and operation of the project is not anticipated to cause a strain on the fire services' capacity to respond to emergencies in the area as they have previously been able to handle emergencies at Manitoba Hydro project sites without compromising their ability to respond to the Town of Gillam's emergency needs. As noted by Pawlachuk (2023, pers comms), current and ongoing challenges for Gillam Hospital include:

- relatively high staff vacancies resulting in for example, reliance on agency/travel nurses to meet staffing level thresholds for providing services,
- lack of housing for hospital staff (staff often rely on the two hotels in Gillam for accommodation), and
- transportation issues (e.g., reduced flight schedule, absence of taxi or bus services, limited train schedule, and road conditions).

The ambulance service in Gillam receives between 500 to 600 calls per year and considering the project's anticipated peak workforce of up to 170 people, they do not anticipate that it will present a strain for their services to Gillam and Fox Lake Cree Nation (Baker 2023, pers. comms.).

Drawing from experience with recent Manitoba Hydro construction projects in the Gillam area, the RCMP's Gillam detachment does not anticipate construction of the project to lead to a major increase in strain or call volume for the services they provide (Ellsworth 2023, pers. comms.). Impacts to the detachment's capacity to respond to service needs will be influenced by whether workers will be living in the town or if they will be housed in a controlled camp environment (Ellsworth 2023, pers. comms.). In the past, the detachment has dealt with related disturbance calls, criminal code charges and provincial sanctions involving Manitoba Hydro construction workers (Ellsworth 2023, pers. comms.), but as previously mentioned, the detachment does not anticipate such calls to substantially strain their capacity to provide their typical services to the community.

11.4.1.4 Strain on solid waste management facilities

The assessment of potential for strain on solid waste management facilities focuses on the potential for an increase in the quantity of waste generated due to the project. The project, particularly construction phase, will cause an influx of workers and contractors, materials, and equipment to the LAA and RAA which in turn will result in increased consumption of goods and materials and associated waste generation that could strain the existing waste management facilities.

Considering that workers and contractors are anticipated to stay at Kettle Camp, the project workforce is not anticipated to cause a strain the existing waste management facilities as the waste generated at Kettle Camp is already disposed of at the Gillam Landfill. The generation of hazardous wastes due to the project is anticipated to be related to accidents and malfunctions (e.g., hydrocarbon spills) and such hazardous wastes would be disposed of at appropriate licensed facilities in Thompson or Winnipeg.

11.4.2 Mitigation measures

11.4.2.1 Mitigation for reduced availability of short-term accommodations

The following mitigation measures will be implemented to reduce demands on temporary accommodations due to the project:

- Workers will be hired locally or regionally, whenever possible.

- Mobile construction camp(s) may be used to house workers where temporary accommodations within communities are not available.
- As part of project engagement, Manitoba Hydro will continue to engage with and share project information with local governments, service providers, and/or businesses.

11.4.2.2 Mitigation for increased traffic and strain on transportation infrastructure

The following mitigation measures will be implemented to reduce adverse road traffic effects of the project:

- Group transportation (e.g., buses, crew vans) will be utilized to transport workers between their short-term accommodations and worksites, and between nearby communities and worksites.
- Manitoba Hydro will work with local authorities to address any damages to roads that occur because of the project.
- All materials transported by truck will be compliant with any weight restrictions or permits, spring road restrictions, or geometric constraints set out by Manitoba Transportation and Infrastructure or municipal governments.
- Vehicles transporting dangerous goods or hazardous products will display required placards and labeling in accordance with provincial legislation and Manitoba Hydro guidelines.

In addition to mitigation through transmission line routing, the following mitigation measures will be implemented to reduce interference with transportation and utility infrastructure:

- The project design will meet or exceed standards for setbacks and overhead clearance, including:
  - CAN/CSA-C22.3 No. 1-10 "Overhead Systems" which outlines electrical and safety clearances including road, pipeline, and rail crossing clearances.
  - CAN/CSA 22.3 No. 60826-10 "Design Criteria for Overhead Transmission Lines" for structural and mechanical design.
  - CAN/CSA-22.3 No. 6-M9I "Principles and Practices of Electrical Coordination between Pipelines and Electrical Supply Lines".
- Manitoba Hydro will obtain permits, as required, from the following entities:
  - Manitoba Transportation and Infrastructure: Permits are required for any construction above or below ground that falls within 250 feet of a PTH or 150 feet of a PR.

  - Arctic Gateway Group which owns and operates the Hudson Bay Railway: Crossing agreements are required for transmission line crossings of railways.
- Manitoba Hydro will continue to engage with the entities responsible for underground infrastructures, roads, railways, and floodways (e.g., municipal governments, Arctic Gateway Group) to identify areas where tower placement could interfere with underground infrastructures, maintenance activities, or plans for expansion. This information will be used to inform the selection of final tower locations during the engineering analysis and design phases (see Chapter 2, Section 2.3.1.5 Tower Location).
- Manitoba Hydro will provide information for conducting aeronautical assessments, as required by Transport Canada/NAV Canada regulations, to identify potential interferences with airports/airstrips. Such assessments are typically required for structures/lines greater than 90 m high or within 4 km of a known airport/airstrip location.

11.4.2.3 Mitigation for strain on health and emergency response services

The following mitigation measures will be implemented to reduce adverse effects on health and emergency response services:

- As part of project engagement, Manitoba Hydro will continue to engage with and share project information with local governments, service providers, and/or businesses.
- An Emergency Response Plan will be developed. As part of the development and implementation, Manitoba Hydro will work with local emergency responders to maintain appropriate emergency response times.
- Project personnel will be made aware of the plan and designated staff will receive training. Among other elements, the plan will address handling and storage of materials, driving safety, animal encounters, emergency response communications, spill response, personnel injury response, and vehicle collisions.
- Project Contractors will have first aid at project sites and camps to provide services to project workers/contractors.

11.4.2.4 Mitigation for strain on waste management facilities

The following mitigation measures will be implemented to reduce adverse effects on community infrastructure and services:

- Subject to suitable soil conditions and drainage, and compliance with *The Public Health Act* and/or *The Environment Act* (Province of Manitoba 1996; 2015a), wastewater will be transported to an appropriate wastewater facility.

- Manitoba Hydro and its contractors will utilize Waste and Recycling Management Plans to manage waste and recycling in accordance with *The Public Health Act* and *The Dangerous Goods Handling and Transportation Act*. This plan will outline policies related to reducing the amount of solid waste generated; facilitating recycling wherever possible; and storing, transporting, and disposing of solid wastes at appropriate facilities.

11.4.3 Characterization of residual effects

11.4.3.1 Reduced availability of short-term accommodations

The potential for reduced availability of short-term accommodations is anticipated to be most pronounced during construction as this phase will be associated with the highest number of project workers and contractors. Short-term accommodation supply in the LAA is anticipated to exceed the project-related demand resulting in inappreciable adverse residual effects on accommodation. This is because of the availability of Manitoba Hydro-owned and operated short-term accommodations for Manitoba Hydro employees and contractors through Kettle Camp which is expected to house most of the project's labour force or other project-specific, temporary contractor camp. Also, as most of the project's labour force would be involved in transmission line construction during frozen ground conditions (typically non-peak tourist season) this will further ameliorate the availability of short-term accommodations.

Considering the implementation of mitigation measures, the residual effects of the project on the availability of short-term accommodation are predicted to be:

- Direction: Neutral (if workforce is fully housed at Kettle Camp) to adverse (if a mix of Kettle Camp and hotels are used for workforce accommodation)
- Magnitude: Negligible (during operations) to low (during construction and decommissioning)
- Geographic extent: LAA, RAA
- Duration: Short-term (during construction and decommissioning) and medium-term (during operation)
- Frequency: Multiple irregular
- Reversibility: Reversible

11.4.3.2 Increased traffic and strain on transportation infrastructure

The potential for increased traffic is anticipated to be most pronounced during construction because this phase will be associated with the highest number of workers and equipment traveling to and from the project site.

As stated in Section 11.4.1.2, considering that there could be the up to 90 project vehicles or 180 daily trips (coming and going to site) on the roads and highway at peak construction during frozen ground conditions, when the bulk of the labour force would be working on the project. However, given the mitigation that crews will be transported by groups in vans and/or buses, there will likely be less than 90 project related vehicles per day using roadways in the LAA. In addition, crews will be working at a number of work sites so project traffic would be dispersed. Also, project work will be spread out temporally, lessening project-related traffic at any given time.

Considering the mitigation measures that will be implemented, the project will result in inappreciable residual effects on health and emergency response services that are predicted to be:

- Direction: Adverse
- Magnitude: Negligible (during operations) to low (during construction and decommissioning)
- Geographic extent: LAA, RAA
- Duration: Short-term (during construction and decommissioning) and medium-term (during operation)
- Frequency: Multiple irregular
- Reversibility: Reversible

11.4.3.3 Strain on health and emergency response services

The potential for strain on health and emergency response services is anticipated to be most pronounced during construction as this phase will be associated with the highest potential number of project workers and contractors accessing these services in the LAA. Considering the mitigation measures that will be implemented, the project will result in inappreciable residual effects on health and emergency response services that are predicted to be:

- Direction: Adverse
- Magnitude: Negligible (during operations) to low (during construction and decommissioning)
- Geographic extent: LAA, RAA
- Duration: Short-term (during construction and decommissioning) and medium-term (during operation)
- Frequency: Multiple irregular
- Reversibility: Reversible

11.4.3.4 Strain on waste management facilities

The potential for strain on waste management facilities is anticipated to be most pronounced during construction as this phase will be associated with waste generation from the highest potential number of project workers as well as use of materials in the LAA. Considering the mitigation measures that will be implemented, the project will result in inappreciable residual effects on waste management facilities that are predicted to be:

- Direction: Adverse
- Magnitude: Negligible (during operations) and low (during construction and decommissioning)
- Geographic extent: LAA, RAA
- Duration: Short-term (during construction and decommissioning) and medium-term (during operation)
- Frequency: Irregular (during operations) to continuous (during construction and decommissioning)
- Reversibility: Reversible

Table 11-10: Project residual effects on infrastructure and community services summarizes the characterization of residual effects on infrastructure and community services.

Table 11-10: Project residual effects on infrastructure and community services

Residual Effects Characterization						
Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility
Reduced availability of short-term accommodations						
Construction	Adverse	Low	LAA	Short term	Continuous	Reversible
Operation	Adverse	Negligible	LAA	Medium term	Irregular	Reversible
Decommissioning	Adverse	Low	LAA	Short term	Continuous	Reversible
Increased traffic and strain on transportation infrastructure						
Construction	Adverse	Low	LAA, RAA	Short term	Irregular	Reversible

Operation	Adverse	Negligible	LAA, RAA	Medium term	Irregular	Reversible
Decommissioning	Adverse	Low	LAA, RAA	Short term	Irregular	Reversible
Strain on health and emergency response services						
Construction	Adverse	Low-Moderate	LAA, RAA	Short term	Irregular	Reversible
Operation	Adverse	Negligible	LAA, RAA	Medium term	Irregular	Reversible
Decommissioning	Adverse	Low-Moderate	LAA, RAA	Short term	Irregular	Reversible
Strain on waste management facilities						
Construction	Adverse	Low	LAA, RAA	Short term	Continuous	Reversible
Operation	Adverse	Negligible	LAA, RAA	Medium term	Irregular	Reversible
Decommissioning	Adverse	Low	LAA, RAA	Short term	Continuous	Reversible

11.4.4 Cumulative effects

The assessment of cumulative effects is initiated with a determination of whether two conditions exist:

- the project has residual effects on the VC and
- a residual effect could interact with residual effects of other past, present, or reasonably foreseeable future physical activities.

If either condition is not met, further assessment of cumulative effects is not warranted because the project does not interact cumulatively with other projects or activities.

11.4.4.1 Project residual effects likely to interact cumulatively

Table 11-12 shows the project and physical activities inclusion list which identifies other projects and physical activities that might act cumulatively with the project to impact infrastructure and services. Where residual effects from the project act cumulatively with residual effects from other projects and physical activities, a cumulative effects assessment is carried out.

Table 11-11: Potential cumulative effects on infrastructure and community services				
Other Projects and physical activities with potential for cumulative environmental effects	Potential cumulative environmental effects			
	Reduced availability of short-term accommodations	Increased traffic and strain on transportation infrastructure	Strain on health and emergency response services	Strain on waste management facilities
Existing/ongoing projects and activities				
Domestic Resource Use (hunting, trapping, fishing)	-	-	-	-
Recreational Activities (canoeing, snowmobiling, hiking)	-	-	-	-
Commercial resource use (e.g., fishery, forestry)	-	-	-	-
Infrastructure (e.g., provincial trunk highways, provincial roads)	✓	✓	✓	✓
Generating and converter stations	✓	✓	✓	✓
Transmission lines	✓	✓	✓	✓
Vale nickel mine	✓	✓	✓	✓
Potential future projects and activities				
Kivalliq Hydro-Fibre Link	✓	✓	✓	✓
Project 6 – All-season road linking Manto Sipi Cree Nation, Bunibonibee Cree Nation, and God's Lake First Nation	✓	✓	✓	✓

✓ = Other projects and physical activities whose residual effects are likely to interact cumulatively with project residual environmental effects.

– = Interactions between the residual effects of other projects and those of the project residual effects are not expected.

Existing activities and projects in the RAA have been underway since prior to 1610 until present day and include domestic resource use; establishment of settlements; European contact and the fur trade; recreational activities; rail, road, and highway infrastructure; commercial resource extraction (e.g., forestry and mining) and hydroelectric generating and converter stations, and transmission lines. As shown in Figure 4-1 (see Section 4.4.1), hydroelectric development in the RAA began in 1957 with the construction of the Kelsey generating station, and the existing hydroelectric transmission lines in the RAA were built between 1960 and 2019.

Past projects and activities identified as having potential cumulative effects with the effects of this project include infrastructure (e.g., provincial trunk highways, provincial roads), generating and converter stations, transmission lines, and the Vale nickel mine. These developments have contributed to reduced availability of short-term accommodations, increased traffic and strain on transportation infrastructure, strain on health and emergency response services, and strain on waste management facilities. The workforce and traffic volumes associated with the existing activities and projects were considered in the residual effects assessment above, and therefore do not create new, cumulative effects.

As outlined in Section 4.4.1, two reasonably foreseeable future projects within the RAA, namely, the Kivalliq Hydro-Fibre Link (KHFL), and Project 6 – All-season road linking Manto Sipi Cree Nation, Bunibonibee Cree Nation, and God's Lake First Nation (Project 6), could interact cumulatively with the project.

11.4.4.2 Reduced availability of short-term accommodation

Pathways for cumulative effect

The construction of the KHFL, a transmission line project that would initiate near Gillam, could lead to an increase in short-term accommodation demand due to the influx of workers into the LAA/RAA. The R44H transmission line project in combination with the KHFL may affect accommodation in the RAA, depending on the KHFL's workforce accommodation plans. Depending on the mitigation strategies adopted for the KHFL project, there could be a cumulative adverse effect on availability of short-term accommodations at hotels and other temporary rental accommodations, where tourists and other businesses may compete to find space at elevated prices, particularly in the Town of Gillam.

While the construction of Project 6 could contribute to reduced availability of short-term accommodations in the RAA, this project's location (i.e., approx.160 km south of the R44H transmission line footprint), its construction timeline (i.e., 2030 to 2038), and its planned mitigation (i.e., use of temporary work camps to house construction workers) make for negligible combined residual cumulative effects with the R44H transmission line.

Mitigation measures

Manitoba Hydro will hire local and regional labour as much as possible and provide temporary work camps where rental accommodations are not available. Mitigations for the KHFL are not known. Mitigations for Project 6 include the use of temporary work camps to house non-local construction workers.

Residual cumulative effect

The direction of the residual cumulative effects on short-term accommodation are expected to be neutral to adverse if temporary work camps (neutral effect) and short-term rental accommodations are used (adverse) (see Table 11-13). The magnitude will be negligible if temporary work camps are used extensively, and low if a mix of work camps and rental accommodations are used. Geographic extent is the LAA/RAA. Duration is short term and would be tied to the two-year construction phase of 2024 to 2026 for the R44H transmission line.

As the KHFL's construction is anticipated to span 2026 to 2030, the frequency of the adverse effects on short-term accommodation would be continuous during the overlap construction period of 2026 and these effects are expected to be reversible.

Project 6's construction period of 2030 to 2038 will overlap with the R44H transmission line's operational period which will involve much fewer workers than construction. Also, Project 6 will have temporary work camps for workers' accommodation, reducing the potential for pressure on short-term accommodations in the RAA. As a result, the combined residual cumulative effects are predicted to be neutral with no net change in measurable parameters for short-term accommodation relative to baseline.

11.4.4.3 Increase in traffic and strain on transportation infrastructure

Pathways for cumulative effect

The work force required for the KHFL combined with the work force for the R44H transmission line may adversely change traffic volumes and transportation infrastructure in the RAA through:

- Increased traffic due to project-related vehicles
- A change in the type of vehicles on the road, including heavy load vehicles.
- Increased road and highway utilization, resulting in wear and tear.

Mitigation measures

The implementation of mitigation measures described in Section 11.4.2.2 will reduce the R44H transmission line's effects on traffic and transportation infrastructure.

While it is assumed that the KHFL personnel and contractors will comply with traffic and transportation laws (e.g., regulations for heavy loads, speed limits), other mitigation measures planned for that project are unknown (e.g., having a work camp to reduce daily travel, and number of vehicles, use of buses, etc.).

For Project 6, given this project's location (i.e., approx. 160 km south of the R44H transmission line footprint) and absence of construction overlap with the R44H transmission line, combined residual cumulative effects on traffic volumes and transportation infrastructure are anticipated to be neutral and negligible.

Residual cumulative effect

Given that the overlap of construction for the R44H transmission line and KHFL will potentially be over several months in 2026 and that construction will be restricted to frozen ground conditions for the R44H transmission line (i.e., low season for tourism), the magnitude of project-related cumulative effects is predicted to be low and the direction neutral to adverse. For these residual cumulative effects, geographic extent is the LAA/RAA, duration is short term, and frequency is anticipated to be irregular event(s) if damage is done to roads, and reversible. Table 11-13 shows the summary of residual cumulative effects.

11.4.4.4 Increased strain on health and emergency response services

Pathways for cumulative effect

There is potential for the influx of workers for the R44H transmission line in combination with the labour force for the KHFL to affect the capacity of local health and emergency response facilities in the LAA/RAA.

While Project 6 will be outside of the LAA and not anticipated to cause potential additional strain to Gillam Hospital and other emergency services, the project may rely on Thompson General Hospital and contribute to combined residual cumulative strain on the hospital. However, considering Thompson General Hospital's capacity, residual cumulative strain on the hospital is anticipated to be negligible.

Mitigation measures

The implementation of mitigation measures described in Section 11.4.2.3 will reduce project-related cumulative effects on health and emergency response services. Mitigation measures for the KHFL project are unknown.

Residual cumulative effect

Residual cumulative effects on health and emergency services could be adverse if the increase in service demands strain available capacity (see Table 11-13). The direction is adverse. Magnitude is predicted to be low to moderate for easily treatable health conditions (e.g., colds, flus) assuming the KHFL project will have a similar workforce size to the R44H transmission line project, but for serious injuries, magnitude could range from high if using local facilities, to low if serious cases are med-evacuated to Thompson or Winnipeg. The geographic extent is the LAA/RAA. Duration is short-term as the two projects' construction phases are predicted to overlap in 2026. Frequency is assessed as irregular event(s), with reversible effects.

Table 11-12: Summary of Residual Cumulative Effects

Residual Cumulative Effect	Residual Cumulative Effects Characterization					
	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility
Reduced availability of short-term accommodation						
Residual cumulative effect	Neutral-adverse	Negligible-low	LAA/RAA	Short-term	Continuous	Reversible
Contribution from the Project to the Residual Cumulative Effect	The project's contribution to socio-economic effects is anticipated to be neutral to potentially adverse for accommodations in the LAA/RAA for the period of 2024 to 2026.					
Increase in traffic and strain on transportation infrastructure						

Table 11-12: Summary of Residual Cumulative Effects

Residual Cumulative Effect	Residual Cumulative Effects Characterization					
	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility
Residual cumulative effect	Neutral-adverse	Low	LAA/ RAA	Short-term	Irregular	Reversible
Contribution from the Project to the Residual Cumulative Effect	The project's contribution to effects on traffic and transportation is anticipated to be neutral to adverse and negligible to low in magnitude.					
Increased strain on health and emergency response services						
Residual cumulative effect	Adverse	Low-high	LAA/RAA	Short-term	Irregular	Reversible
Contribution from the Project to the Residual Cumulative Effect	The project's contribution to cumulative socio-economic effects could potentially be adverse and of negligible to low magnitude, depending on the capacity of the health and emergency response services during construction and operation.					

11.4.5 Determination of significance

With mitigation and environmental protection measures, the residual effects on infrastructure and community services are predicted to be not significant.

With mitigation and environmental protection measures, the cumulative effects on infrastructure and community services are predicted to be not significant.

11.4.6 Prediction confidence

Prediction confidence is based on the information compiled during desktop-based data compilation, engagement feedback, and an understanding of project activities, location, and schedule.

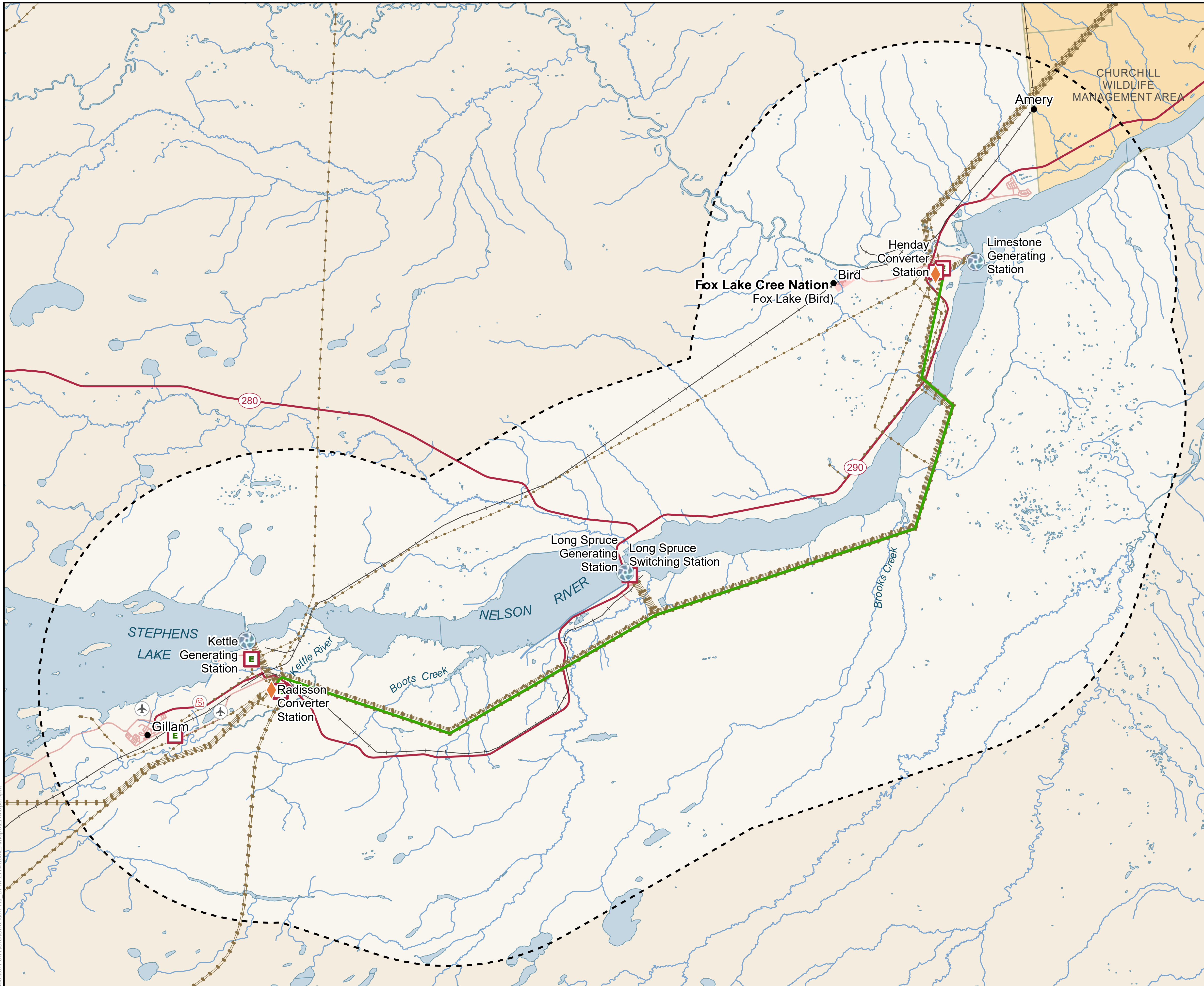
There is a moderate degree of confidence in the assessment predictions for accommodation, traffic and transportation, and health and emergency services based on the data collected for this assessment and understanding of project pathways and effects from comparable projects.

11.4.7 Follow-up and monitoring

Due to confidence in predictions and monitoring results from other similar projects in Manitoba, a comprehensive environmental monitoring plan has not been proposed for this project. However, if environmental inspections identify unexpected effects, monitoring and follow-up would be undertaken in pursuit of appropriate rehabilitation per the EPP (see Chapter 19).

11.4.8 Sensitivity to future climate change scenarios

Effects of climate change on infrastructure and community services are expected to relate to the anticipated increase in temperature and associated extreme weather events (e.g., flooding).



Manitoba Hydro

R44H Transmission Line

Project Infrastructure

- Final Preferred Route

Assessment Area

- Infrastructure and Services LAA (10km Buffer)

Existing Infrastructure

- Converter Station
- Electric Station
- Generating Station
- Existing ≥69kV Transmission Line

Other Infrastructure

- Gillam Landfill
- Aerodrome

Landbase

- Community
- Railway
- Provincial Highway
- Provincial Road
- Local Road
- First Nation Lands
- Wildlife Management Area

Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023

N

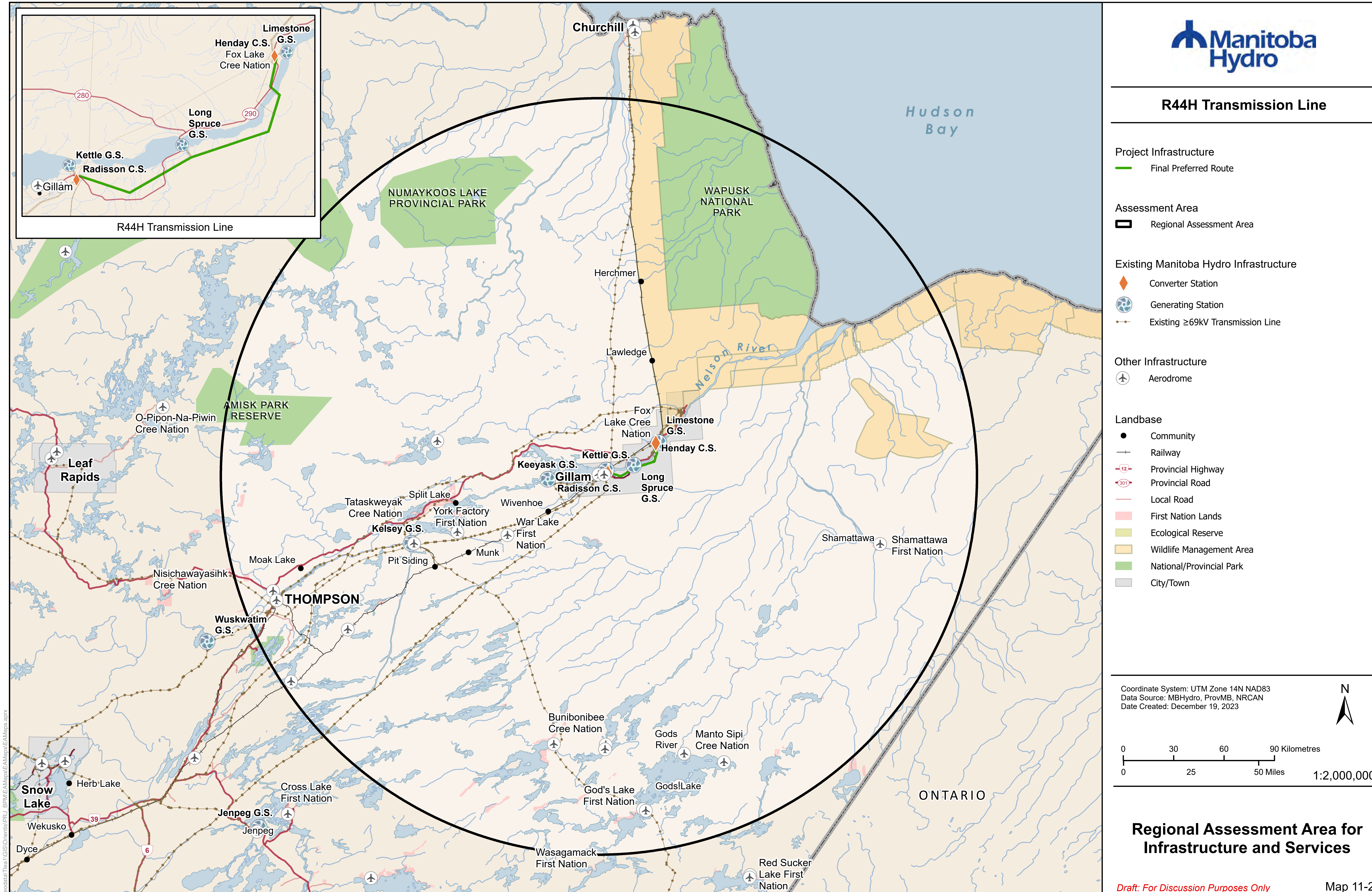
0 1 2 3 4 5 6 Kilometres
0 0.5 1 2 3 Miles

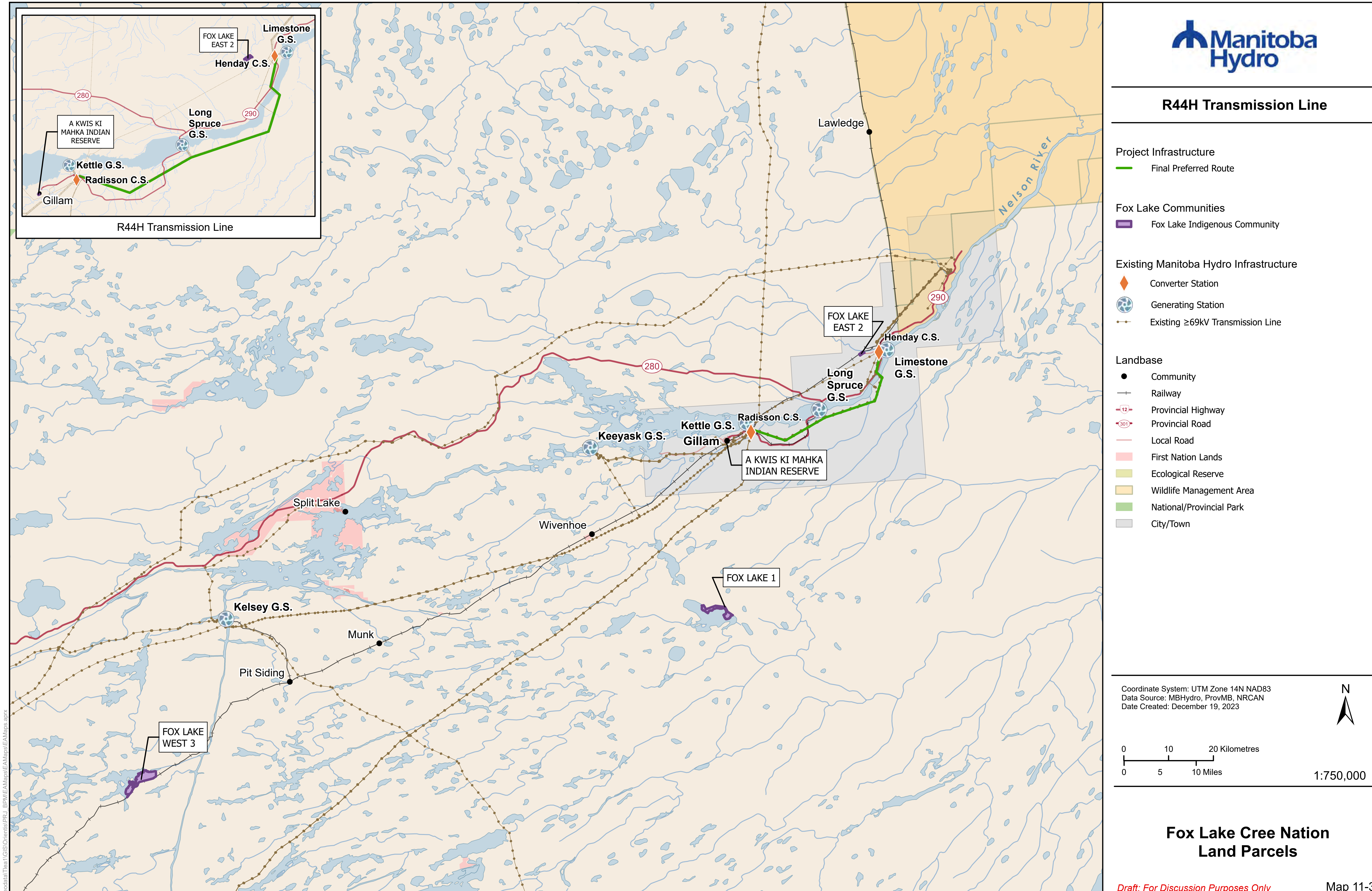
1:160,000

Local Assessment Area for Infrastructure and Services

Draft: For Discussion Purposes Only

Map 11-1


Manitoba Hydro
R44H Transmission Line
Project Infrastructure
Final Preferred Route
Assessment Area
Regional Assessment Area
Existing Manitoba Hydro Infrastructure
Converter Station
Generating Station
Existing ≥69kV Transmission Line
Other Infrastructure
Aerodrome
Landbase
Community
Railway
Provincial Highway
Provincial Road
Local Road
First Nation Lands
Ecological Reserve
Wildlife Management Area
National/Provincial Park
City/Town
Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023
N
0 30 60 90 Kilometres
0 25 50 Miles
1:2,000,000
Regional Assessment Area for Infrastructure and Services
Draft: For Discussion Purposes Only
Map 11-2
R44H Transmission Line
Limestone G.S.
Henday C.S.
Fox Lake Cree Nation
280
290
Long Spruce G.S.
Kettle G.S.
Radisson C.S.
Gillam
Churchill
Hudson Bay
NUMAYKOOS LAKE PROVINCIAL PARK
WAPUSK NATIONAL PARK
Herchmer
Lawledge
Nelson River
AMISK PARK RESERVE
O-Pipon-Na-Piwin Cree Nation
Leaf Rapids
Fox Lake Cree Nation
Keeyask G.S.
Tataskweyak Cree Nation
Split Lake
York Factory First Nation
Wivenhoe
War Lake First Nation
Kelsey G.S.
Munk
Pit Siding
Moak Lake
Nisichawayasihk Cree Nation
THOMPSON
Wuskwatim G.S.
Shamattawa
Shamattawa First Nation
Bunibonibee Cree Nation
Gods River
Manto Sipi Cree Nation
God's Lake First Nation
Gods Lake
ONTARIO
Snow Lake
Herb Lake
Cross Lake First Nation
Jenpeg G.S.
Jenpeg
Wekusko
Dyce
39
6
Wasagamack First Nation
Red Sucker Lake First Nation


Manitoba Hydro
R44H Transmission Line
Project Infrastructure
Final Preferred Route
Fox Lake Communities
Fox Lake Indigenous Community
Existing Manitoba Hydro Infrastructure
Converter Station
Generating Station
Existing ≥69kV Transmission Line
Landbase
Community
Railway
Provincial Highway
Provincial Road
Local Road
First Nation Lands
Ecological Reserve
Wildlife Management Area
National/Provincial Park
City/Town
Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023
N
0 10 20 Kilometres
0 5 10 Miles
1:750,000
Fox Lake Cree Nation
Land Parcels
Draft: For Discussion Purposes Only
Map 11-3
R44H Transmission Line
FOX LAKE EAST 2
Limestone G.S.
Henday C.S.
Long Spruce G.S.
A KWIS KI MAHKA INDIAN RESERVE
Kettle G.S.
Radisson C.S.
Gillam
280
290
Lawledge
Nelson River
Keeyask G.S.
Split Lake
Wivenhoe
FOX LAKE 1
Kelsey G.S.
Munk
Pit Siding
FOX LAKE WEST 3

12.0 Economic opportunities

Economic opportunities refer to unique business situations or community circumstances that enhance the economic state of individuals and or communities by providing a stimulus to the growth and or retention of commerce and industry.

Economic opportunities was selected as a VC because of its importance to local and provincial residents, business owners, communities, and governments. The project also has potential to create and enhance economic activities in the project region. During project engagement, various audiences expressed interest in employment and business opportunities related to the project. Tataskweyak Cree Nation specifically shared that the regulatory review should consider economic benefits and local business opportunities. Fox Lake Cree Nation and the Manitoba Métis Federation have also shared feedback related to employment and economic opportunities associated with the project.

Economic opportunities include the following topic areas:

- Regional employment – employment opportunities for local and regional labour forces through construction, operation and maintenance, and decommissioning
- Regional business – subcontracting opportunities and increased demand for goods and services from local and regional businesses
- Regional economy – estimates of government tax revenue and contributions to gross domestic product (GDP) into the regional, provincial and federal economies

This section assesses the potential effects and cumulative effects of project construction, operation and maintenance, and decommissioning activities on economic opportunities.

12.1 Scope of the assessment

This section assesses the effects of project activities during construction, operation and decommissioning on economic opportunities.

This assessment was influenced by engagement feedback and Manitoba Hydro's experience with other recent transmission line projects in Northern Manitoba (e.g., the Bipole III Transmission Project (2011) and the Keeyask Transmission Project (2012)).

12.1.1 The project

The scope of the project consists of the construction, operation, and decommissioning of a new and approximately 42-km long, 230-kV transmission line that would terminate at the Radisson and Henday converter stations, within an existing transmission line corridor.

A new transformer associated with the project would be added at Radisson converter station. There will not be footprint expansions at either converter station as modifications would be done within existing station properties.

12.1.2 Regulatory and policy setting

There are no provincial laws, and associated regulations, policies, and guidelines that were deemed relevant for the assessment of project effects to economic opportunities. Manitoba Hydro's Northern Purchasing Policy (p405) encourages participation in business and employment opportunities for northern Indigenous communities. Participation is encouraged through a variety of means, including information sharing, northern Indigenous content provisions for tenders and contracts, and prioritization of contract awards.

12.1.3 Consideration of feedback raised during engagement

Project engagement (Chapter 3) actively sought to provide opportunities for concerned and interested parties to provide VC related feedback about the project.

Feedback raised during project engagement primarily related to training, employment, and business opportunities for the project. Tataskweyak Cree Nation and the Manitoba Métis Federation both shared concerns and preferences related to the contracting strategy and the inclusion of Indigenous content. Fox Lake Cree Nation asked whether there would be small, realistic direct negotiated contract opportunities for the project work and expressed a preference to be subcontracted directly for work as opposed to employment through Manitoba Hydro's jobs and training program.

Fox Lake Cree Nation members participated in discussions with Manitoba Hydro regarding training, employment, and business opportunities related to the project. Fox Lake Cree Nation members provided a list of potential businesses and services in the community that may be interested in project work. Through these discussions, Fox Lake Cree Nation members also shared feedback related to barriers to training and employment. These barriers include a lack of cultural sensitivity at worksites, the need to find housing for Fox Lake Cree Nation workers, job readiness, lack of childcare services, a requirement for a driver's licence, and gaps in work experience and knowledge.

Overall, there is an interest in the amount and types of employment opportunities that will be generated by construction, and whether local business opportunities will arise from project work.

12.1.4 Potential effects, pathways, and measurable parameters

The potential project effects on economic opportunities, along with effects pathways and measurable parameters are outlined in Table12-1.

Table12-1: Potential effects, effects pathways, and measurable parameters for economic opportunities

Potential Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Increase in regional employment	Project demand for labour during construction, operation and maintenance, and decommissioning will create job opportunities.	Direct, indirect, and induced employment, labour force availability.
Increase in regional business	Required purchase of goods and services during project construction, operation and maintenance, and decommissioning.	Procurement of goods and services ($).
Increase in regional economy	Tax revenue generated through construction, operation and maintenance, and decommissioning.	Estimated government revenue ($). Estimated GDP ($).

12.1.5 Spatial boundaries

Three spatial boundaries are used to assess residual and cumulative environmental effects of the project on economic opportunities:

Project development area (PDA): the project footprint and anticipated area of physical disturbance during construction and operation and maintenance of the project.

Local assessment area (LAA): includes all components of the PDA and consists of a 225 km buffer around the town of Gillam to encompass the communities for which economic opportunities could be impacted due to the project.

Regional assessment area (RAA): the RAA is the same as the LAA and deemed to encompass a sufficiently broad area for assessing cumulative effects, including the incremental effects of the project.

The LAA/RAA for economic opportunities includes the following cities, towns, First Nations, and Northern Affairs Communities:

- Bunibonibee Cree Nation
- City of Thompson
- Fox Lake Cree Nation
- God's Lake First Nation
- Ilford
- Manto Sipi Cree Nation
- Pikwitonei
- Shamattawa First Nation
- Tataskweyak Cree Nation
- Thicket Portage
- Town of Gillam
- War Lake First Nation
- York Factory First Nation

12.1.6 Temporal boundaries

The primary temporal boundaries for the assessment of project effects on economic opportunities are based on the timing and duration of project activities as follows:

- Construction – Anticipated to start in December 2024 and be completed by summer 2026. Station work to occur year-round, transmission line construction to occur under frozen conditions.
- Operations and maintenance – for the life of the project, estimated to be a 75-year design life.
- Decommissioning – estimated to be two years once the project has reached the end of its serviceable life.

12.1.7 Residual effects characterization

Table 12-2 provides the definitions used to characterize the residual effects on economic opportunities.

Table 12-2: Characterization of residual effects on economic opportunities

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Positive –** a residual effect that moves measurable parameters in a direction beneficial to economic opportunities relative to baseline. **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to economic opportunities relative to baseline. **Neutral –** no net change in measurable parameters for economic opportunities relative to baseline.
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**No Measurable Change –** no measurable change in the effect can be noted. **Low –** a measurable change to economic opportunities that is not substantial compared to other existing economic opportunities and contributors. **Moderate –** a measurable change to economic opportunities that is comparable to other existing economic opportunities and contributors. **High –** a measurable change to economic opportunities that is substantial compared to other existing economic opportunities and contributors.
Geographic Extent	The geographic area in which a residual effect occurs	**PDA –** residual effects are restricted to the PDA

Table 12-2: Characterization of residual effects on economic opportunities

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
		LAA/RAA – residual effects extend into the LAA / RAA
Duration	The time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Short-term –** the residual effect is restricted to the construction phase (2 years). **Medium-term –** the residual effect extends through the operation phase (75 years). **Long-term -** the residual effect extends beyond the operation phase (>75 years).
Frequency	Identifies how often the residual effect occurs and how often during the project or in a specific phase	**Single event** **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and reclamation **Irreversible –** the residual effect is unlikely to be reversed

12.1.8 Significance definition

For this assessment, a significant adverse residual effect for economic opportunities is defined as follows:

- The effects are distinguishable from current economic conditions and trends for the region and cannot be managed or mitigated through adjustments to programs, policies, or plans, or through other mitigation measures.

The residual effects assessment considers both positive and adverse effects after mitigation and other management measures are implemented. However, a significance determination is provided only for adverse effects.

12.2 Project interactions with economic opportunities

Table 12-3 identifies, for each potential effect, the physical activities that might interact with economic opportunities and result in the identified effect.

Table 12-3: Project interactions with economic opportunities

Project activity	Increase in regional employment	Increase in regional business	Increase in regional economy
Transmission Line Construction			
Mobilization and staff presence	✓	✓	✓
Vehicle and equipment use	✓	✓	✓
Access development	✓	✓	✓
Right-of-way clearing	✓	✓	✓
Transmission tower construction	✓	✓	✓
Helicopter use	✓	✓	✓
Clean-up and demobilization	✓	✓	✓
Station Modification			
Mobilization and staff presence	✓	✓	✓
Vehicle and equipment use	✓	✓	✓
Clean-up and demobilization	✓	✓	✓
Transmission Line and Station Operation and Maintenance			
Vehicle and equipment use	✓	✓	✓
Inspection and maintenance	✓	✓	✓
Vegetation management	✓	✓	✓
Decommissioning			
Mobilization and staff presence	✓	✓	✓
Vehicle and equipment use	✓	✓	✓
Rehabilitation	✓	✓	✓
Clean-up and demobilization	✓	✓	✓

✓ = Potential interaction
– = No interaction

Table 12-3 indicates which project opportunities will have an impact on regional employment, regional business, and regional economy. For the purposes of the assessment, mobilization and staff presence is intended to capture the effects of the project on economic opportunities through the general employment and subsequent business and economy opportunities associated with each project phase. Other project effects (e.g., right-of-way clearing, access development) have also been identified if they have the potential to generate additional local employment and business opportunities.

12.3 Existing conditions

Baseline information for this assessment was gathered through a detailed review of available desktop data. The existing conditions described in this section focus on population employment and education information relevant to the potential local workforce.

As mentioned in the regional cumulative effects assessment of hydroelectric developments on the Churchill, Burntwood and Nelson River systems (Government of Manitoba and Manitoba Hydro 2015), while numerical data can provide some quantitative understanding of changes to socio-economic conditions, "they do not necessarily reflect how individuals, families and communities feel about their circumstances and overall well-being". For example, to an outsider, an increase in regional household income over time may be viewed as a positive trend. However, at the individual or family level, that increase may come at the expense of time spent participating in traditional resource harvesting pursuits or result in less time spent in one's home community or with one's family. Many statistical indicators provide a good sense of standard of living. However, they may not always provide the best indication of one's quality of life, overall well-being, and sense of life satisfaction (Government of Manitoba and Manitoba Hydro 2015).

Much of the numerical information in this section is based on census data reported by Statistics Canada. Although the census data is intended to survey all of Canada's population at one point in time, there are concerns regarding the quality of census data when it pertains to Indigenous populations. One of these concerns is the non-participation by Indigenous people in completing the census, potentially due to a "distrust of and/or political disagreement with federal government agencies and accessibility with respect to assumed literacy levels" (Smylie and Firestone 2015). In addition, Statistics Canada noted that participation rates in the 2021 census were hampered by the COVID-19 pandemic, the discovery of burial sites at former residential schools, and forest fires across many provinces (Taylor 2022). As well, there are two Northern Affairs Communities – Pikwitonei and Thicket Portage – where the data is suppressed due to low population size, and detailed information is not available.

12.3.1 Economy

The regional cumulative effects assessment undertook an assessment of the industries that contributed to the gross economic output (a measure of an industry's sales or receipts) of northern Manitoba, which is an area larger than but encompassing the LAA/RAA (Government of Manitoba and Manitoba Hydro 2015). Based on this assessment, the regional cumulative effects assessment determined that in the mid 2000s, the largest contributor to the regional economy was mineral production, followed by hydroelectricity generation (see Figure 12-1). The regional cumulative effects assessment cautioned that this data was intended to indicate a general sense of changes in economic activity over time and the percentages provided are approximations.

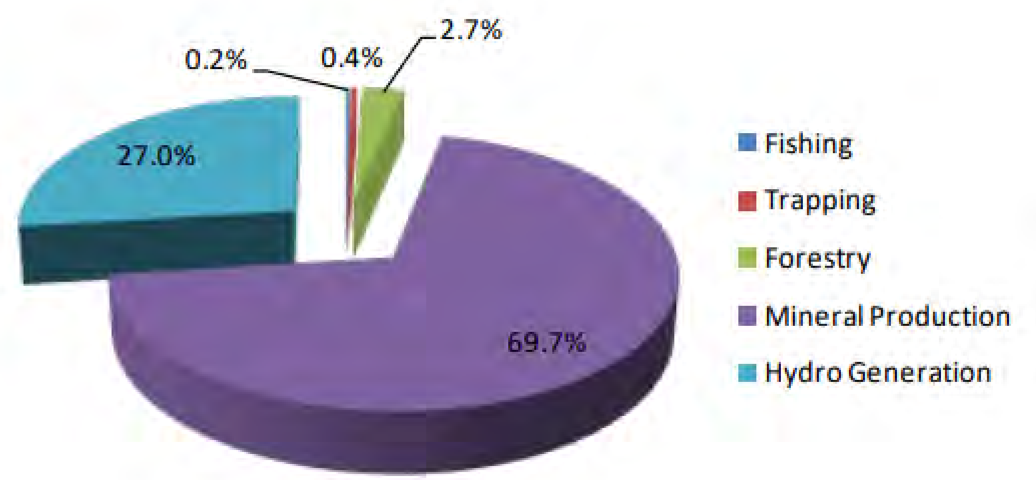


Figure 12-1 Composition of gross economic output in mid 2000s for Northern Manitoba (Government of Manitoba and Manitoba Hydro 2015)

12.3.2 Employment

Across the LAA/RAA, the communities with the lowest unemployment rate are the City of Thompson (8.9%) and the Town of Gillam (9.3%), both of which are slightly higher than the provincial average of 8.3%. The communities with the highest unemployment rates are Bunibonibee Cree Nation (33.0%) and Fox Lake Cree Nation (30.0%). Although Bunibonibee Cree Nation appears to have the highest unemployment rate among communities in the LAA/RAA, the statistics from

Bunibonibee Cree Nation are from the 2016 census and may not reflect the current unemployment rate in the community.

Table 12-5 shows the labour force characterization for communities in the LAA/RAA for 2021.

The main occupational fields for communities in the LAA/RAA were generally occupations related to education, law and social, community and government services, followed by sales and services, and trades.

Table 12-6 shows the occupational classification for communities in the LAA/RAA for 2021.

12.4 Assessment of effects

Project construction, operation and maintenance, and decommissioning will create local and regional employment and procurement opportunities, while household spending by workers directly or indirectly associated with the project will induce additional economic effects. Government tax revenue generated during all project phases will be from income and consumption taxes. These effects include the following:

- Increase in regional employment
- Increase in regional business
- Increase in regional economy

12.4.1 Effects Pathways

As discussed in Section 12.1.4, there are three main effect pathways for economic opportunities:

- Project demand for labour, creating job opportunities
- Required purchase of goods and services
- Tax revenue generated through project activities

12.4.1.1 Demand for labour

Project construction will generate employment opportunities for the local and regional labour force. Direct employment opportunities may include management and supervisory roles, inspection services, equipment operators, health and safety, trades, and semi-skilled and unskilled labour.

Project spending during construction will also generate indirect and induced employment opportunities. Indirect employment is generated within industries supplying intermediate components such as raw materials, while induced employment is generated by household spending (e.g., consumer products, restaurants) from wages earned by direct and indirect workers.

The demand for labour related to the project has the potential to result in employment opportunities in the LAA/RAA through direct and indirect jobs. Direct effects can be created through the employment of workers who live in the LAA/RAA. Indirect effects can result from an increased workforce in the area, placing additional demands on existing businesses and leading to more employees being hired to meet this increased demand.

12.4.1.2 Purchase of goods and services

Project spending will generate subcontracting opportunities and the demand for goods and services from local and regional businesses. Such opportunities could include the provision of accommodations, parts supply, and vehicles and equipment for project activities.

The procurement of equipment, goods, and services from businesses in the LAA/RAA during construction, operation and maintenance, and decommissioning will generate direct and indirect opportunities for local and regional businesses. This increased business revenue could in turn support capital investment and hiring, thereby increasing capabilities and capacity within the LAA/RAA. Spending of wages by direct and indirect workers will contribute to positive effects on local businesses, primarily within the service sector, resulting in indirect economic benefits to businesses in the LAA/RAA.

12.4.1.3 Tax revenue

Tax revenue is based on estimates of government tax revenue and contributions to the GDP. Project spending and employment will contribute to the regional, provincial, and national economies. It will also contribute to federal, and provincial government revenue through taxation on income and on goods and services procured for the project.

Project expenditures during construction, operation and maintenance, and decommissioning will result in increased economic activity in the form of employment and procurement, as discussed in previous sections. The project's contribution to provincial and federal economies is measured through GDP (value added after the cost of intermediate goods and services). In addition to GDP contributions, the project and its workers will be subject to varying levels of taxation which will contribute to government revenues.

12.4.2 Mitigation measures

Facilitation of economic and employment opportunities include the following, which apply to each of the potential environmental effects for employment and economy:

- Manitoba Hydro will contact local municipal authorities prior to project start-up.
- Manitoba Hydro will contact First Nation and Manitoba Métis Federation representatives prior to project start-up.
- Manitoba Hydro will work with the contractors through the contracting process to promote participation of Manitoba businesses in the project.
- Continue to provide information to communities in the RAA on training, employment and business opportunities associated with project construction.
- Contract measures will promote opportunities for Indigenous people and businesses including employment and training opportunities, and incentives to encourage Indigenous business and supplier participation.

12.4.3 Characterization of residual effects

12.4.3.1 Demand for labour

Project construction, operation and maintenance, and decommissioning will generate direct and indirect employment opportunities for the local and regional labour force.

Across the three project phases, the workforce for the construction phase is anticipated to be the largest. For the transmission line construction, we anticipate a direct onsite workforce ranging from 30 to 110 persons. For the converter stations, a direct workforce ranging from six to 30 persons for the Radisson Station work and six to 30 persons for the Henday Station work, is anticipated. Transmission line construction will occur during frozen ground conditions while work at the stations will occur year-round. As a result, the number of people directly employed on the project will be largest in the winter when transmission line construction will be occurring concurrently with station work.

The contracting strategy for the project is specifically considering Indigenous content, including mandatory training, employment, and economic opportunities. On-the-job training will include opportunities for environmental monitoring, safety administration and tower assembly, among others. There will be mandatory Indigenous employment levels established in the tender, and thresholds for Indigenous content.

Construction activities typically require skilled and unskilled labour for short-term employment. Construction employment will require education or trades certification, or applicable construction experience for some positions. Employment opportunities typically associated with construction include:

- Management and supervisory personnel (e.g., supervisor, foreperson)
- Transmission line inspection services
- Equipment operators (e.g., heavy equipment, bulldozers, cranes)
- Trades and apprentices (e.g., mechanics, technicians)
- Semi-skilled and unskilled labour (e.g., labourer, mechanic's helper)
- Health and safety (e.g., health and safety coordinator)

During operations and maintenance, Manitoba Hydro staff and contractors will be used, as required. Typical employment opportunities will include staff positions, operators, electrical technicians, mechanical technicians, and maintenance utility workers. Contractor staff could include patrollers, and equipment operators. The average workforce requirement will be small, unless there is damage to towers and replacement is required.

Based on previous experience, Manitoba Hydro anticipates that the decommissioning workforce size will be less than that needed for construction. Typical employment opportunities associated with decommissioning include management and supervisory personnel, equipment operators, trades and apprenticeships, semi-skilled and unskilled labour, and health and safety.

As of 2021 in the LAA/RAA, there were 370 workers employed in natural and applied sciences, 1,805 works in trades, transport, and equipment operation, and 205 works in manufacturing and utilities. These occupations seem applicable to construction-related activities and it is assumed that some of the skilled workforce required for the project will be filled by locals in the LAA/RAA. It is likely that a portion of the project's workforce will be comprised of non-local workers; in particular, specialized labour. Other factors, including contractor(s) use of preferred labour and the degree to which workers choose to seek employment with the project will also affect the final composition of project workforces. It is likely that employment benefits related to the project will be highly skewed toward the existing skilled trades workforce with most construction positions comprised of skilled trades positions filled by people identifying as men.

- Direction: Positive
- Magnitude: Low
- Geographic Extent: LAA/RAA
- Duration: Short-term (for construction and decommissioning) to medium-term (for operations)
- Frequency: Continuous

- Reversibility: Reversible

12.4.3.2 Purchase of goods and services

Where project expenditures occur locally, positive effects on regional businesses are expected. During construction, contracts to clear the transmission line right-of-way and for tower assembly could result in short-term opportunities for businesses in the LAA/RAA. Technically complex components and tower structures will be designed and manufactured outside the RAA. In addition to direct and indirect contracting, service sector businesses operating in communities near the project will experience induced economic benefits from the purchase of meals, fuel, and accommodations by workers. Incidental purchases of repairs and parts for construction vehicles and equipment, as well as the purchase of some materials required for construction will also result in economic benefits in nearby communities.

During operations, maintenance activities could include short-term contracts for maintaining the transmission line right-of-way. Decommissioning is expected to result in indirect and induced contracting opportunities for local and regional businesses and would also be expected to result in induced opportunities through consumer spending. Economic opportunities associated with the project will include provisions for Indigenous content which will be included as a tender evaluation criterion. Specifics around the various contracts and Indigenous-related provisions and opportunities are currently under review; however, based on Manitoba Hydro's previous experience it is anticipated that this approach to Indigenous procurement will provide opportunities for Indigenous contractors to participate in the work as prime or sub-contractors.

After the application of mitigation measures, the residual effects of the project on the purchase of goods are services are predicted to be:

- Direction: Positive
- Magnitude: Low
- Geographic Extent: LAA/RAA
- Duration: Short-term (for construction and decommissioning) to medium-term (for operations)
- Frequency: Continuous
- Reversibility: Reversible

12.4.3.3 Tax revenue

Quantitative estimates of GDP contributions are not available. However, considering the low magnitude characterizations associated with the project phases on employment and business, the project's contribution to the GDP of the local economy is low in magnitude. At the provincial and federal level, the project's GDP contribution is negligible in magnitude. In terms of taxes, increases to regional government revenue would only be realized where additional property taxes are realized because of changes in the assessed value of lands traversed by the project. Because the entirety of the R44H transmission line will be in an existing right-of-way with an existing easement, changes to regional government revenue are not anticipated. Benefits to provincial and federal tax revenues would occur where the taxable income of workers increases, resulting in increased income tax revenue, and through PST and GST collected on goods and services used on the project. Given the size of the workforce and duration of work, project effects on provincial and federal tax revenues are anticipated to be negligible in magnitude.

After the implementation of mitigation measures, the residual effects of the project on tax revenue are predicted to be:

- Direction: Positive
- Magnitude: Low
- Geographic Extent: LAA/RAA
- Duration: Short-term (for construction and decommissioning) to medium-term (for operations)
- Frequency: Continuous
- Reversibility: Reversible

12.4.3.4 Summary of residual effects

This assessment considers residual effects on economic opportunities after mitigation measures are implemented.

Table 12-4 characterizes the residual effect on economic opportunities.

Table 12-4: Project residual effects on economic opportunities

Residual Effects Characterization						
Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility
Change in regional employment						
Construction	Positive	Low	LAA/RAA	Short-term	Continuous	Reversible

Operation	Positive	Low	LAA/RAA	Medium-term	Continuous	Reversible
Decommissioning	Positive	Low	LAA/RAA	Short-term	Continuous	Reversible
Change in regional business						
Construction	Positive	Low	LAA/RAA	Short-term	Continuous	Reversible
Operation	Positive	Low	LAA/RAA	Medium-term	Continuous	Reversible
Decommissioning	Positive	Low	LAA/RAA	Short-term	Continuous	Reversible
Change in regional economy						
Construction	Positive	Low	LAA/RAA	Short-term	Continuous	Reversible
Operation	Positive	Low	LAA/RAA	Medium-term	Continuous	Reversible
Decommissioning	Positive	Low	LAA/RAA	Short-term	Continuous	Reversible

12.4.4 Cumulative effects on economic opportunities

The assessment of cumulative effects is initiated with a determination of whether two conditions exist:

- the project has residual effects on the VC and
- a residual effect could interact with residual effects of other past, present, or reasonably foreseeable future physical activities.

If either condition is not met, further assessment of cumulative effects is not warranted because the project does not interact cumulatively with other projects or activities. Because the project is not expected to have a residual *adverse* effect on regional employment, business or economy, further assessment of cumulative effects is not warranted.

12.4.5 Determination of significance

With mitigation and environmental protection measures, the residual effects on economic opportunities are predicted to be not significant.

12.4.6 Prediction confidence

Prediction confidence is moderate based on professional judgement, quality of publicly available data, and the past effectiveness of proposed mitigation measures. Quantitative data is provided primarily through publicly accessible data from Statistics Canada, which has limitations as outlined in Section 12.3.

12.4.7 Follow-up and monitoring

Manitoba Hydro monitors training, employment and business effects associated with the development of new projects. The objective of monitoring is to track outcomes for three target groups; Indigenous peoples, women and apprentices who are residents of Manitoba.

Manitoba Hydro will track training and employment outcomes for the three target groups as well as business outcomes for Manitoba Indigenous businesses.

Monitoring training, employment and business outcomes for the project will occur for each year of construction.

12.4.8 Sensitivity to future climate change scenarios

Effects of climate change on economic opportunities are expected to relate to the anticipated increase in temperature, changes in precipitation patterns, and associated extreme weather events (e.g., flooding). Infrastructure damage may occur because of higher temperatures, extreme weather events, and changes in precipitation patterns. This may create the need for more frequent repair and maintenance work on the transmission line, resulting in increased economic opportunities related to employment and business demands.

Table 12-5 Labour force characterization for communities in the LAA/RAA for 2021

	Bunibonibee Cree Nation[3]	City of Thompson	Fox Lake Cree Nation	Gods Lake First Nation	Ilford	Manto Sipi Cree Nation	Pikwitonei	Shamattawa First Nation[4]	Tataskweyak First Nation	Thicket Portage	Town of Gillam	War Lake First Nation	York Factor First Nation	Manitoba
Total population aged 15 years and over by labour force status	1,220	9,525	90	925	45	430	N/A	600	1,385	N/A	705	45	310	1,058,415
In labour force	545	6,505	50	415	30	215	N/A	260	700	N/A	535	25	175	681,505
Employed	356	5,925	35	360	30	180	N/A	185	555	N/A	480	25	160	625,115
Unemployed	180	580	15	55	0	30	N/A	75	145	N/A	50	0	20	56,390
Not in labour force	675	3,020	40	510	10	220	N/A	340	685	N/A	170	20	135	376,905
Participation rate	44.7	68.3	55.6	44.9	66.7	50.0	N/A	43.3	50.5	N/A	75.9	55.6	56.5	64.4
Employment rate	29.9	62.2	38.9	38.9	66.7	41.9	N/A	30.8	40.1	N/A	68.1	55.6	51.6	59.1
Unemployment rate	33.0	8.9	30.0	13.3	0	14.0	N/A	28.8	20.7	N/A	9.3	0	11.4	8.3

[3] 2021 data not available for Bunibonibee Cree Nation (Oxford House 24). Census data from 2016 is presented.

[4] 2021 data not available for Shamattawa First Nation. Census data from 2016 is presented.

Table 12-6 Occupational classification for communities in the LAA/RAA for 2021

	Bunibonibee Cree Nation[5]	City of Thompson	Fox Lake Cree Nation	Gods Lake First Nation	Ilford	Manto Sipi Cree Nation	Pikwitonei	Shamattawa First Nation[6]	Tataskweyak First Nation	Thicket Portage	Town of Gillam	War Lake First Nation	York Factor First Nation	Manitoba
Total population aged 15 years and over by occupation	545	6505	45	420	35	210	N/A	260	700	N/A	530	25	175	681,505
All occupations	455	6360	45	400	30	200	N/A	215	620	N/A	520	25	170	665,880
Legislative and senior management	20	50	0	15	0	0	N/A	15	0	N/A	0	0	10	6,440
Business, finance and administration	40	760	10	30	10	20	N/A	20	80	N/A	50	10	20	106,520
Natural and applied sciences and related	10	265	0	0	0	0	N/A	0	10	N/A	85	0	0	39,030
Health	45	620	0	10	0	10	N/A	0	20	N/A	20	0	10	57,585
Education, law and social, community and government services	115	1245	10	105	0	50	N/A	70	190	N/A	95	10	50	91,725
Art, culture, recreation and sport	10	75	0	0	0	10	N/A	10	10	N/A	0	0	10	15,375
Sales and services	120	1605	10	105	0	65	N/A	55	145	N/A	120	10	45	160,900
Trades, transport, and equipment operators and related	90	1210	10	120	10	40	N/A	45	130	N/A	105	10	35	124,140
Natural resources, agriculture, and related production	10	405	0	10	0	0	N/A	10	20	N/A	0	0	0	29,805
Manufacturing and utilities	10	135	0	0	0	0	N/A	0	20	N/A	40	0	0	34,355

[5] 2021 data not available for Bunibonibee Cree Nation (Oxford House 24). Census data from 2016 is presented.

[6] 2021 data not available for Shamattawa First Nation. Census data from 2016 is presented.

13.0 Health and safety

For the purposes of this assessment, health and safety refers to the measures and conditions in place to protect and promote the well-being of individuals and communities. This chapter is focused on potential changes to environmental conditions attributable to the project that can influence:

- the health risk of individuals and communities, and
- psychological stress caused by perceived and realized changes in physical, mental, and psychological safety and well-being.

Health and safety was selected as a valued component (VC) because of its importance to individuals and communities based on engagement feedback on this project and other past projects in the area, e.g., the Bipole III Transmission Project (Manitoba Hydro 2011) and the Keeyask Transmission Project (Manitoba Hydro 2012).

13.1 Scope of the assessment

This chapter assesses the effects of project activities during construction, operation and decommissioning on health and safety. An assessment of cumulative effects on health and safety is also presented.

This assessment was influenced by engagement feedback and Manitoba Hydro's experience with other recent transmission line projects in northern Manitoba (e.g., the Bipole III Transmission Project (2011) and the Keeyask Transmission Project (2012)). The assessment considers the following:

- Change in air quality from project activities
- Change in noise levels from project activities, including noise from corona discharge
- Changes to a sense of community safety, and
- Changes to psychological stress related to human health concerns and stress related to changes in tranquility and exposure to electric and magnetic fields (EMF)

13.1.1 The project

The scope of the project consists of the construction, operation, and decommissioning of a new and approximately 42 km long, 230-kV transmission line that would terminate at the Radisson and Henday converter stations, within an existing transmission line corridor.

A new transformer associated with the project would be added at Radisson converter station. There will not be footprint expansions at either converter station as modifications would be done within existing station properties.

13.1.2 Regulatory and policy setting

The following provincial laws, and associated regulations, policies, and guidelines, as well as Manitoba Hydro's policies were considered for assessing project effects to health and safety.

- International Commission on Non-Ionizing Radiation Protection
- Health Canada noise guidance
- Manitoba Guidelines for Sound Pollution
- Canadian Ambient Air Quality Standards
- Manitoba Ambient Air Quality Guidelines and Objectives
- Manitoba Hydro's code of conduct
- Manitoba Hydro's policies on sustainable development, drug and alcohol, violence in the workplace, and workplace discrimination and harassment prevention

13.1.2.1 International Commission on Non-Ionizing Radiation Protection

While there are not provincially or federally maintained guidelines or standards for low frequency EMF exposure, Health Canada recognizes the international exposure guidelines established by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), a group recognized by the World Health Organization as the international independent advisory body for non-ionizing radiation protection (ICNIRP 2010).

Government and international medical agencies, including Health Canada, have thoroughly reviewed the available scientific information about EMF, but have not recommended regulatory standards. This guidance is relevant for the environmental assessment because it provides information on EMF exposure levels to reference in relation to the anticipated EMF that could result from the project.

13.1.2.2 Health Canada noise guidance

Although Health Canada does not have noise guidelines or enforceable noise thresholds or standards, they do consider noise-induced endpoints as health effects. These include noise-induced hearing loss, sleep disturbance, interference with speech comprehension, complaints, and change in the percentage of the population at a specific receptor location who become highly annoyed (Health Canada 2010). Health

Canada advises different assessment approaches depending on the project phase, duration of noise-producing activities, and range of noise levels (Health Canada 2010); (Health Canada 2017). Health Canada has also produced a guidance document for evaluating the human health impacts of noise through the environmental assessment process (Health Canada 2017).

13.1.3 Manitoba Guidelines for Sound Pollution

Manitoba's Guidelines for Sound Pollution specify outdoor environmental sound level objectives for residential, commercial, and industrial areas and include maximum acceptable noise levels for the protection of human health (Province of Manitoba 1992).

These guidelines are applied in the assessment of potential impacts to health and safety to determine whether predicted levels of noise due to the project are above the acceptable thresholds and to determine whether additional mitigation measures may be needed to reduce or control noise levels.

13.1.4 Canadian Ambient Air Quality Standards

The Canadian Council for Ministers of the Environment has developed the Canadian Ambient Air Quality Standards (CAAQS) for fine particulate matter, ozone, nitrogen dioxide and sulfur dioxide. The CAAQS have four management levels (green, yellow, orange, red) for the four pollutants and set out recommended management actions to control pollutant levels (Canadian Council of Ministers of the Environment n.d.). The CAAQS are established as air quality objectives under the *Canadian Environmental Protection Act, 1999*.

13.1.5 Manitoba Ambient Air Quality Guidelines and Objectives

Regulatory requirements are in place for assessing potential project-related change to air quality. Air quality is regulated by Manitoba Environment and Climate Change based on the Manitoba Ambient Air Quality Guidelines and Objectives (Government of Manitoba 2005).

13.1.6 Manitoba Hydro policies

Manitoba Hydro has policies related to safety and health, not only for its employees but also for the communities and environments in which we work. Manitoba Hydro has a sustainable development policy and 13 guiding principles that influence corporate decisions, actions, and day-to-day operations to achieve environmentally sound and sustainable economic development. Stewardship of the economy and the environment is the first guiding principle of this policy. Under this principle, Manitoba Hydro commits to safeguarding human health (Manitoba Hydro 2023).

Manitoba Hydro's Code of Conduct principles also explicitly include a commitment to safety:

> *We provide a safe working environment. We will take all necessary steps to minimize the risk of sickness, disease, injury and death to employees and the public resulting from our operations and activities. Employees are responsible for taking all necessary actions to protect their personal safety, the safety of fellow workers and the public.*

Manitoba Hydro also has corporate policies around the use and possession of alcohol and drugs (*Drug and Alcohol Policy* p584), violence in the workplace (*Violence in the Workplace Policy* p48), and workplace discrimination and harassment prevention (*Discrimination and Harassment Free Workplace Policy* p597), which provide further guidance on acceptable behaviour of Manitoba Hydro staff and contractors while on duty or performing work for Manitoba Hydro.

13.1.7 Consideration of feedback from project engagement

Project engagement (Chapter 3) actively sought to provide opportunities for concerned and interested parties to provide VC related feedback about the project.

Health and safety-related feedback that was raised during project engagement included concerns about noise from project activities, corona discharge, EMF, public safety issues due to increased presence of non-local workers, and concerns about how the presence of multiple lines may change the levels of effects.

Engaged First Nations shared that they are considering the proposed transmission line from a position in which health and safety have already been, and continue to be, compromised by past Manitoba Hydro developments, creating concern and stress about additional negative effects to health and safety that the project may cause.

Additionally, Fox Lake Cree Nation shared that cultural awareness training is essential, should be provided to all staff that will work on the project, and should be provided directly by the community.

The assessment of effects on health and safety also considered information provided through engagement and socio-economic studies from previous projects in northern Manitoba, including Wuskwatim Generation Project, Keeyask Generation Project, Keeyask Transmission Project, Bipole III Transmission Project, and the Regional Cumulative Effects Assessment.

13.1.8 Potential effects, pathways, and measurable parameters

The potential project effects on health and safety, along with effects pathways and measurable parameters are outlined in Table 13-1.

Table 13-1: Potential effects, effects pathways, and measurable parameters for health and safety

Potential Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Decrease in air quality	Emission of dust and exhaust from vehicles and equipment particularly during construction, posing a potential increased human health risk via inhalation of criteria air contaminants.	NAAQS levels for criteria air contaminants. Qualitative assessment of whether exposure to criteria air contaminants represents potential health risk.
Increase in noise levels	Increased noise or changes in the types of noise during construction, operations, and decommissioning activities.	Assessment of noise risk based on Province of Manitoba guidelines.
Decline in sense of community safety	Influx of workers and financial capital to the project area causing perceived and realized adverse effects on safety.	Size of anticipated workforce related to community population. Substance use (qualitative) Crime (qualitative)

Increase in psychological stress	Perceived health risks of EMF resulting from operation of the line. Changes to the aesthetic condition of the project area. Perception that the project may exacerbate or add to unresolved issues that have resulted from past hydroelectric development. Changes, real or perceived, in aspects of the environment that support health, safety, and well-being.	Qualitative assessment of EMF risk based on ICNIRP guidelines. Qualitative assessment of aesthetic conditions. Qualitative assessment of feedback related to health and safety shared through project engagement (e.g., breadth and perceived severity of impact) Qualitative assessment of residual effects of other valued components that support health/well-being and safety

13.1.9 Spatial boundaries

Three spatial boundaries are used to assess residual and cumulative environmental effects of the project on health and safety:

Project development area (PDA): the project footprint and anticipated area of physical disturbance during construction and operation and maintenance of the project.

Local assessment area (LAA): includes all components of the PDA and consists of a 10 km buffer. This area includes the Town of Gillam and Fox Lake Cree Nation, the two communities nearest to the project, but considers direct effects that may occur to the health and safety of all people who spend time in the LAA regardless of where they reside or the community they come from.

Regional assessment area (RAA): includes the PDA and LAA and is a 225 km buffer around Gillam. This area encompasses the communities that could experience indirect and cumulative effects related to health and safety.

The RAA for health and safety includes the following cities, towns, First Nations, and Northern Affairs Communities:

- Bunibonibee Cree Nation
- City of Thompson
- Fox Lake Cree Nation

- God's Lake First Nation
- Ilford
- Manto Sipi Cree Nation
- Pikwitonei
- Shamattawa First Nation
- Tataskweyak Cree Nation
- Thicket Portage
- Town of Gillam
- War Lake First Nation
- York Factory First Nation

13.1.10 Temporal boundaries

The primary temporal boundaries for the assessment of project effects on health and safety are based on the timing and duration of project activities as follows:

- Construction – Anticipated to start in December 2024 and be completed by July 2026. Station work to occur year-round, transmission line construction to occur under frozen conditions.
- Operations and maintenance – for the life of the project, estimated to be a 75-year design life.
- Decommissioning – estimated to be two years once the project has reached the end of its serviceable life.

13.1.11 Residual effects characterization

Table 13-2 provides the definitions used to characterize the residual effects on health and safety.

Table 13-2: Characterization of residual effects on health and safety

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Positive –** a residual effect that moves measurable parameters or qualitative categories in a direction beneficial to health and safety relative to baseline. **Adverse –** a residual effect that moves measurable parameters or qualitative categories in a direction

Table 13-2: Characterization of residual effects on health and safety

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
		detrimental to health and safety relative to baseline. **Neutral –** no net change in measurable parameters or qualitative categories for health and safety relative to baseline.
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**No Measurable Change –** non-discernable change to health and safety risk. **Low –** a discernable change in health and safety risks or outcomes, below regulatory benchmarks and not affecting daily activities **Moderate –** a measurable change in health and safety risks or outcomes that is at or around regulatory benchmarks and may moderately affect an individual's daily life and activities **High –** a measurable change in health and safety risks or outcomes above regulatory benchmarks that has a severe effect on an individual's daily life or activities or could result in hospitalization or death.
Geographic Extent	The geographic area in which a residual effect occurs	**PDA –** residual effects are restricted to the PDA **LAA –** residual effects extend into the LAA **RAA –** residual effects extend into the RAA
Duration	The time required until the measurable parameter or	**Short-term –** the residual effect is restricted to the construction phase

Table 13-2: Characterization of residual effects on health and safety		
Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
	the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Medium-term –** the residual effect extends beyond the construction phase **Long-term –** the residual effect extends for the life of the project (including operation and decommissioning)
Frequency	Identifies how often the residual effect occurs and how often during the project or in a specific phase	**Single event** **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and reclamation **Irreversible –** the residual effect is unlikely to be reversed

13.1.12 Significance definition

For this assessment, adverse residual effects on health and safety are considered significant if the proposed project has the potential to adversely change mental and physical health outcomes so that they exceed baseline conditions and cannot be mitigated or reduced with current or anticipated programs, policies, or mitigation measures.

For air quality, adverse residual effects on air quality are considered significant if the project contributes to an increase in air quality parameter concentrations to levels that are above ambient air quality guidelines and if there is a severe health risk posed by exposure to criteria air contaminants.

For noise, adverse residual effects on noise are considered significant when estimated audible noise exceeds Manitoba's provincial noise guidelines for residential and commercial areas for both daytime and nighttime conditions. Manitoba Environment and Climate does not enforce specific noise limits for regulation of ambient daytime and nighttime noise levels, but instead will review nuisance noise if five complaints have been reported by residents.

If the measurable parameter is below the significance threshold, there is no significant change to health and safety risk for that subcomponent. If the measurable parameter is above the significance threshold, mitigation measures would be implemented or improved upon to reduce the potential risk to below threshold levels.

For psychological stress and well-being, there is a lack of defined numerical parameters for evaluating adverse residual effects quantitatively. The residual effects related to psychological stress and well-being are evaluated through qualitative assessments, which consider indicators of the potential effect, literature reviews, engagement feedback, and professional judgment to consider if adverse residual effects are significant. Other effects in this section, such as effects on sense of community safety, are also at least partially informed through qualitative assessments.

13.1.13 Project interactions with health and safety

Table 13-3 identifies, for each potential effect, the physical activities that might interact with health and safety and result in the identified effect.

Table 13-3: Project interactions with health and safety

Project activity	Reduction in air quality	Increase in noise levels	Decline in sense of community safety	Increase in psychological stress
Transmission Line Construction				
Mobilization and staff presence	✓	✓	✓	✓
Vehicle and equipment use	✓	✓	✓	✓
Right-of-way clearing	✓	✓	✓	✓
Watercourse crossings	✓	-	-	✓
Marshalling / fly yards	✓	-	-	✓
Transmission tower construction	✓	-	✓	✓
Implosive connectors	✓	✓	-	✓
Helicopter use	✓	✓	✓	✓
Clean-up and demobilization	✓	✓	✓	✓

Table 13-3: Project interactions with health and safety				
Project activity	Reduction in air quality	Increase in noise levels	Decline in sense of community safety	Increase in psychological stress
Station Modification				
Mobilization and staff presence	✓	✓	✓	✓
Vehicle and equipment use	✓	✓	✓	✓
Marshalling / fly yard	✓	-	-	✓
Site preparation	✓	-	-	✓
Installation of electrical equipment	✓	✓	-	✓
Clean-up and demobilization	✓	✓	✓	✓
Transmission Line and Station Operation and Maintenance				
Transmission line and station presence	✓	✓	-	✓
Vehicle and equipment use	✓	✓	✓	✓
Inspection and maintenance	✓	✓	✓	✓
Vegetation management	✓	✓	✓	✓
Decommissioning				
Mobilization and staff presence	✓	✓	✓	✓
Vehicle and equipment use	✓	✓	✓	✓
Removal of transformers, disassembled towers, foundations, conductors, and associated equipment	✓	✓	-	-
Rehabilitation	✓	✓	✓	✓
Clean-up and demobilization	✓	✓	✓	✓

Table 13-3: Project interactions with health and safety				
Project activity	Reduction in air quality	Increase in noise levels	Decline in sense of community safety	Increase in psychological stress
✓ = Potential interaction – = No interaction				

For the purposes of the assessment, mobilization and staff presence is the anticipated project activity through which a sense of community safety may be most impacted. Other project activities (e.g., right-of-way clearing, inspection and maintenance) have also been identified to potentially affect a sense of community safety if they have the potential to generate an influx of workers through additional employment opportunities.

All project activities have been identified as potential pathways for increasing psychological stress. The project is taking place in a context where individuals, communities, nations, and their traditional territories have experienced and continue to experience first-hand and intergenerational adverse impacts resulting from hydroelectric development that has occurred along the Nelson River since the 1960s. The result of Manitoba Hydro's legacy of development in the area comes with an ongoing level of distrust in Manitoba Hydro for some individuals who live in the project area or may be affected by the project. In other words, the fact that the project is a Manitoba Hydro hydroelectric development means that the project may trigger stress about how the project may cause adverse impacts or exacerbate ongoing legacy issues.

13.2 Existing conditions

Baseline information for this assessment was gathered through a detailed review of available desktop data. The existing conditions described in this section focus on:

- Regional population health
- Well-being and stress
- Air quality
- Noise
- Legacy impacts of hydroelectric development

During project engagement for the Bipole III transmission project, engaged nations shared that the health and wellness of members are contingent upon the availability of both Eurocentric modes of health and wellness programming and traditional health and wellness practices (Northern Lights Heritage Service 2011). This section includes information related to existing health and safety conditions from both Eurocentric and Indigenous perspectives, where possible.

13.2.1 Regional population health

The RAA for the project falls within the Northern Health Region, which covers over 60% of Manitoba's area and serves over 76,000 Manitobans (as of 2022) (Northern Health Region 2022). The population density in the region is 0.18 persons per km^2 in comparison to the overall provincial density of 2.19 persons per km^2. The low population density in comparison to the provincial average and the fact that many communities are only accessible by air and winter roads creates challenges in providing quality health care to the regional population. There are several demographic challenges identified for providing health care in the Northern Health Region (Northern Health Region 2022):

- On-reserve vs. off-reserve care: there are jurisdictional differences related to the provision of health based on whether an individual is seeking health care on-reserve (provided through First Nation Inuit Health) or off-reserve (provided through the Northern Health Region). This can lead to confusion among patients when trying to access care and a lack of coordination across healthcare providers regarding follow-up and continuity of care.
- Isolation and remoteness: the large geographic area and remote nature of many communities in the Northern Health Region impact the ability of patients to access health care services easily or affordably.
- Housing: the quality, quantity and affordability of housing are issues in many remote northern communities.
- Healthy foods: many communities experience challenges in having access to and purchasing affordable and nutritious food.
- In addition, the Northern Health Region identified key health issues and challenges currently experienced by individuals, families, and communities:
- Disparity in health status: Individuals living on reserve are more likely to have higher rates of acute care stays, longer days spent in hospital, lower rates of immunization, and higher rates of diabetes, sexually transmitted infections, and tuberculosis.
- Mental health and addictions: the prevalence of substance abuse disorders in the Northern Health Region is found to be measurably higher than the Manitoba average.

- Communicable diseases: the Northern Health Region has high rates for communicable diseases, including syphilis, chlamydia, gonorrhea, and tuberculosis, as well as sexually transmitted blood-borne infections.

13.2.2 Well-being and stress

The community well-being (CWB) index, reported on by Indigenous Services Canada (Indigenous Services Canada 2019), measures socio-economic well-being for individual communities across Canada. It is the only published index that provides comparability across all census subdivisions in Canada for which data are available.

The CWB index assigns each community a single overall CWB score, ranging from a low of zero to a high of 100, that considers four component scores related to factors widely accepted to be important to well-being: education, labour force activity, income, and housing. The CWB index score is just one of many possible measures used to describe levels of community well-being. The most current CWB scores available are from the 2016 census reporting year (Indigenous Services Canada 2019).

Community-specific CWB scores are not available for certain communities in the RAA, which could be due to a population size of less than 65 people, data quality issues, or not being fully enumerated in the 2016 census. Data at the provincial level is included in Table 13-4.

Table 13-4: 2016 CWB index scores and individual component scores at the provincial level overall, for First Nations and for non-First Nation communities in Manitoba

Community group	CWB score	Component scores			
		Education	Labour	Income	Housing
Manitoba overall	69.2	48	72.3	65.3	83.2
Manitoba First Nations communities	49.3	31.9	52.4	42.8	59
Manitoba non-First Nation communities	78	55.2	81.2	75.4	94
Gap between First Nations and non-First Nation communities:	28.7	23.3	28.8	32.6	35

Note: Data from the 2016 Community Well-Being index map and tables (Indigenous Services Canada 2019)

One limitation to note about the CWB index is that it does not capture scores specific to the Red River Métis Nation because there are no geographic census areas specifically attributed to the Red River Métis.

The average CWB index score for communities in Manitoba is 69.2. For First Nations, the average CWB index score is 49.3, while the average CWB score for communities that are not designated as First Nations is 78.0 (Indigenous Services Canada 2019).

The component scores indicate that First Nations communities in Manitoba score lower than non-First Nations communities in the noted four components (i.e., education, labour force activity, income, and housing). The component score with the largest gap is housing, for which First Nations communities score 35 points lower than non-First Nation communities on average. This aligns with some of the feedback we have heard during project engagement. Tataskweyak Cree Nation expressed concern about the quality of housing in their community versus the housing available for Manitoba Hydro staff that come to the area to work and how housing issues contribute to the baseline of well-being Tataskweyak Cree Nation is experiencing before the project.

Potentially affected Indigenous nations may have their own models or perspectives on understanding what wellness means to their unique nation.

13.2.3 Air quality

Manitoba generally has good air quality, with poorer air quality being attributable to aspects such as wildfire smoke and transboundary pollutants from the United States or other Canadian provinces. In 2023, there were 137 fires in northern Manitoba, affecting a total area of 137,814 hectares (Manitoba Natural Resources and Northern Development 2023). Exposure to smoke from wildfires can cause lung problems and a persistent cough, can exacerbate existing heart and lung conditions, and is more likely to affect young children and the elderly (Manitoba Health n.d.).

Communities in the regional cumulative effects assessment area of interest shared that poor quality roads can contribute to respiratory conditions from dust (Manitoba Hydro 2016).

Comparison of PM2.5 and ozone for the three-year period from 2013 to 2015, as part of the national Air Quality Management System (AQMS), indicated that these parameters complied with the Canadian Ambient Air Quality Standards (CAAQS) at the air monitoring stations located across the province of Manitoba, including a monitoring station in Thompson (Manitoba Environment and Climate 2023).

The largest current industrial activity in the RAA is Vale's operational Thompson Mine which consists of two interconnected underground nickel mines. Nickel mining releases several by-products and harmful metals, most notably sulfur dioxide an air pollutant that is harmful to lungs.

13.2.4 Noise

Existing noise levels in the area would be typical of rural settings, with some areas typical of suburban residential areas. Noise in rural areas may be due to highway traffic, airplanes, and recreational activities.

Health Canada (Health Canada 2017) considers day-night noise levels to vary from less than 45 dBA for a typical quiet rural area to 53 to 57 dBA for a typical suburban residential area. The audible noise from the presence of a transmission line decreases by about 3 to 4 dBA for each doubling of distance from the line. The regional cumulative effects assessment (Manitoba Hydro 2016) found that Manitoba Hydro's transmission lines comply with provincial guidelines related to audible noise.

13.2.5 Legacy impacts of hydroelectric development

As noted in the Clean Environment Commission (CEC) review of the regional cumulative effects assessment (Manitoba Hydro 2016), community members in the region shared that hydroelectric development is seen as the source of many, if not most, of the adverse impacts experienced by communities over the last 60 years (Manitoba Clean Environment Commission 2018).

Communities that participated in the CEC review shared that hydroelectric development has reduced their ability to provide for themselves through a decrease in the quantity, quality, and safety of traditionally harvested foods.

Many communities in the regional cumulative effects assessment area of interest have indicated that the convergence of rapid societal changes brought on by a series of intrusions have affected family and social units. Examples of intrusions include social assistance, residential schools and related abuse, the effects of the hydroelectric development projects, new transportation routes and modern amenities (e.g., stores, television).

Such intrusions have resulted in cultural and identity loss, structural inequalities, collective stress, and trauma as well as a range of social problems including demoralization, depression, and substance abuse. Community members have suggested that changes in traditional harvesting activities (both commercial and domestic) limited their ability to secure food for family members, leading to increased reliance on store-bought foods, often without the means necessary to purchase these foods.

The transmission of traditional knowledge decreased, which communities have associated with a growing disconnect to the land, identity, and cultural practices breakdown. This loss of self-sufficiency has been described by communities as a diminishing sense of confidence and self-worth (Manitoba Hydro 2016). More information on the legacy impacts of hydroelectric development, as covered in the regional cumulative effects assessment, can be found in Section 5.5.

13.3 Assessment of effects

While effects on health and safety could occur during construction, operation, and decommissioning, they are anticipated to be most pronounced during construction and include the following:

- Decrease in air quality
- Increase in noise levels
- Decline in sense of community safety
- Increase in psychological stress

13.3.1 Decrease in air quality

The main effect pathway related to a decrease in air quality is the emission of exhaust and generation of dust from the operation of vehicles and equipment, particularly during clearing and other construction activities. Air quality is determined by the levels of gases and particulate matter in the air. Gases commonly emitted by passenger vehicles and other machinery include nitrogen dioxide (NO_2), sulphur dioxide (SO_2), and carbon monoxide (CO), all of which can have harmful health effects above certain concentrations. Particulate matter is classified according to particle size, with fine particulate matter defined as PM10 (less than 10 μm diameter) and PM2.5 (less than 2.5 μm diameter). Smaller particles pose a greater health risk, as they can travel deeper into the respiratory system when inhaled (Health Canada 2016), (Government of Canada 2017).

Exhaust and dust emissions from the operation of vehicles and equipment during project construction, operation, and decommissioning activities may cause a change in local air quality. Project-related change to air quality poses a potential human health risk if levels of gases and particulates exceed health-based air quality objectives. Change in air quality is of particular importance to sensitive individuals, e.g., children, the elderly, and people with existing cardio-respiratory health problems such as asthma and chronic obstructive pulmonary disease (Health Canada 2021).

Exhaust and dust emissions are anticipated to be highest during the construction phase which will involve vegetation clearing, cutting, piling, and chipping/mulching activities along the right-of-way. During the construction phase, heavy equipment and vehicles will emit combustion by-products (e.g., NO_2, SO_2, CO and particulate matter). Construction activities may also emit fugitive dust (dust from disturbed soils becoming airborne) during the operation of heavy machinery.

Similar effects are anticipated for the maintenance, operation, and decommissioning phases of the project but to a lesser extent given the smaller workforce size and work activities being shorter-term and more isolated.

13.3.2 Increase in noise levels

Throughout construction, there will be an increase in noise or change in the types of noise in the project area resulting from activities such as the mobilization of equipment, right-of-way clearing, installation of tower foundations, developing and using access routes, creating, and using marshalling/fly yards, transmission tower construction, helicopters, and the use of implosive connectors for conductor splicing.

Noise levels during the night will remain unchanged from the existing conditions because construction activities related to the assembly and installation of towers will only occur during the day.

Research on maximum noise levels generated during the construction phase of a project from combined construction equipment sources is suggested to be 89 dBA at a 15-metre distance from noise sources (Stantec 2015). At 480 metres from noise sources, construction activities on a past transmission line project were expected to generate 59 dBA of noise, which is comparable to the noise level of indoor conversation (Stantec 2015). An exception to the predicted construction noise levels occurs when implosive connectors are used for conductor splicing. Implosive sleeve instantaneous discharges can generate 110 dBA of noise (Stantec 2015). If tower placement involves the use of helicopters, this activity would also result in isolated periods of elevated noise.

During operations and maintenance, the noise generated is expected to be far less than during the construction phase. However, within the PDA in areas very close to the transmission line there is potential for the ongoing presence of corona discharge, which results from the ionization of air surrounding electrical conductors. Corona discharge can create a hissing or crackling noise that can be heard close to high-voltage transmission lines under certain conditions. Audible noise from corona discharges along the edge of the right-of-way is expected to be approximately 23 dBA during medium to fair-weather conditions (Exponent 2015).

During operations and decommissioning, activities involving the use of vehicles and equipment will generate noise. This will include inspections, vegetation management, and the eventual removal of transmission infrastructure and rehabilitation activities. The noise resulting from these activities will be temporary and localized, contained mostly within the PDA.

The Bipole III Electric and Magnetic Field Effects Monitoring Report (Manitoba Hydro 2021) examined measurements of audible noise, resulting from corona discharge, recorded at a monitoring site positioned under Bipole III southeast of Winnipeg during operations. At the edge of the right-of-way, all measurements were below the predicted levels and well below the provincial recommendation that levels be a maximum of 55 dBA during the day and 45 dBA at night in residential and commercial areas (Manitoba Hydro 2021) .

13.3.3 Decline in sense of community safety

The main effects pathway for a decline in sense of community safety is through an influx of workers and money into the RAA. As discussed in the effects assessment for the Keeyask Generation Project (Keeyask Hydropower Limited Partnership 2012), the two main pathways resulting in potential adverse interactions between construction workers and local community members are:

- the influx of non-local construction workers into communities
- the availability of new disposable income for residents employed during construction

Possible adverse interactions include behaviours undertaken by the non-local workforce that may contribute to the transmission of communicable diseases through workers seeking social interaction (which could lead to sexual encounters) within the communities and contribute to the spread of clusters and outbreaks (Oster, et al. 2021).

It is possible that out-of-region workers could undertake other risky behaviours such as substance misuse or heavy alcohol consumption which has the potential to affect the safety of the residents within communities. There are relationships between increased substance abuse, including alcohol, and the presence of a predominantly male transient workforce (Prospectors & Developers Association of Canada 2022). There are also relationships between those who have higher earnings and higher alcohol consumption (Government of Canada 2023).

Consequences of alcohol use by a non-local workforce to the community may include traffic accidents and violence (World Health Organization 2023). The socio-economic monitoring plan for the Keeyask Generation Project (Manitoba Hydro 2018) indicated that the Keeyask Generation Project has contributed to an increase in the presence and use of drugs and alcohol in the region. Concerns were also raised about potential sexual exploitation at the Keeyask site and within the community (Manitoba Hydro 2018).

Although the number and types of interactions between construction workers and local community members cannot be quantifiably predicted, given past experiences with hydroelectric development and adverse interactions with community members, communities are concerned about adverse effects related to worker interaction, particularly in Gillam and Thompson (Keeyask Hydropower Limited Partnership 2012). Fox Lake Cree Nation community members shared that they were victims of racism during construction on previous hydro projects and are concerned that racism may be an issue on future hydro development projects.

As discussed in Section 12.1.4, the project workforce will be comprised of some non-local workers, particularly in roles for specialized labour. These positions tend to be held by people identifying as men. The impacts on a sense of community safety resulting from a non-local, male-dominated workforce will disproportionately affect women and girls. A non-local workforce can exacerbate the existing disproportionate rates of disappearance, violence, and homicide affecting Indigenous women and girls across Canada.

In addition to the presence of workers, temporary worker accommodations are also linked to adverse impacts on Indigenous women and girls, including sexual harassment, human trafficking, sexist and racist employment practices, increased domestic violence, and increased incidences of sexually transmitted infections and HIV/AIDS (Narratives Inc. 2023). The Keeyask Cree Nations identified a risk that construction workers from Manitoba Hydro projects would abuse women from the communities (Cree Natins Partners 2012), Section 7.4).

The workforce size will be the largest during construction and could peak with a total of 170 workers. The total population in Gillam, Fox Lake Cree Nation's A Kwis Ki Mahka Indian Reserve, and Fox Lake Cree Nation's Bird Reserve is 1,191 (Statistics Canada 2023a), (Statistics Canada 2023b), (Statistics Canada 2023c). The non-local workforce will represent a 14% increase in the LAA population during peak construction.

In the absence of mitigation measures, a sudden influx of a non-local workforce is associated with social, economic, cultural and health impacts on communities, including inappropriate spending on drugs and alcohol, increased violence and exploitation, and increased demand and strain on local services and infrastructure (Manitoba Hydro 2016).

13.3.4 Increase in psychological stress

The project may increase psychological stress for individuals living or regularly spending time in the project area because of perceptions that the project will increase health risks or that the project may exacerbate ongoing issues already affecting the quality of life in the LAA and RAA.

This assessment considers that where a perception that the project may cause adverse impacts on health and safety exists, there will be an effect on psychological stress levels regardless of whether the perceived adverse impact occurs.

Risk perception refers to people's subjective judgements about the likelihood of negative occurrences such as injury, illness, disease, and death (Paek and Hove 2017). Hess et al. (Hess, McKane and Pietzryk 2022) reported that perceived health risks related to topics like EMF, noise, and other construction effects, were frequently shared as concerns on proposed powerlines in North America. This observation aligns with feedback gathered through engagement on past Manitoba Hydro transmission projects. Perceived negative effects of the project may cause undue stress and potential trauma for individuals experiencing these perceptions (Northern Lights Heritage Services Inc. 2011).

The specific pathways that will be discussed concerning potential increases in psychological stress resulting from project activities include the following:

- Unresolved issues that have resulted from past development in the RAA and the perception that these issues may be exacerbated by the project.
- Perceived health risks of EMF resulting from the operation of the line.
- Changes to the aesthetic condition of the project area.
- Changes in aspects of the environment that support health and safety.

13.3.5 Unresolved legacy issues

The history and legacy impacts of hydroelectric development have caused distrust of Manitoba Hydro for some individuals and nations in the project area, largely because of impacts from flooding, the associated loss of ways of life, and broken promises from previous projects (Dimark Research Inc. and InterGroup Consultants Ltd. 2001).

Ongoing distrust of Manitoba Hydro that communities in the RAA may already be experiencing may result in increased anxiety about future development (Keeyask Hydropower Limited Partnership 2012). York Factory First Nation has previously shared that their "history of interactions with Manitoba Hydro is full of frustrations, miscommunications, mistrust and lack of mutual respect" (Keeyask Hydropower Limited Partnership 2012a).

Manitoba Hydro recognizes that there may be generalized stress and perceived impacts associated with any proposed new hydroelectric development. Therefore, all project activities may be pathways to increase psychological stress due to perceived risks.

Through the engagement process, communities shared that providing feedback specific to a new project can be challenging when legacy impacts of hydroelectric development in general are still being experienced in addition to other broad issues that affect current states of well-being. There are concerns that the project may exacerbate, or not support the resolution of, ongoing issues, including but not limited to diminished water quality and a shortage of quality housing.

Tataskweyak Cree Nation shared that people in the south are under the impression that northern Manitoba is pristine land and waters, and they don't see the contamination that has occurred and how the livelihoods of community members have been negatively affected. Tataskweyak Cree Nation stated that the Nelson River system is one of the most contaminated in the world and that the community is still under a boil water advisory, despite the development of Keeyask being presented as an opportunity with the potential to improve living conditions in the community.

Tataskweyak Cree Nation also shared concern that the development of temporary work camps to accommodate workers on Manitoba Hydro projects does not help provide more suitable housing in the community, which is experiencing a shortage in quality housing.

Manitoba Hydro acknowledges that ongoing issues, many of which have links to past hydroelectric development, are top of mind for individuals and nations that may be affected by the project. Introducing another project with potential impacts on the area can generate the feeling that efforts being undertaken to offset the impacts of past developments are an uphill battle.

Fox Lake Cree Nation shared that community members are working on rehabilitation and revegetation projects to offset impacts at previously disturbed sites. However, with new projects causing new disturbance, it can feel like such offset and rehabilitation efforts are not accomplishing what they are setting out to achieve, leading to a sense of fatigue, potentially diminished hope, and stress.

It is understood that all project activities through construction and operations may result in increases in stress due to a perceived risk that existing issues may be exacerbated or are being ignored.

13.3.6 Perceived health risks of EMF

Following project construction, perceived health risks of exposure to EMF created by the operation of the transmission line will be a specific pathway through which the project may cause an increase in psychological stress.

Electric fields are a result of voltages applied to electrical conductors and equipment, expressed as volts per metre (V/m) or kilovolts per metre (kV/m), and are easily blocked by most objects (e.g., fences, vegetation, buildings).

Magnetic fields are produced by the flow of electric current, expressed as magnetic flux density in units of gauss (G) or milligauss (mG), and are not blocked by most materials, but rapidly diminish with distance from the source (Exponent 2015b).

The EMF produced by transmission lines is categorized as extremely low frequency (ELF), in the range of 1 Hertz (Hz) to 3 kilohertz (kHz) on the electromagnetic spectrum. This ELF EMF can induce electric fields in the human body, but the levels are extremely small (World Health Organization 2016).

There is a perceived risk that living near powerlines increases cancer risk due to the production of electric and magnetic fields (City of Hope 2023) which was first raised in 1979 due to a study which associated increased risk of childhood leukemia with residential proximity to power lines (Zeman n.d.). There has been no consistent evidence linking cancer to EMF exposure from powerlines including childhood leukemia and brain tumours (National Cancer Institute 2022).

Health Canada states: "Health Canada does not consider that any precautionary measures are needed regarding daily exposures to EMFs at ELFs. There is no conclusive evidence of any harm caused by exposures at levels found in Canadian homes and schools, including those located just outside the boundaries of power line corridors" (Health Canada 2023). Inside a home, the electric fields from high-voltage power lines are often weaker than the fields from household electrical appliances (Government of Canada 2022).

The only well-established effects on people exposed to short-term ELF magnetic fields are the stimulation of central and peripheral nervous tissues and the perception of faint flickering light in the periphery of the visual field (ICES 2022) at very high exposure levels. The levels at which these short-term effects occur are not encountered in typical environments accessible to the public, including areas near electric transmission and distribution facilities (Exponent 2015a).

The ICNIRP has issued guidelines for limiting exposure to ELF EMF which help ensure that exposures to ELF EMF do not create electric currents that are stronger than the ones made naturally in the body.

This assessment considered the EMF measurements taken on a higher voltage transmission line, the Manitoba–Minnesota Transmission Project (MMTP), which is a 500 kilovolt (kV) AC transmission line in southeastern Manitoba. For the MMTP, the highest calculated electric field at the edge of the right-of-way was 0.8 kV/m. This level was well below the recommended ICNIRP (ICNIRP 2010) reference level for public exposure of 4.2 kV/m.

The highest calculated electric field level on the MMTP right-of-way (more directly beneath the line) was 10 kV/m. While the ICNIRP does not discuss separate guidelines for within a right-of-way, the International Committee on Electromagnetic Safety (ICES) and the Canadian Standards Association (CSA) both recommend that levels don't exceed 10kV/m with the CSA noting that this recommendation is based on comfort and that electric field levels may exceed 10 kV/m for voltage classes 200 kV and greater (ICES 2002, CSA 2015).

The highest magnetic field levels found on the MMTP right-of-way were 32 milligauss (mG) on the edge of the ROW and 225 mG on the ROW (Exponent 2015b). These values were well below the reference levels for public exposure of 2,000 mG (ICNIRP 2010) and 9,040 mG respectively (ICES 2002).

The Bipole III Electric and Magnetic Field Effects Monitoring Report (Manitoba Hydro 2021) found that the measured results of operational EMF quantities in 2019 and 2020 at a monitoring site located under Bipole III southeast of Winnipeg were at or below the predicted levels.

Although levels on past transmission projects generally fall below exposure guidelines and there is no literature to support that ELF EMF may impact human health, Manitoba Hydro recognizes that the perceived concerns of project-related EMF on human health may increase psychological stress associated with the project.

13.3.7 Changes to aesthetic conditions

During construction, vegetation clearing and grubbing of the right-of-way is the primary pathway for a direct and measurable change in aesthetics, which may indirectly cause a change in experience and enjoyment of the area. The aesthetic change will be sustained through operations due to the ongoing presence of the transmission line and maintenance of the right-of-way.

Since the project is in an area that is already largely altered due to past hydroelectric development, the presence of the project is not anticipated to cause a notable visual difference in the aesthetics of the LAA.

During decommissioning, rehabilitation activities would support the gradual return of the area to a more natural aesthetic condition over time.

13.3.8 Changes in aspects of the environment that support health and safety

On past projects, we have heard during engagement with Indigenous communities that well-being is a holistic concept that is influenced by biophysical, social, economic, cultural, and spiritual components of the environment. As a result, health and safety may be affected if the project causes adverse residual effects to any component of the natural environment that is integral to the health, safety, and well-being of individuals and communities in the area.

All project activities throughout the project life cycle (construction, operations, and decommissioning) have the potential to affect different aspects of the environment that support health and safety. Therefore, we consider that all project activities have the potential to affect health and safety through the residual effects identified throughout this environmental assessment report.

13.4 Mitigation measures

This section describes the mitigation measures that have been identified to reduce effects on health and safety including air quality, noise levels, sense of community safety, and psychological stress.

13.4.1 Mitigation measures related to air quality

Mitigation measures to reduce project-related combustion and dust emissions during construction, operation, and decommissioning include:

- Mud, dust, and vehicle emissions will be managed in a manner that allows for safe and continuous public activities near construction sites where applicable.
- Carrying out burning during winter season only, under supervision, and away from permanent human receptor locations, to confine the fire to the cleared project area and limit effects of offsite drift of smoke.

13.4.2 Mitigation measures related to noise levels

Mitigation measures to reduce project-related increases in noise during the construction, operation and maintenance phases include:

- Informing resource users and communities of major noise-generating activities such as the use of implode sleeves for conductor splicing and potential helicopter use for tower installation.

- Use of passive or active techniques to minimize noise such as the construction of barriers or noise cancellation to the extent feasible.

13.4.3 Mitigation measures related to a decline in sense of community safety

Mitigation measures to reduce potential adverse interactions between workers and local community members include:

- Indigenous cultural awareness training will be required for all project workers (i.e., both Manitoba Hydro staff and contractors) before their participation in any project work. Manitoba Hydro will invite Fox Lake Cree Nation to participate in the delivery of the training.
- Manitoba Hydro workers will adhere to Manitoba Hydro's Code of Conduct. Important objectives from the Code are incorporated into contracts for work to be undertaken by consultants, contractors, and suppliers.
- The *Discrimination and Harassment Free Workplace Policy* will be enacted and enforced for Manitoba Hydro workers. Contractors are expected to conduct themselves in a manner consistent with this policy.
- The *Violence in the Workplace Policy* will be enacted and enforced for Manitoba Hydro workers.
- The *Drug and Alcohol Policy* will be enacted and enforced for Manitoba Hydro workers and contractors.
- Workers will be housed in serviced Manitoba Hydro camp accommodations (e.g., Kettle Camp), equipped with food, laundry, and recreation facilities, to reduce the potential for interactions with local community members.

13.4.4 Mitigation measures related to psychological stress

Mitigation measures to reduce project-related increases in psychological stress during construction, operation, and decommissioning include:

- Manitoba Hydro will continue project engagement, sharing up-to-date information about timelines and project activities.
- Manitoba Hydro will remain available and open to meet to discuss the project, the effects being experienced, and potential ideas on how project concerns may be addressed.

13.5 Characterization of residual effects

This section characterizes the residual project effects on health and safety predicted to remain after the application of mitigation measures. Table 13-2 describes the factors used to characterize the interactions between the project and health and safety.

13.5.1 Decrease in air quality

Project-related air emissions during the construction phase are expected to be minor, resulting in temporary, short-term reductions in localized air quality at and immediately around construction sites, but are not anticipated to result in exceedances of Manitoba's Ambient Air Quality Guidelines. Residual human health risk effects associated with changes in air quality during the construction phase are adverse.

Vehicles and heavy machinery will generate fugitive dust, particulate matter, and combustion products, but the magnitude of change in health risk from air quality is expected to be negligible.

Residual human health risk effects associated with changes in air quality during the operation and maintenance phase are adverse. However, particulate matter and dust generated during routine activities will be minor because of limited vehicle and equipment use during operations, and transient change in air quality will be limited to the PDA and immediately adjacent areas.

Project air emissions during the decommissioning phase are expected to be like the construction phase.

After the application of mitigation measures, the residual effects of the project on air quality are predicted to be:

- Direction: Adverse
- Magnitude: Negligible
- Geographic extent: PDA
- Duration: Short-term
- Frequency: Irregular event
- Reversibility: Reversible

13.5.2 Increase in noise

Residual effects on health and safety related to noise are anticipated to be more pronounced during the construction phase of the project as there will be the most noise-generating activities taking place during construction. The project is not anticipated to change noise levels during operations because the project is in a highly developed existing transmission line corridor in which maintenance activities already occur on existing transmission lines.

After the application of mitigation measures, the residual effects of the project on noise are predicted to be:

- Direction: Adverse
- Magnitude: Low during construction and decommissioning; no measurable change during operations
- Geographic extent: LAA
- Duration: Long-term
- Frequency: Multiple irregular events through construction, operations, and decommissioning, and continuous corona discharge-related noise emission during operations
- Reversibility: Reversible

13.5.3 Decline in sense of community safety

There remains a possibility that the mostly male workforce may interact with community members in social settings which could lead to adverse effects on a sense of community safety.

Although all community members are potentially susceptible to adverse interactions with non-local workers, women, First Nations peoples and Métis citizens, and 2SLGBTQQIA+ (two-spirited, lesbian, gay, bisexual, transgender, queer, questioning, intersex, asexual plus) population groups experience inequitable instances of sexual violence and effects of substance misuse from transient workforces that are predominately male (National Inquiry into missing and murdered Indigenous women and girls 2019).

Although the project workforce is anticipated to be largest during the construction stage, there will likely be a non-local workforce present for operation and maintenance activities, as well as project decommissioning. Therefore, the potential residual effects on a sense of community safety are expected to extend throughout the life of the project.

After the application of mitigation measures, the residual effects of the project on a sense of community safety are predicted to be:

- Direction: Adverse
- Magnitude: No measurable change to moderate depending on the individual
- Geographic extent: RAA
- Duration: Long term

- Frequency: Multiple irregular events
- Reversibility: Reversible

13.5.4 Increase in psychological stress

Despite the measures in place to reduce effects on perceived health risks and stress, an increase in psychological stress could occur due to the past and ongoing adverse effects attributable to the legacy impacts of hydroelectricity-related development in the RAA and the resulting mistrust.

The magnitude of project effects on psychological stress has been assessed as ranging from negligible to moderate because perceived health risks are subjective, and stressors and the experience of stress may vary broadly between individuals. Individuals living closer to the transmission line or frequently visiting the area may experience a greater magnitude of perceived risk and increased stress (Mueller, 2019).

Risk perceptions may change over time for some individuals and may linger beyond the lifespan of the project for others depending on individuals' ability to cope with stress.

After the application of mitigation measures, the residual effects of the project on a sense of community safety are predicted to be:

- Direction: Adverse
- Magnitude: No measurable change to moderate depending on the individual
- Geographic extent: RAA
- Duration: Long-term
- Frequency: Continuous
- Reversibility: Reversible or irreversible depending on the individual

13.6 Summary of residual effects on health and safety

Table 13-5 summarizes the characterizations of residual effects on health and safety.

Table 13-5: Project residual effects on health and safety

<table>
<tr><th colspan="7">Residual Effects Characterization</th></tr>
<tr><th>Project Phase</th><th>Direction</th><th>Magnitude</th><th>Geographic Extent</th><th>Duration</th><th>Frequency</th><th>Reversibility</th></tr>
<tr><td colspan="7">Decrease in air quality</td></tr>
<tr><td>Construction</td><td rowspan="3">Adverse</td><td rowspan="3">No Measurable Change</td><td rowspan="3">PDA</td><td rowspan="3">Short-term</td><td rowspan="3">Irregular</td><td rowspan="3">Reversible</td></tr>
<tr><td>Operation</td></tr>
<tr><td>Decommissioning</td></tr>
<tr><td colspan="7">Increase in noise levels</td></tr>
<tr><td>Construction</td><td rowspan="3">Adverse</td><td>Low</td><td rowspan="3">LAA</td><td rowspan="3">Long-term</td><td>Irregular</td><td rowspan="3">Reversible</td></tr>
<tr><td>Operation</td><td>No Measurable Change</td><td>Irregular /Continuous</td></tr>
<tr><td>Decommissioning</td><td>Low</td><td>Irregular</td></tr>
<tr><td colspan="7">Decline in sense of community safety</td></tr>
<tr><td>Construction</td><td rowspan="3">Adverse</td><td>No Measurable Change - Moderate</td><td rowspan="3">RAA</td><td rowspan="3">Long-term</td><td rowspan="3">Irregular</td><td rowspan="3">Reversible</td></tr>
<tr><td>Operation</td><td>No Measurable Change - Low</td></tr>
<tr><td>Decommissioning</td><td>No Measurable Change - Low</td></tr>
<tr><td colspan="7">Increase in psychological stress</td></tr>
<tr><td>Construction</td><td rowspan="3">Adverse</td><td rowspan="3">No Measurable Change - Moderate</td><td rowspan="3">RAA</td><td rowspan="3">Long-term</td><td rowspan="3">Continuous</td><td rowspan="3">Reversible /Irreversible</td></tr>
<tr><td>Operation</td></tr>
<tr><td>Decommissioning</td></tr>
</table>

13.7 Cumulative effects on health and safety

The assessment of cumulative effects is initiated with a determination of whether two conditions exist:

- the project has residual effects on the VC and
- a residual effect could interact with residual effects of other past, present, or reasonably foreseeable future physical activities.

If either condition is not met, further assessment of cumulative effects is not warranted because the project does not interact cumulatively with other projects or activities.

For health and safety, both conditions are present. The project is anticipated to have adverse residual effects on air quality, noise levels, sense of community safety, and psychological stress. Each of the residual effects could interact with residual effects of other past, present, or reasonably foreseeable future physical activities.

13.7.1 Project residual effects likely to interact cumulatively

Table 13-6 shows the project and physical activities inclusion list which identifies other projects and physical activities that might act cumulatively with the project to impact health and safety. Where residual effects from the project act cumulatively with residual effects from other projects and physical activities, a cumulative effects assessment is carried out.

Table 13-6: Potential cumulative effects on health and safety

Other Projects and physical activities with the potential for cumulative environmental effects	Potential cumulative environmental effects			
	Decrease in air quality	Increase in noise	Decline in sense of community safety	Increase in psychological stress
Existing/ongoing projects and activities				
Domestic Resource Use (hunting, trapping, fishing)	-	-	-	-
Recreational Activities (Canoeing,	-	-	-	-

Table 13-6: Potential cumulative effects on health and safety

Other Projects and physical activities with the potential for cumulative environmental effects	Potential cumulative environmental effects			
	Decrease in air quality	Increase in noise	Decline in sense of community safety	Increase in psychological stress
Snowmobiling, Hiking)				
Commercial resource use (e.g., fishery, forestry)	✓	✓	✓	✓
Infrastructure (i.e., provincial trunk highways, provincial roads)	✓	✓	✓	✓
Generating and converter stations	✓	✓	✓	✓
Transmission lines	✓	✓	✓	✓
Vale nickel mine	✓	✓	✓	✓
Future projects and activities				
Project 6 – All-season road linking Manto Sipi Cree Nation, Bunibonibee Cree Nation and God's Lake First Nation	✓	✓	✓	✓
Kivalliq Hydro Fibre Link	✓	✓	✓	✓

Table 13-6: Potential cumulative effects on health and safety

Other Projects and physical activities with the potential for cumulative environmental effects	Potential cumulative environmental effects			
	Decrease in air quality	Increase in noise	Decline in sense of community safety	Increase in psychological stress

✓ = Other projects and physical activities whose residual effects are likely to interact cumulatively with project residual environmental effects.

– = Interactions between the residual effects of other projects and those of the project residual effects are not expected.

The project is not anticipated to interact cumulatively, concerning health and safety, with ongoing domestic resource use (hunting, trapping, fishing) or recreational activities because those activities are not understood to be causing appreciable residual effects on health and safety in this geographic area based on engagement feedback and literature review.

The pathways through which the project is anticipated to interact cumulatively with ongoing and reasonably foreseeable future projects are discussed below.

13.7.1.1 Effect pathways for cumulative effects on health and safety

<u>Assessment of cumulative effects on air quality</u>

Existing activities in the RAA, except the Vale nickel mine, are not anticipated to appreciably diminish air quality, because these activities likely occur at regular intervals and should not contribute to a reduction in air quality beyond baseline conditions.

The Vale nickel mine is near the City of Thompson. Manitoba Hydro was unable to attain information from Vale regarding any current mitigation measures in place related to current emission levels of sulfur dioxide emissions and other by-products from Vale's nickel mining operations.

The future KHFL and Project 6 projects are likely to have the same effect pathways on air quality as the R44H transmission line, namely through the emission of dust and exhaust from vehicles and equipment during construction.

In summary, potential cumulative effects to air quality will be negligible to low, continuous, long-term, and reversible.

Assessment of cumulative effects on noise levels

Noise generated by future projects and activities in the LAA/RAA have the potential to interact cumulatively with the project and could increase the overall exposure to noise experienced by people living and working in the RAA. Any activities involving the use of vehicle and equipment will contribute to noise levels.

However, effects will only be additive if noise-generating activities occur concurrently and close to one another. Implementation of mitigation measures will reduce the effects of the project on change to noise levels. Other proponents may adopt mitigation measures to mitigate their own projects' effects, or they may be required as permitting conditions.

These effects will be experienced primarily close to construction areas; they will be short-term and continuous until the end of construction.

In summary, potential cumulative effects due to noise will be negligible to low in magnitude, continuous, long-term, and reversible.

Assessment of cumulative effects on sense of community safety

Assuming that domestic resource use and recreational activities are undertaken by residents, these activities are not anticipated to interact cumulatively with the project to adversely impact sense of community safety.

Existing Manitoba Hydro operations in the RAA rely on a largely local workforce, primarily based in Gillam, which reduces the likelihood of a non-local workforce being used.

The workforce required for both the KHFL and Project 6 may adversely impact sense of community safety through an influx of workers and financial capital to the RAA, causing perceived and realized adverse effects on sense of community safety through the same pathways identified for the R44H transmission line. These effects are anticipated to be most pronounced during the construction phase, when these projects' workforces would likely be largest.

Potential cumulative effects on sense of community safety will be negligible to moderate depending on the individual, extend through the RAA, are long-term, may include multiple irregular events, and are reversible.

Assessment of cumulative effects on psychological stress

Concerning psychological stress, the project is likely to interact cumulatively with all ongoing and future activities in Table 13-6 that involve the development and alteration of the environment in the project area due to the ongoing issues being experienced by individuals and communities in the RAA. Current and reasonably foreseeable future projects may contribute to perceived health effects and associated stress, regardless of the nature of the activity.

13.7.1.2 Mitigation measures for cumulative impacts on health and safety

Manitoba Hydro will follow mitigation measures in Section 13.4 to reduce impacts of the project on health and safety.

Details of the KHFL, including, project footprint, project design and technical aspects, specific point of initiation in the Gillam area, construction schedule, and anticipated number of workers for the Manitoba segment, were unknown to Manitoba Hydro at the time of filing this EA report.

Project 6 will be using temporary workcamps to house non-local construction workers. The proximity of these future workcamps to towns and communities in the RAA will affect the likelihood of potential adverse impacts on sense of community safety by non-local workers. Project 6 mitigation measures for air quality include using low sulfur fuels, limiting long-term idling, regular maintenance on equipment and vehicles, and placing quarries, borrow areas, laydown areas and camps near the road corridor to reduce driving distances and thereby emissions. To mitigate noise, Project 6 will use best management practices for blasting activities and follow noise control and noise limitation guidelines. Project 6 did not specifically look at community safety as it relates to adverse experiences and interactions between local community members and a non-local workforce.

13.7.2 Residual cumulative impacts on health and safety

Overall, the residual cumulative impacts on health and safety are anticipated to be adverse, negligible, extend through the RAA, short to medium term (mainly in the construction phase), continuous, and reversible.

The residual cumulative impacts on psychological stress are anticipated to be adverse, negligible to moderate depending, extend through the RAA, have the potential to be long-term, may be irregular or continuous, and potentially irreversible. The magnitude, frequency and reversibility of these impacts will vary depending on the individual.

13.7.3 Determination of significance

With mitigation and environmental protection measures, the project’s residual effects on health and safety are predicted to be not significant.

With mitigation and environmental protection measures, the project’s cumulative effects on health and safety are predicted to be not significant.

Although the project's residual effects and contribution to cumulative effects are predicted to be not significant, Manitoba Hydro acknowledges that individuals and communities may experience these effects uniquely and some individuals may deem such effects substantive. There is the potential for individuals to experience stress as the result of the legacy impacts of hydroelectric development. This stress may be felt to different magnitudes depending on the individual and their experiences with past development in the RAA.

13.7.4 Prediction confidence

Prediction confidence in the assessment of effects on health and safety is based on desktop-based data compilation, engagement feedback from this project and previous projects in the study area, and an understanding of project activities, location, and schedule.

The prediction confidence is high for impacts to noise and air quality, since the environmental effects mechanisms are well understood, and Manitoba Hydro has experience on the impacts of air quality and noise from transmission line construction.

There is a moderate degree of confidence in the assessment for impacts on sense of community safety and psychological stress, given that individuals and communities may experience project effects differently. These effects were assessed qualitatively, considering indicators of the potential effect, literature reviews, engagement feedback, and professional judgment.

13.7.5 Follow-up and monitoring

Due to monitoring results from other similar projects and the well-established mitigation measures that will be implemented for the project, additional monitoring related to health and safety specific to this project is not proposed.

There are a few existing committees that originated from previous projects in the RAA with representation from Manitoba Hydro and communities in the RAA. These committees continue to provide a forum for affected communities to raise concerns to Manitoba Hydro about impacts and issues associated with Manitoba Hydro projects including issues related to health and safety.

We understand that Fox Lake Cree Nation has a Wellness Action Working Group (WAWG) which discusses programming related to wellbeing and support services. This committee emerged from the no-longer active Worker Interactions Subcommittee that was established by Manitoba Hydro in 2013 to discuss then-anticipated increases in the Gillam area workforce due to past projects including the Keeyask Generating Project, Bipole III Transmission Project and the Keewatinohk Converter Station.

Recognizing that not all individuals who may have concerns related to the project's effects on health and safety will have connections to these existing committees, Manitoba Hydro also maintains a dedicated phone number and email address to provide an avenue for any member of the public to ask questions and share concerns about transmission projects.

13.7.6 Sensitivity to future climate change scenarios

Effects of climate change on health and safety are expected to relate to the anticipated increase in temperature, changes in precipitation patterns, and associated extreme weather events (e.g., flooding).

Adverse impacts to regional infrastructure could result in an increased need for construction and maintenance, resulting in increased noise and reduced air quality. In addition, infrastructure damage may require non-local workforces from travelling to the RAA, negatively impacting sense of community safety, and increasing psychological stress.

Climate change can influence the frequency and intensity of extreme weather events such as heatwaves, storms, and wildfires. These events can strain healthcare facilities and emergency response services, potentially affecting the health and safety of communities.

There is a growing body of literature surrounding the impacts of climate change on mental health and increased anxiety, often referred to as climate anxiety (Clayton 2020). Emotional responses to climate change can be both the result of physical changes to the landscape (such as an increase in severe weather patterns) and the perception of climate change, including the dread associated with negative environmental information or feelings that environmental challenges are intractable (Clayton 2020). Climate anxiety will negatively impact health and safety, particularly related to psychological stress.

14.0 Effects of the environment on the project

Effects of the environment on the project refer to the forces of nature that could affect the project physically or hamper the ability to carry out the project's activities in their normal, planned manner.

Typically, potential effects of the environment on any project are a function of project or infrastructure design and the risks of natural hazards and influences of nature.

These effects may result from physical conditions, landforms and general site characteristics that may act on the project such that project components, schedule and/or costs could be substantively and adversely changed.

While environmental forces (e.g., severe weather, climate change) have the potential to adversely affect a project, good engineering design considers and accounts for such effects and the associated loadings or stresses on the project that may be caused by these environmental forces. The methods used for mitigating potential effects of the environment on the project are inherent in the planning, engineering design, construction, and planned operation of a well-designed project expected to be in service for several decades or longer.

The potential effects of the environment on the project are focused on the following effects:

- Delays in construction and/or operation and maintenance
- Damage to infrastructure
- Reduced visibility impacting public health and safety

14.1 Effects analysis

The assessment of the effects of the environment on the project considers potential changes to the project that may be caused by the environment. There are no environmental factors expected to interact substantially with the construction of the project. While some weather-related delays are possible, they are not likely to adversely affect the project's construction, schedule, or cost.

During operation and maintenance, the R44H transmission line or the station components with which it will be associated may be subject to severe weather events. While Manitoba Hydro designs its infrastructure to withstand extreme weather, it is not possible to design for all eventualities.

Severe weather that has adversely affected the Manitoba Hydro system in the past includes tornados, ice storms and floods. There is potential for any of these to occur in the regional assessment area of the project. Mitigation measures include, applying engineering practices and scheduling of activities to account for possible weather disruptions.

Over the next 100 years, Manitoba will likely experience warmer temperatures, a greater frequency of storm events, increasing storm intensity and an increase in annual precipitation.

Potential effects of climate change on the operation and maintenance of the project would relate to increases in the frequency of severe weather events, changes in temperature and changes in precipitation. It is expected that increases in extreme weather events would affect operation and maintenance of the project by increasing unexpected maintenance due to storm damage. Changes in temperature could affect the freeze/thaw cycle and result in decreased foundation stability and potentially increased maintenance.

Mitigation measures include applying engineering practices and scheduling of activities to account for possible weather disruptions. Based on the above, the residual effects of the environment on the project during all phases of the project were deemed minor, with a moderate level of confidence because of the uncertainty in the potential changes to local, regional, and global climate that could occur over the life of the project.

14.2 Assessment conclusions

The most likely effect of the environment on the project is a short-term disruption in service and the economic costs of repair. The project will be designed to meet applicable CSA standards.

Design will be subject to two general design standards and the structural design loads will be based on a 150-year return period.

Despite these measures, it is possible that extreme weather events could still result in outages and the requirement for repair of transmission lines, conductors, or towers.

While this can result in socio-economic effects and potential public safety hazards, potential effects on the biophysical environment would be limited and associated mainly with an increased risk of an accidental release of hydrocarbons in the event of a flood or fire.

The project is being designed and will be constructed and operated with regard for health, safety, and environmental protection to minimize potential environmental effects that could:

- occur during construction, operation, and maintenance, and or

- result from forces of nature and affect the project physically or hamper the ability for project activities to proceed normally as planned.

The careful planning and design of the project will minimize the potential for damage from extreme weather events. The effects of an individual event could have significant effects on a localized extent. However, the potential for these events to occur, given the measures that will be undertaken to prevent their occurrence, is low.

In the very unlikely and improbable event that damage to the R44H transmission line were to occur, it would be of a short duration, low frequency, or limited geographic extent such that major residual adverse environmental effects will not likely occur.

Overall, given the nature of the project, proposed mitigation, the potential residual environmental effects due to extreme weather events on the valued components during all phases of the project, are assessed as not significant.

15.0 Greenhouse gases and climate change

The Environment Act Proposal Report Guidelines Information Bulletin (Manitoba Environment, Climate and Parks 2022) requires the discussion of climate change implications including a greenhouse gas inventory that should be calculated according to guidelines developed by Environment Canada (2021) and the United Nations (IPCC 2019). The following sections outline past, present, and future climate conditions and a summary of the greenhouse gas assessment. Further details on climate and greenhouse gases can be found in Chapter 15.0.

Climate, including historic climate (Section 5.1.1) and trends (Section 5.1.2) is covered in Chapter 5, environmental setting. Future climate is covered below, followed by a summary of the greenhouse gas mitigation assessment.

15.1 Future Climate

Global climate models driven by future greenhouse gas emission scenarios (van Vuuren, et al. 2011) are used to project how earth's climate may evolve in the future. Forty simulations from eighteen global climate models and two greenhouse gas emission scenarios (Representative Concentration Pathways; RCP4.5 and RCP8.5) provide the basis for this assessment.

Descriptions of models, representative concentration pathways, methods, and mapped projections can be found in (Manitoba Hydro 2020). Agreement among global climate model projections can provide a measure of confidence and are used to characterize the climate change signal.

The tables and text below characterize projections specific to the Gillam area. Projections are presented for the 2050s (2040-2069) and 2080s (2070-2099) future horizons relative to the reference 1981-2010 period.

Table 15-1: Median projected change from an ensemble of 40 global climate models simulations for the 2050s future horizon (2040-2069) relative to 1981-2010*

Season	T_{min} (°C)	T_{mean} (°C)	T_{max} (°C)	Precipitation (%)	Evaporation (mm / mo)	Runoff (mm / mo)	Wind Speed (%)
Annual	3.15	3.02	2.71	8.10	2.63	0.57	0.25
Winter	4.17	3.97	3.31	12.98	0.53	1.43	2.25
Spring	2.87	2.49	2.29	10.31	3.12	0.65	0.34
Summer	2.35	2.42	2.37	2.41	5.95	0.09	-1.56

Fall	3.28	2.98	2.78	7.30	2.39	0.34	0.56

*Cell colours reflect ensemble agreement on the direction of change. In accordance with the agreement terminology defined in Manitoba Hydro (2020), dark green (brown) indicates strong agreement that an increase (decrease) will occur, medium green (brown) indicates moderate agreement that an increase (decrease) will occur, light green (brown) indicates weak agreement that an increase (decrease) will occur, and grey denotes projections where the ensemble agreement is less than 60% on the direction of future change.

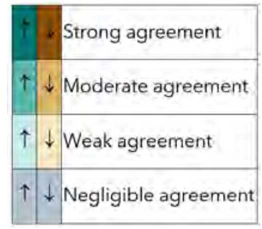
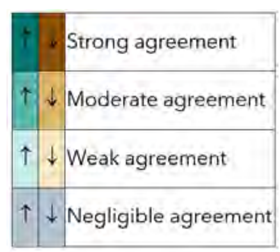


Table 15-2: Median projected change from an ensemble of 40 global climate models simulations for the 2080s future horizon (2070-2099) relative to 1981-2010.

Season	T_{min} (°C)	T_{mean} (°C)	T_{max} (°C)	Precipitation (%)	Evaporation (mm/mo)	Runoff (mm/mo)	Wind Speed (%)
Annual	4.91	4.30	3.93	11.96	4.40	0.72	0.76
Winter	6.11	5.70	4.75	20.33	1.11	3.14	3.57
Spring	4.04	3.59	3.44	15.59	6.33	-0.92	0.48
Summer	3.59	3.50	3.57	5.76	8.46	0.46	-1.74
Fall	4.31	3.94	3.65	10.11	3.38	1.68	0.91



The global climate models median projects annual average temperatures will increase by 3.02°C in the 2050s and 4.30°C in the 2080s. Both future time horizons show strong agreement that temperature will increase into the future in all seasons, with the winter season projected to experience the greatest temperature increase.

There is strong agreement from the global climate models that annual and winter precipitation will increase for both future time horizons. There is strong agreement that spring precipitation will increase for the 2080s period, with slightly less confidence for the 2050s period. Increasing fall precipitation for both future time horizons is also projected with moderate confidence. There is a weak signal that summer season precipitation is projected to increase, although to a lesser extent compared to other seasons.

As expected, increasing temperature results in increasing evaporation which, depending on changes in precipitation, may result in dryer summers.

Local runoff projections show increasing winter runoff with strong agreement, with all other seasons showing weak or negligible agreement on the projected change. This result is expected as increased winter temperatures contribute to earlier snowmelt, which may leave less snow to melt in the spring.

Global climate models suggest relatively small changes in future mean wind speed, with weak to moderate agreement of decreasing wind speeds in the summer and increasing wind speeds in the winter.

15.2 Greenhouse gases

A greenhouse gas mitigation assessment (*"R44H GHG Assessment"*) was undertaken for the project. This assessment can be found in Appendix D and built on mitigation assessments Manitoba Hydro has undertaken for previous transmission projects. The R44H GHG Assessment concluded that the project will almost certainly result in the reduction of greenhouse gas emissions in Manitoba, Canada, and globally (Table 15-3). For clarity, this conclusion is based on a comparison against a "do-nothing" scenario; however, it is assumed that the project must be completed to ensure adequate reliability of the Manitoba electrical system and a "do-nothing" scenario is not realistic.

Table 15-3: Summary of Absolute R44H Greenhouse Gas Effects (kilotonnes of CO_2e)

R44H Greenhouse Gas Effects	**kt CO_2e**
Life Cycle Construction Related Emissions	+24
Generation Effects due to Improved System Efficiency	-400
Generation Effects due to Outage Mitigation	-660 to +5
Combined Greenhouse Gas Effects: Very likely at least 400 kt CO_2e in global reductions	

GHG emission reductions are the direct result of the R44H project mitigating transmission issues affecting the reliability of the Manitoba Hydro HVDC transmission system. Following the completion of the R44H project, Manitoba Hydro will be able to mitigate several outage conditions that could potentially, and adversely, impact the delivery of hydroelectric generation from northern Manitoba to southern Manitoba. The R44H project will also improve the overall efficiency of the Manitoba Hydro's HVDC transmission system.

Beyond the assessment of generation effects, the R44H GHG Assessment also quantified life cycle construction related greenhouse gas emissions (Table 15-4). Construction related GHG emissions were calculated using the transmission line's final preferred route design elements. The two most important categories of construction related emissions are the supply-chain emissions embedded in the materials of R44H components (45% of emissions) and permanent land-use change due to the formation of the right-of-way (29% of emissions). As with other Manitoba Hydro transmission projects, emissions related to on-site energy consumption during construction are estimated to be relatively small (10% of emissions).

Table 15-4 Summary of R44H Project Life Cycle Construction Related Emissions

R44H Project Construction Related Activity	**kt CO_2e**	**% of total**
Construction: Material Supply-Chain	10.7	45%
Construction: On-Site Energy & Labour Transport	2.3	10%
Maintenance and Refurbishment	3.8	16%
Permanent Land Use Change	6.9	29%
All R44H Project Construction Related Emissions	**23.7**	

It is expected that global emission reductions resulting from the R44H project's generation effects will outweigh construction related emissions by at least one order of magnitude, potentially up to three orders of magnitude.

16.0 Accidents and malfunctions

In the context of environmental assessment, an accident is an unexpected and unintended interaction of a project component or activity with environmental, health-related, social, or economic conditions, and a malfunction is a failure of a piece of equipment, a device, or a system to operate as intended (Impact Assessment Agency 2021).

Accidents and malfunctions could occur because of abnormal operating conditions, wear and tear, human error, equipment failure, or other possible causes.

Many accidents or malfunctions are preventable and can be readily addressed or prevented by good planning, design, equipment selection, hazards' analysis and corrective action, emergency response planning, and mitigation.

In this section, potential accidents and malfunctions associated with the project that could result in appreciable adverse environmental effects are described, discussed, and assessed. The focus is on credible accidents that have a reasonable probability of occurrence, and where the resulting residual environmental effects could be major without careful management.

It is noted that accidents and malfunctions are evaluated individually, in isolation of each other, as the probability of a series of accidental events occurring in combination with each other is deemed unlikely. These possible events, on their own, generally have a very low probability of occurrence and thus their environmental effects are of low likelihood. They have an even lower probability or likelihood of occurring together – thus their combination is not considered credible, nor of any measurable likelihood of occurrence.

Accident and malfunction event scenarios have been conservatively selected to represent higher consequence events that would also address the consequences of less likely or lower consequence scenarios.

The following accidents, malfunctions, and unplanned events are assessed in this section and were selected based on experience and professional judgment:

- Worker accident
- Fire
- Power outage
- Tower or structure collapse (e.g., due to adverse weather, sabotage, or force majeure)
- Spill of hazardous materials
- Vehicle accident
- Encounter of a heritage site or object

- Electrocution
- Failure of erosion/sediment control
- Release of insulating gas
- Explosives accident

Table 16-1 presents the potential interactions between the areas of assessment and potential accidents or malfunctions. Project and cumulative effects of the accident or malfunction event on each valued component with a potential interaction are described, and the significance of the effect is determined using the same thresholds as those for the project environmental effects. Any event that results in human mortality is considered significant. The potential for, and consequence of, accidents and malfunctions were assessed considering historical risk information from Manitoba Hydro's experience and other similar projects.

Table 16-1: Potential interactions between accidents and malfunctions and areas of assessment

Potential accidents and malfunctions	Fish and fish habitat	Vegetation	Wildlife and wildlife habitat	Harvesting and recreation	Important sites	Infrastructure and community services	Economic opportunities	Health and safety
Worker accident	-	-	-	-	-	✓	-	✓
Fire	-	✓	✓	✓	✓	✓	-	✓
Power outage	-	-	-	-	-	✓	✓	✓
Tower or structure collapse	-	✓	✓	✓	✓	✓	-	✓
Hazardous materials spill	✓	✓	✓	✓	✓	-	-	✓
Vehicle accident	-	-	✓	-	-	✓	-	✓
Encounter of a heritage site or object	-	-	-	-	-	-	-	✓
Electrocution	-	-	✓	-	-	-	-	✓
Failure of erosion/sediment control	✓	-	-	-	-	-	-	-
Release of insulating gas	-	-	-	-	-	-	-	✓
Explosives accident	-	✓	✓	✓	✓	✓	-	✓

✓ = Potential interactions that might cause an effect.
- = Interactions not expected.

16.1 Effects assessment for accidents and malfunctions

16.1.1 Worker accident

A worker accident has the potential to interact with health and safety and infrastructure and community services as it could result in harm, injury, or death to workers and could prompt the need for emergency response and medical services.

All workers will be properly trained in practices to prevent workplace accidents including Workplace Hazardous Materials Information System (WHMIS), first aid, and other applicable training programs. These procedures are designed to prevent serious injury to staff and the public as well as to minimize the occurrence of unplanned events and minimize any potential damage to the environment.

Interactions between a worker accident and communities will be mitigated by compliance with health and safety legislation, safety by design, and implementation of environmental management measures aimed at protecting human health.

Safety risks to workers will be reduced by complying with the requirements of various governing standards including the federal Canada Labor Code, the *Transportation of Dangerous Goods Act (Canada)*, the *Workplace Health and Safety Act* (Manitoba) and all associated regulations.

Adherence to public safety codes and regulations will help the project to be carried out in a safe manner to protect workers and the public.

With the application of, and compliance with, the above-mentioned acts, regulations, and standards, including the application of safety and security measures that are known to effectively mitigate the potential environmental effects, the potential environmental effects of a worker accident on communities during construction and operation and maintenance of the project are considered not significant.

16.1.2 Fire

Potential effects caused by a fire include:

- Carbon dioxide emissions (contribute to GHG emissions and climate change)
- Safety risks to workers and the public (human health and safety)
- Need for emergency response and medical services (infrastructure and community services)
- Loss or damage to property or resources (health and safety, harvesting and recreation)
- Direct vegetation and habitat loss (vegetation, wildlife and wildlife habitat, harvesting, and resource use)

- Soil and shallow groundwater contamination with sediment-laden water used in extinguishing the fire (groundwater [human health and safety], wildlife and wildlife habitat)
- Damage to infrastructure or heritage sites or objects (infrastructure and services, important sites)

A fire may arise from heavy equipment or from natural causes such as a lightning strike.

Manitoba Hydro will ensure that personnel are trained in the use of fire-extinguishing equipment. In the unlikely event of a fire, local emergency response will be able to reduce the severity and extent of damage.

A large fire could create particulate matter levels greater than the ambient air quality standard over distances of several kilometers or damage vegetation or infrastructure in the area, but such situations would be of short duration, infrequent, and are not expected to occur because of planned mitigation and prevention measures. The potential residual environmental effects of a fire are therefore considered not significant.

16.1.3 Power outage

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

A power outage can affect infrastructure and services, economic activities, and human health and safety.

Effects on infrastructure and services consist of disruption to community road traffic and transportation due to failure of traffic lights and interference with communication and radio signals with the loss of power to signal sources.

Effects on economic opportunities would occur if the power outage resulted in a loss of productivity for businesses.

Effects to human health and safety relate to changes to the capacity of health care services. The lack of power could affect the operation of health care facilities.

With the application of, and compliance with, the various acts, regulations, and standards, including the application of safety and security measures that are known to effectively mitigate the potential environmental effects, the potential environmental effects of a power outage on communities during construction and operation and maintenance of the project are considered not significant.

16.1.4 Tower or structure collapse

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

Tower collapse has the potential to:

- Cause injury or death (human health and safety)
- Prompt the need for emergency response and medical services (infrastructure and community services)
- Cause fires (effects and mitigation discussed above)
- Damage other infrastructure, heritage, or cultural sites, either directly due to tower collapse or indirectly because of emergency repair activities (human health and safety, harvesting and recreation, and important sites)
- Impede access or movement (harvesting and recreation, and wildlife and wildlife habitat)

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

Engineering design will adhere to industry standards and reflect Manitoba Hydro's experience with similar projects. Design will follow the Canadian Standards Association (CSA) C22.3 No. 1-10 "Overhead Systems" standard. The reliability-based design method will be used for designing the structural components following the CAN/CSA-C22.3 No. 60826-10 "Design Criteria of Overhead Transmission Lines" standard.

In addition, consequences are managed through mitigation. Line maintenance crews will address damage to personal property, vegetation, or soils. Soil contamination issues will be addressed as part of spill response planning.

The effects of a tower collapse would be localized and short term.

The viability of wildlife populations or the capacity of critical habitat for wildlife species of conservation concern would not be jeopardized.

Disruption of infrastructure would be short term and minimal.

Given the localized extent of the effects on wildlife habitat, effects on land use activities are not expected to extend beyond the actual collapsed structures.

The likelihood of injury to or death of humans or wildlife is low given the limited area affected by a tower collapse and the rarity of such an occurrence.

As a result, while the magnitude of the effect of tower collapse on the affected valued component could be moderate to high, given the low likelihood and array of mitigation measures the effect is assessed as being not significant.

16.1.5 Hazardous material spills

Hazardous materials could be released into the air, soils, surface water or groundwater because of an accidental spill during construction, operation decommissioning activities.

In general, hazardous materials spills have the potential to:

- Contaminate surface and groundwater (health and safety, harvesting and recreation, wildlife and wildlife habitat, and fish and fish habitat)
- Contaminate soil (vegetation, wildlife and wildlife habitat, harvesting and recreation, and health and safety)
- Increase harmful emissions (GHG effect, climate change)

Spills are usually localized and easily cleaned up by on-site crews using standard equipment. The oil containment infrastructure for the stations will limit potential effects during operation.

Implementation of a detailed spill response plan and a well-designed construction environmental protection plan (Appendix E) will result in minimal potential effects through accidental releases.

The contractor will be required to provide environmental training, as well as training in spill prevention and response, to construction personnel.

Prior to the commencement of construction activities, Manitoba Hydro will ensure that spill response equipment is readily available.

All spills will be contained, cleaned, and reported to applicable authorities as follows:

- Contaminated material or potentially hazardous material will be contained.
- Proper safety precautions (e.g., protective clothing and footwear) will be implemented.
- The contractor will follow their spill response plan and ensure that the province's spill-reporting line is notified for reportable spills.
- Contaminated wastes, such as used cleaning cloths, absorbents, and pads, will be stored in proper waste containers.
- Waste material will be disposed of at approved disposal facilities.

Construction equipment will be cleaned and maintained in good working condition, with visual inspections of equipment performed on a regular basis. Petroleum products such as gasoline, diesel fuel, and oil will be properly labeled in accordance with the appropriate legislation and regulations.

Refueling, oiling, and maintenance of equipment, as well as storage of hazardous materials, will be conducted in a designated and contained area(s). Servicing of equipment (e.g., oil changes and hydraulic repairs) will be completed in designated areas. Vehicles will be equipped with spill containment and cleanup materials.

Personnel handling fuels and hazardous wastes will have WHMIS training and be qualified to handle these materials in accordance with the manufacturer's instructions and applicable regulations.

Hazardous waste and storage area(s) will be clearly marked and secured. Industrial waste will be reused or recycled on a priority basis. Where reuse or recycling opportunities are not available, industrial waste will be collected and disposed of at an approved facility.

Garbage receptacles for solid non-hazardous wastes will be available. These wastes will be collected on a regular basis or as they are generated and will be disposed of at approved locations.

With these mitigation measures and emergency response procedures implemented, and because of the low likelihood of such events, the potential residual environmental effects of a hazardous material spill on groundwater resources, aquatic environment, and terrestrial environment during construction and operation and maintenance of the project are considered not significant.

16.1.6 Vehicle accident

A vehicle accident arising from project-related activities could cause injury or death to workers or the public (health and safety) and wildlife (wildlife and wildlife habitat), and could prompt the need for emergency response and medical services (infrastructure and community services). The potential for a fire or hazardous material spill, which could be associated with a vehicle accident or other means has been addressed above.

The potential for a vehicle accident would exist during construction, operation and maintenance, as well decommissioning phases of the project. Worker traffic and truck traffic to and from the site, and the operation of heavy equipment on-site during construction have the potential to result in a vehicle accident during construction.

Project-related vehicles will observe all traffic rules and provincial and federal highway regulations. Trucking activity will observe speed limits and weight restrictions.

Because the project will comply with all applicable traffic rules and regulations, the nominal increase in traffic volumes because of the project along with safety precautions, the potential residual environmental effects of a vehicle accident are considered not significant.

16.1.7 Encounter of a heritage site or object

Cultural or heritage sites or objects may be encountered during activities involving ground disturbance such as construction-related excavation. It is unlikely that heritage sites or objects will be encountered during operation.

The encounter of a heritage site or object has the potential to affect harvesting and important sites and heritage resources. Heritage potential is determined during the environmental assessment. If areas of high potential are found, a preconstruction archaeological survey may be conducted.

Mitigation for the protection of heritage sites or objects is outlined in the Culture and Heritage Resource Protection Plan (CHRPP) (an Appendix of the CEnvPP; AppendixE).

The CHRPP will provide clear instructions on how to proceed should Manitoba Hydro, its contractors and/or consultants, discover or disturb a cultural or heritage sites or objects and will determine the ongoing protection measures for the resources through processes outlined in this document.

If a heritage site or object is discovered, project work will cease around the discovery and the project archaeologist will be contacted. Work in the area will continue only if approval is received from the archaeologist or the Historic Resources Branch.

With the low probability of encountering heritage sites or objects during the project related activities, and in consideration of the nature of the project and planned mitigation, the potential residual effects are considered not significant.

16.1.8 Electrocution

Human or animal contact with a live wire or electrical equipment could lead to electrocution. While unlikely, electrocution could also occur if an aircraft were to collide with live wires or if collision of equipment with towers resulted in contact with live wires.

From a public safety perspective, the threat of electrocution would be of greatest concern during the operation and maintenance phase if flooding or storm conditions damaged infrastructure and resulted in live wires contacting the ground.

Electrocution during construction is unlikely because the conductors will be grounded as per grounding safe work procedures and will not be energized until the commissioning phase of construction.

Any testing of electrical equipment during commissioning will be conducted by qualified personnel under controlled conditions following Manitoba Hydro safe work procedures.

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

Human or wildlife contact with high-voltage electricity can result in human or wildlife injury or death. Electrocution of humans and most wildlife (i.e., other than birds) from regular operation of the transmission line is not likely due to the height and grounding of the towers and transmission lines.

Birds could be at risk of electrocution during normal operational conditions if they perch and connect two electrified line phases (i.e., two lines). Bird electrocutions are not anticipated due to the large spans between two electrified transmission line phases (even a very large bird could not stretch wide enough to touch two electrified parts simultaneously). Application of design standards and the fact that 230-kv and larger electrical components have large separation distances between phases will also reduce the risk of bird electrocutions at stations.

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

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

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

16.1.9 Erosion/Sediment Control Failure

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

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

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

During construction, an Erosion Protection and Sediment Control Plan (as part of the CEnvPP; Appendix E) will be part of the construction contract. The plan is in accordance with Canadian professional erosion and sediment control standards and guidelines to manage construction activities that have the potential to cause soil erosion and result in sediment releases to the aquatic environment.

The extent of a failure would be small and the effects on fish and fish habitat, vegetation, wildlife habitat, or heritage resources would be localized.

While failure of an erosion and sediment control measure could occur over the course of project construction, routine monitoring and inspection will aid in the rapid identification of such failure. Implementation of remedial action as required will limit environmental effects. Failure of erosion and sediment control measures are not a concern during long-term operation because erosion and sediment will be controlled by vegetative cover and other permanent measures such as riprap, gabions, and other treatments.

The likelihood of the occurrence is low to moderate and the environmental effects on the affected VCs are assessed as being not significant.

16.1.10 Release of insulating gas

Manitoba Hydro has used insulating gas since the 1980s to replace the use of oils and air as interrupting and insulating mediums in high voltage equipment. Insulating gases are handled in their pure state or mixed for use in gas-insulated equipment (GIE). Sulphur hexafluoride (SF_6) is the primary insulating gas, and due to the low operating temperature requirements, GIE is designed to be mixed with carbon tetrafluoride (CF4) or nitrogen (N2) gas.

Insulating gas is not used directly on a conventional air-insulated transmission line but is used in electrical equipment outdoors in the terminal switchyard at each end of the line; for example, in circuit breakers, gas insulated switchgear and circuit switchers.

SF6 and CF4 are potent greenhouse gases, and Manitoba Hydro makes every effort to minimize or eliminate their release to the atmosphere.

Environment Canada has required mandatory reporting of SF6 and CF4 releases to the atmosphere since 2004. SF6 and CF4 are heavier than air, and if released, will collect in low areas, and displace oxygen.

Insulating gas subject to high heat, primarily from normal arcing inside a circuit breaker interrupter, or due to a flashover, will develop toxic SF6 arc by-product. Flashover events are very rare.

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

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

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

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

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

Insulating gases are potent greenhouse gases and can be toxic. Under normal circumstances minor releases may occur during testing and handling procedures or from leaking equipment. A flashover event could result in a release of insulating gas to the environment and deposition of SF6 arc by-products, which would require decontamination and may result in a line outage. Line outages related to releases of insulating gas could affect infrastructure and services and community health and safety.

The release of insulating gas to the environment could result in a localized pocket of SF6 arc by-products, which could result in wildlife mortality or contamination of wildlife habitat. However, as with the potential for power outages, this effect would be local and short term.

The rapid dissipation of GIE into the atmosphere, should there be a release, minimizes the likelihood of effects on human health.

In addition, there are measures in place to reduce consequences, including design measures in equipment, response protocols and low-pressure alarm systems that will alert the SCC, which will notify the work area responsible and arrange an outage of the GIE so that repairs could be made. Given the magnitude and likelihood of effects, and the mitigation measures in place, effects from the release of insulating gases are determined to be not significant.

16.1.11 Explosives Accident

Explosives (Implo) will be used for conductor splicing during conductor installation. The implos will be stored at the Manitoba Hydro transmission line material yard magazines (which already has a permit for this activity) prior to being used on the project. The contractors will be responsible to transport and temporarily store near the worksite for installation of the conductor.

The transportation of explosives is controlled by the Transportation of Dangerous Goods Directorate of Transport Canada. All companies that transport explosive materials for the project will be required to comply with all related regulations. Any on-site explosives magazines will be in accordance with guidelines.

Environmental concerns associated with potential accidents during explosives storage and usage include:

- Disturbance of nearby receptors, including wildlife, due to associated sound
- Damage to project infrastructure or facilities.

Explosive handling and storage are highly regulated in Canada and compliance is mandatory.

A blasting plan will be developed describing all proposed blasting operations at the project and will address:

- Personnel responsibilities
- Type of equipment and materials to be utilized
- Safety requirements, including pre- and post-blast notification and notices for site personnel, and pre- and post-blast pit inspections
- Periphery signs
- Dust suppression
- Spillage control and clean-up

All personnel who handle explosives will have appropriate training; all other individuals will be restricted from access to blasting areas.

Destruction of explosives (such as those unfit for use) and misfires will be handled according to applicable regulatory instruments. Deteriorated explosives are potentially more hazardous than explosives in good condition and will be handled under strict, carefully controlled conditions. All destruction will be completed by experienced personnel.

By contracting an experienced transmission line construction company, having well-trained employees, following regulatory requirements, and using good housekeeping practices, explosives will be appropriately managed at the project, with minimal potential of inadvertent detonation or other accidents.

The worst possible scenario would involve improper handling of explosives causing bodily harm.

Damage to facilities and infrastructure may be possible but would generally only occur in association with the explosives' storage and potentially at a blasting location.

The potential for an uncontrolled explosion would be limited to a malfunction or accident in relation to a planned blasting activity (i.e., an early detonation or unplanned detonation). As all explosives will be handled by a licensed blasting contractor who will be highly trained in the safe handling, storage, and use of explosives, this accident scenario is unlikely and the effects therefor not significant.

16.2 Assessment conclusion for accidents and malfunctions

The project is being designed and will be constructed and operated with regard for health, safety, and environmental protection, to minimize potential environmental effects that could result during the normal course of construction, operation, and maintenance as well as those that could result from accidents and malfunctions.

The careful planning of the project and the implementation of proven and effective mitigation will minimize the potential for accidents and malfunctions. The effects of an individual accident or unplanned event could have notable effects at a localized scale. However, the potential for these events to occur, given the measures that will be undertaken to prevent their occurrence, is low. In the very unlikely and improbable event that an accident or malfunction were to occur, it would be of a short duration, low frequency, or limited geographic extent such that major residual adverse environmental effects will not likely occur.

Overall, given the nature of the project, the credible accidents and malfunctions considered, and proposed mitigation, the potential residual environmental effects of project-related accidents and malfunctions on the valued components considered in this report, are assessed as not significant.

17.0 Environmental protection program

17.1 Introduction

Manitoba Hydro will implement the mitigation measures, monitoring and other follow-up actions identified during the assessment through an Environmental Protection Program (EPP). The EPP provides the framework for implementing, managing, monitoring, and evaluating environmental protection measures consistent with regulatory requirements, corporate commitments, beneficial practices, and public expectations. Environmental protection, management and monitoring plans will be prepared and implemented under the EPP to address environmental protection requirements in a responsible manner.

The purpose of this chapter is to outline how Manitoba Hydro will implement, manage, and report on environmental protection measures, monitoring and other follow-up actions as well as regulatory requirements and other commitments identified in this environmental assessment report.

Manitoba Hydro developed the EPP in accordance with its environmental policy.

Manitoba Hydro's Corporate Environmental Management Policy states the corporation is committed to protecting the environment by:

- Ensuring that work performed by its employees and contractors meets environmental, regulatory, contractual, and voluntary commitments
- Recognizing the needs and views of its interested parties and ensuring that relevant information is communicated
- Continuously assessing its environmental risks to ensure they are managed effectively
- Reviewing its environmental objectives regularly, seeking opportunities to improve its environmental performance
- Considering the life cycle impacts of its products and services
- Ensuring that its employees and contractors receive relevant environmental training, and
- Fostering an environment of continual improvement

17.2 Environmental management

Manitoba Hydro is seeking self-verification under the International Organization for Standardization (ISO) 14001 Environmental Management System Standard.

An environmental management system is a framework for developing and applying an organization's environmental policy and includes articulation of organizational structure, responsibilities, practices, processes, and resources at all levels of the corporation. The environmental management system includes commitments to comply with legislation, licenses, permits and guidelines, conduct inspections and monitoring, and review the results for adherence to requirements. The ISO standard ensures quality, performance, and continual improvement in the delivery of Manitoba Hydro's environmental protection program.

17.3 Adaptive management

Adaptive management is a planned systematic process employed with the goal of continually improving environmental management practices by learning from their outcomes. The environmental protection program for the project has established the principles of adaptive management allowing for flexibility in the mitigation of adverse environmental effects that may result from the project. Manitoba Hydro will use the information gathered during follow up and monitoring activities to verify the accuracy of the environmental assessment effects predictions and the effectiveness of implemented mitigation measures.

Manitoba Hydro designed the EPP to be adaptive and responsive throughout the project lifecycle by evaluating program documents, processes, procedures, and mitigation measures through inspection, monitoring and communication programs and conducting reviews to facilitate updates to the program.

Within the EPP, adaptive management will take place in two primary areas:

- At the management level, involving changes with the program structure itself.
- At the implementation level, involving individual mitigation measures as management and implementation teams evaluate the onsite effectiveness of mitigation strategies or the program.

17.4 Experience from previous projects

Manitoba Hydro has extensive experience in the development of environmental protection, monitoring and follow-up plans for all sizes of projects in many different environments, from small electrical stations to transmission lines that span over half of Manitoba.

The development of the EPP has allowed the standardization and consistent approach to environmental protection, monitoring and follow-up. The EPP improves through the experiences from past and current projects (e.g., monitoring and inspection results, documentation format changes).

17.5 First Nation and Métis feedback

Feedback shared by First Nations and the Manitoba Métis Federation during project engagement helped inform the environmental assessment report and EPP. The knowledge that was shared by First Nations people and Red River Métis citizens assisted Manitoba Hydro with:

- Developing a greater understanding of the PDA
- Identifying key concerns in the PDA
- Identifying potential project effects
- Planning and designing the project and environmental assessment process
- Developing potential mitigation measures

There will be opportunities for additional sensitive sites to be identified in the EPP should any be discovered during construction or operation of the project.

Manitoba Hydro recognizes the unique relationship that First Nations people and Red River Métis citizens have with their traditional lands and appreciates the sharing of information about First Nation and Métis histories, cultures, and perspectives on the project.

17.6 Environmental protection program framework

Manitoba Hydro's Environmental Protection Program (EPP) provides the framework for the delivery, management and monitoring of environmental and socio-economic protection measures that satisfy corporate policies and commitments, regulatory requirements, environmental protection guidelines and beneficial practices, and input during the project engagement. The EPP:

- Describes how Manitoba Hydro is organized.
- Functions to deliver timely, effective, comprehensive solutions and mitigation measures to address potential environmental effects.
- Defines roles and responsibilities for Manitoba Hydro employees and contractors.
- Outlines management, communication, and reporting structures.

The EPP includes what, where, and how aspects of protecting the environment during the pre-construction, construction, operation and decommissioning of the project. Figure 17-1 illustrates the components of the EPP. The following sections describe each component in further detail.

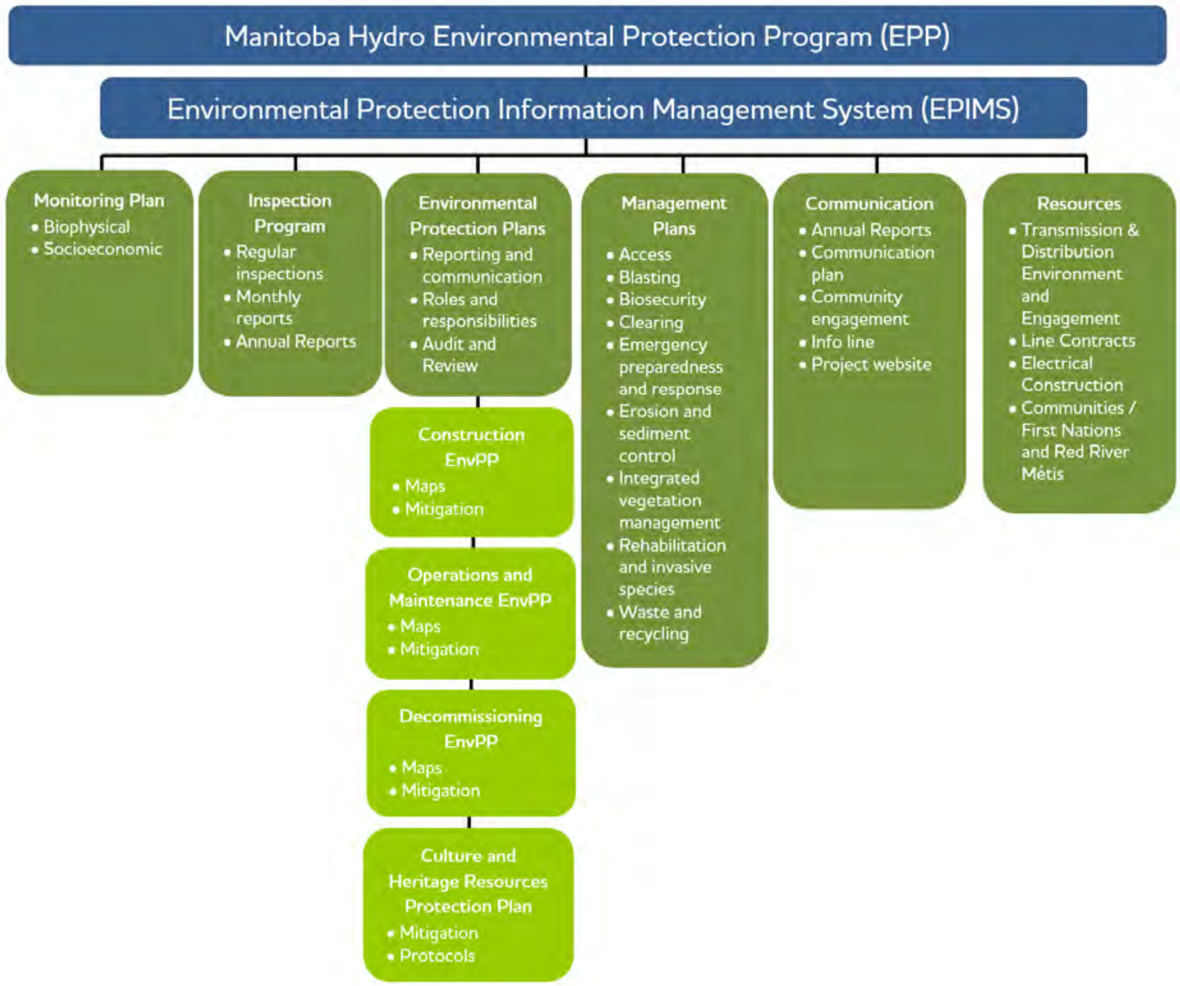


Figure 17-1: Program components

17.7 Organization

The organizational structure of the EPP (Figure 17-2) includes senior Manitoba Hydro management, project management and implementation teams that work together to provide timely and effective implementation of environmental protection measures identified in environmental protection plans. Manitoba Hydro senior management is responsible for the overall EPP, including resourcing, management, and performance, and is accountable for regulatory compliance, policy adherence and interested party satisfaction.

The environmental protection management team is composed of senior Manitoba Hydro staff and is responsible for the management of environmental protection plans, including compliance with regulatory and other requirements, quality assurance and control, consultation with regulators, and related public and First

Nation and Métis engagement activities. Environmental consultants and advisors support the management team.

The environmental protection implementation team is composed of Manitoba Hydro operational field and office staff and is responsible for the day-to-day implementation of environmental protection plans, including monitoring, inspecting, and reporting. The implementation team works closely with other Manitoba Hydro staff as required.

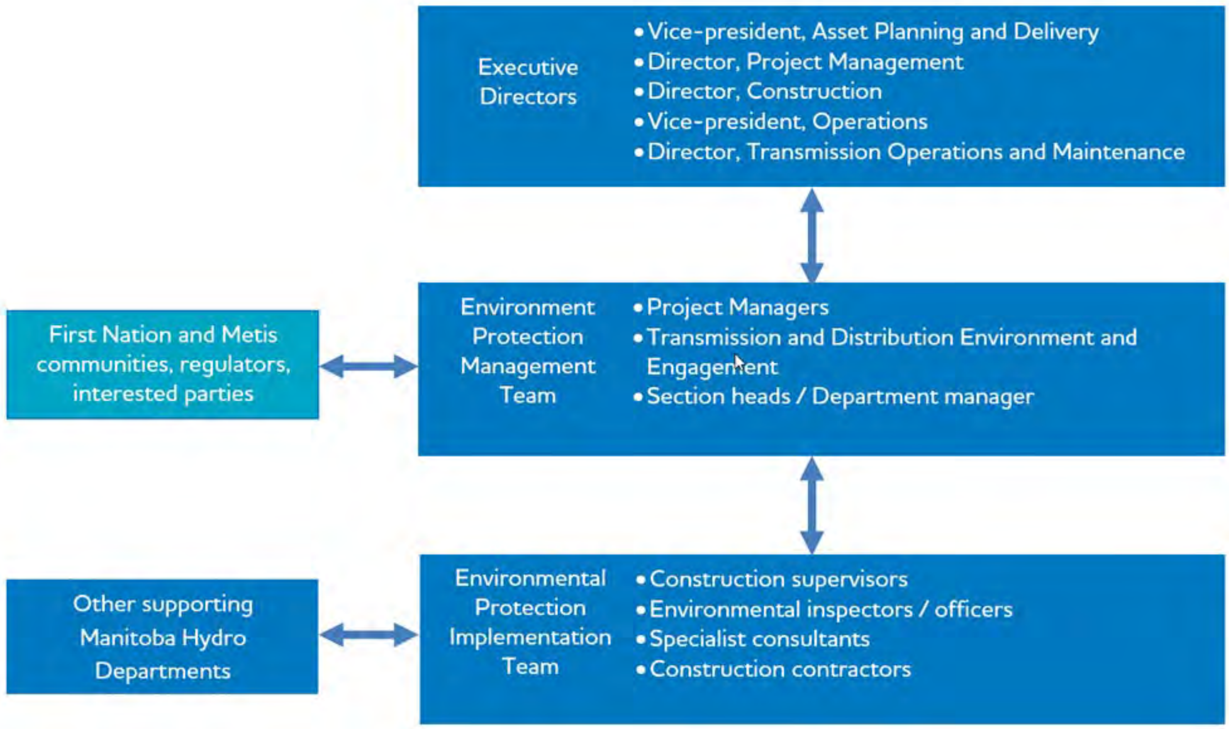


Figure 17-2: Environmental protection program organizational structure

17.7.1 Resources

Manitoba Hydro commits resources early in the planning cycle to provide effective environmental assessment, mitigation, and monitoring. Teams of engineers and environmental professionals develop preventative or avoidance mitigation measures that include design and routing alternatives.

In addition, there are resource allocations for the delivery and implementation of environmental protection measures to meet corporate policy and government regulatory requirements.

Manitoba Hydro is committed to staffing the environmental protection program with environmental inspectors and providing required support, including training, financial resources, and equipment.

17.7.2 Roles and responsibilities

Figure 17-3 illustrates the typical organizational lines of reporting and communications. The roles and responsibilities for delivery of the project and implementation of environmental protection measures are as follows:

- The project engineer has overall responsibility for the implementation of the environmental protection plans and reports to a section head or department manager.
- The Transmission & Distribution Environment and Engagement Department oversees the development of environmental protection documents and associated inspection and monitoring programs, including ongoing project engagement.
- The construction contractor is responsible for ensuring work adheres to the environmental protection plans and reports to the construction supervisor.
- Environmental inspectors and officers have the primary responsibility to confirm that environmental protection measures and specifications are implemented per the environmental protection plans as well as provide information and advice to the construction supervisor.
- Manitoba Hydro field safety, health and emergency response officers are responsible for the development and execution of the safety program and occupational health and safety practices at the various construction sites.

Other Manitoba Hydro employees, including engineers and technicians, provide information and advice to the construction supervisor.

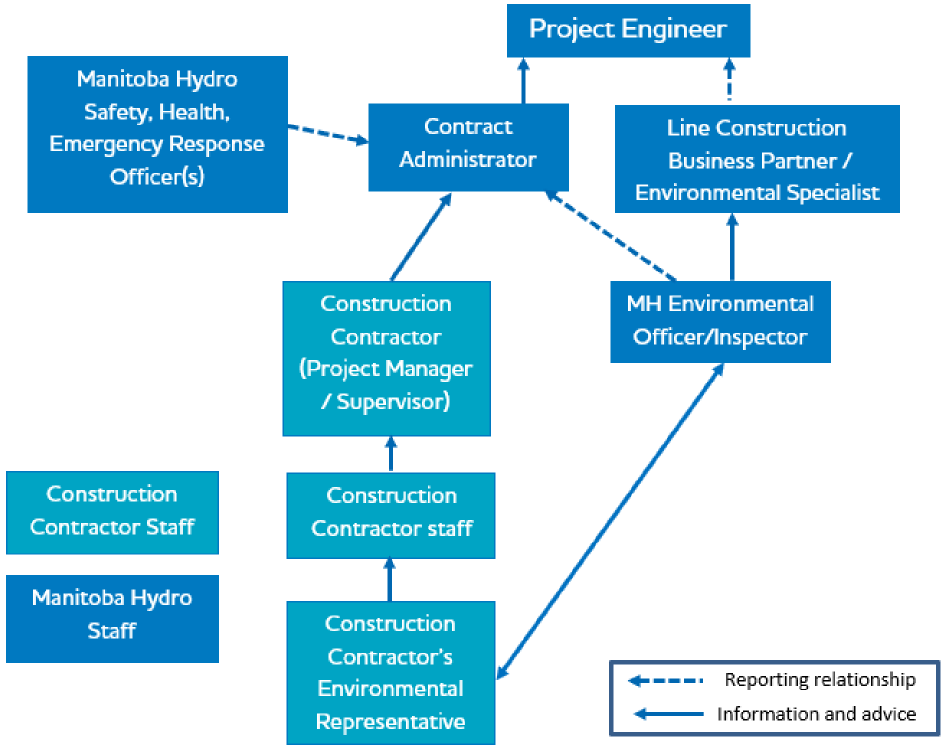


Figure 17-3: Typical organizational lines or reporting and communications

17.7.3 Communication and reporting

Manitoba Hydro personnel will maintain ongoing communications with Manitoba Environment and Climate Change, other provincial and federal departments, First Nations, the Manitoba Métis Federation, and organizations regarding implementation of the environmental protection plan.

The contract administrator and environmental officers/inspectors will maintain ongoing communications with the contractor and contract staff through daily tailboard meetings and weekly or otherwise scheduled construction meetings at the worksite. Inspection reports as well as incident, monitoring and other reports will be prepared and available for the regulators, contractors, and Manitoba Hydro staff.

Manitoba Hydro will provide First Nations, the Manitoba Métis Federation, and organizations, landowners, interested parties and the public with ongoing opportunities to review and comment on the project. Manitoba Hydro developed a dedicated project webpage to facilitate communication with First Nations, the Manitoba Métis Federation, and organizations, landowners, interested parties and the public. The environmental protection management team will record and review formal enquiries or complaints for response or action.

17.7.4 Environmental protection plans

Environmental protection plans document environmental protection measures to provide for compliance with regulatory and other requirements, and to achieve environmental protection goals consistent with corporate environmental policies. Manitoba Hydro designed the environmental protection plans as user-friendly reference documents that provide project managers, construction supervisors and contractors with detailed lists of environmental protection measures and other requirements implemented in the design, construction, and operation phases of a project.

Manitoba Hydro organized the environmental protection measures by construction component and activity, and environmental component and issue to assist project personnel in implementing measures for work sites and activities.

Manitoba Hydro will develop the environmental protection plans described in the following sections.

17.7.4.1 Construction

The construction environmental protection plan (CEnvPP) (Appendix E) will be updated prior to construction. It is a key element in implementing effective environmental protection and limiting the potential adverse environmental effects identified in the environmental assessment report. It also outlines actions to identify unforeseen environmental effects and implement adaptive management strategies to address them. An important component of an environmental protection plan is review and updating. This allows environmental protection measures to remain current, continually improving environmental performance.

A CEnvPP is composed of general and specific environmental protection measures that cover all aspects of the work and the environment. General environmental protection measures for the project include mitigation measures and follow-up actions identified in the environmental assessment report, including design mitigation, provincial and federal regulatory requirements, beneficial practice guidelines, Manitoba Hydro environmental policies and commitments, and input during public and First Nation and Métis engagement.

The CEnvPP lists the general environmental protection measures for major components and activities associated with the project. Environmental protection measures are provided for environmentally sensitive sites (ESS) identified during project engagement and assessment activities. Environmentally sensitive sites are locations, features, areas, activities, or facilities along or immediately adjacent to the transmission line corridor or other project components that are ecologically, socially, economically, or culturally important and sensitive to disturbance by the project and, as a result, require site-specific mitigation measures.

The CEnvPP will contain orthophoto map sheets (provided as a mapbook – Appendix to the CEnvPP) that provide Manitoba Hydro project managers, construction supervisors, employees, contractors, and contract employees with detailed site-specific environmental protection information that can be implemented, managed, evaluated, and reported on in the field.

17.7.4.2 Operation and maintenance

Standard mitigation measures will apply during operations. A specific operation and maintenance environmental protection plan is not planned.

17.7.4.3 Decommissioning

A decommissioning environmental protection plan will be prepared at the end of the project's operational life and will contain decommissioning methods, waste and recycling management, and mitigation measures to address environmental effects and legislation that is in effect at that time.

17.7.4.4 Cultural and heritage sites/objects

The fact that cultural and heritage sites/objects have intrinsic value to Manitobans is understood by Manitoba Hydro and addressed through a separate protection plan. The culture and heritage resource protection plan outlines protection measures in the event of the discovery of previously unrecorded cultural and heritage sites / objects during construction and describes the ongoing monitoring of known cultural and heritage sites/objects for disturbance.

Through First Nation and Métis engagement and previous projects, Manitoba Hydro understands and acknowledges the importance of cultural and heritage sites/objects to Indigenous communities. Manitoba Hydro has developed mechanisms such as notification of discovery and involvement in site investigations, which are further explained in the culture and heritage resource protection plan.

Results from the heritage resources monitoring program will be addressed in conjunction with First Nation and Métis engagement on an as required basis during construction, as well as through a heritage resources impact assessment to the Manitoba Historic Resources Branch per the terms of the *Heritage Resources Act* (1986) and heritage permit(s) issued to Manitoba Hydro.

17.7.5 Management plans

Management involves the organization of activities and resources to resolve or respond to environmental problems, issues, or concerns. Management plans provide reasoned courses of action to achieve pre-defined goals or objectives. Management plans will be prepared to address important management issues, regulatory requirements and corporate commitments identified in the environmental assessment report. The management plans will describe the management actions, roles and responsibilities, evaluation mechanisms, updating requirements and reporting schedules.

Environmental inspectors / officers will conduct regular inspections during construction to ensure adherence to the plans. The following sections describe each plan.

17.7.5.1 Access management plan

Manitoba Hydro has prepared an access management plan to minimize the need to construct new access roads and trails.

The access management plan outlines:

- The use of existing roads and trails to the extent possible during construction
- Management objectives and principles
- Security requirements, including
  - Terms and conditions for access
  - Restrictions on firearms
  - Hunting and fishing
  - Other resource use activities
- Environmental protection measures including
  - Timing windows
  - Vehicle cleaning and servicing
  - Load restrictions
  - Warning signage
  - Speed limits
  - Sensitive area avoidance
  - Stream crossings
  - Other environmental issues
- Access management issues and mitigation strategies
- Safety of construction workers and the public
- Respect for First Nation and Red River Métis rights and resource users
- Protection of natural, cultural and heritage sites / objects

17.7.5.2 Blasting

Prior to the use of explosives, the contractor will prepare blasting plans to manage the storage and use of explosives at construction sites in accordance with environmental protection measures, provincial and federal legislation and guidelines, and corporate policies for explosives.

17.7.5.3 Emergency preparedness and response

Prior to the start of construction, each contractor will prepare an emergency preparedness and response plan to prepare for and respond to emergencies at construction sites in accordance with provincial legislation and guidelines, and corporate policies and procedures for the protection of human health and the environment. The plan will include the following:

- Spills or releases of hazardous substances, including petroleum products
- Accidents involving hazardous substances
- Medical emergencies
- Explosions and fire

17.7.5.4 Erosion protection and sediment control

Manitoba Hydro has developed an erosion protection and sediment control framework (Appendix E) to guide each contractor in preparing an erosion protection and sediment control plan to limit adverse environmental effects of sediment releases on the aquatic environment in accordance with provincial and federal legislation and guidelines, and corporate environment policies and guidelines.

The plan prescribes environmental protection measures including:

- Frozen ground conditions
- Establishment of buffer zones
- Avoidance of sensitive areas
- Use of bioengineering techniques

17.7.5.5 Rehabilitation and invasive species

Manitoba Hydro has prepared a rehabilitation and invasive species management plan (Appendix E) in accordance with environmental protection measures and provincial guidelines for rehabilitation.

The plan prescribes measures for:

- Washing equipment and vehicles prior to entering construction sites
- Controlling vegetation at construction sites

- Restoring and re-vegetating disturbed sites

17.7.5.6 Waste and recycling

Manitoba Hydro has developed a waste and recycling management plan (Appendix E) to manage waste at construction locations in accordance with provincial legislation and guidelines, and corporate policies and procedures for the protection of human health and the environment.

The plan will include measures for:

- Waste reduction
- Recycling and reusing initiatives
- Storage of kitchen wastes
- Recycling and disposal of construction wastes
- Disposal of wastes at licenced facilities

17.7.5.7 Clearing management

A clearing management plan will be developed prior to clearing that provides guidance and instruction to contractors to manage vegetation removal within the right-of-way required to construct the project.

The plan will provide clearing prescriptions, additional guidance and required actions specific to the project and is augmented by a mapbook, which will contain detailed locations where clearing prescriptions are implemented. The mapbook will be created prior to construction.

17.8 Follow-up and monitoring

Follow-up and monitoring are conducted to verify the accuracy of the environmental assessment of a project, assess the effectiveness of measures taken to mitigate adverse effects and determine compliance with regulatory requirements. Manitoba Hydro implements the follow-up and monitoring activity using two programs called inspection and monitoring, which are discussed further in the sections below.

17.8.1 First Nation and Métis engagement

Manitoba Hydro will meet with First Nations, the Manitoba Métis Federation and northern affairs communities who express interest to review and discuss how the information shared will inform the EPP and monitoring interests for the project.

17.8.2 Inspection program

Inspection is the organized examination or evaluation involving observations, measurements and sometimes tests for a construction project or activity. The results of an inspection are compared to specified requirements, drawings, and standards for determining whether the item or activity is in conformance with these requirements. Environmental inspection is an essential and key function in environmental protection and implementation of mitigation measures.

Manitoba Hydro has established a comprehensive integrated environmental inspection program to comply with regulatory approvals and meet corporate environmental objectives. The program includes environmental inspectors onsite during construction activities. Manitoba Hydro's approach to environmental inspection includes:

- Compliance with regulatory approvals
- Adherence to environmental protection plans
- Onsite environmental inspectors
- Training and education
- Regular monitoring and inspection during construction
- Interaction with contractors (e.g., pre-construction meeting, daily discussion)
- Regular review of inspection and monitoring information
- Quick response to incidents or changing conditions
- Monthly summary reports
- Regular reporting to regulators
- Notification of regulators of emergency or contingency situations

Environmental inspectors / officers will:

- Visit active work sites to inspect for compliance with licence, permit or other approval terms and conditions, and adherence to environmental protection plan general and specific mitigation measures
- Report all instances of non-compliance to the construction supervisor, contractor, and applicable regulatory authority
- Report incidents such as accidents, malfunctions, spills, fires, explosions, and environmental damage to the construction supervisor and applicable regulatory authority
- Record all inspection activities in a daily journal and complete daily inspection forms
- Provide daily and monthly inspection reports electronically to the environmental protection information management system for review and viewing by applicable Project staff

Incidents will be dealt with immediately and followed up in subsequent daily inspection reports.

17.8.3 Monitoring program

Due to understood effects to natural habitat traversed by the project, and confidence in predictions based on monitoring results learned from recently completed projects in Manitoba, an environmental monitoring plan has not been prepared for this project. However, should environmental inspection identify unexpected environmental effects or damage to habitat, a monitoring plan will be developed to outline monitoring steps to describe additional mitigation and follow-up.

17.8.4 Environmental protection information management system

An environmental protection information management system (EPIMS) is the internal central repository of environmental protection information, including:

- Environmental protection documents
- Reference information such as regulations and guidelines
- Inspection reports
- Monitoring field data and reports

The environmental inspection program will employ modern electronic recording, reporting and communication systems using field computers, geographic positioning systems and digital cameras. Field computers will have project and other reference information needed for effective implementation of environmental protection measures, including regulations, guidelines, licences, permits, engineering drawings, specifications, maps, reports, and data.

EPIMS is a tool that helps Manitoba Hydro monitor and report on environmental protection implementation, regulatory compliance, and incident reporting. EPIMS will be the mechanism to provide reporting and tracking of environmental protection performance.

17.9 Pre-construction activities

Manitoba Hydro will undertake several activities prior to commencing construction of the project to set the direction for environmental protection and compliance with legislated requirements. Manitoba Hydro will endeavour to meet with interested Indigenous communities and organizations during the finalization of the construction environmental protection plan to discuss and work to address and mitigate concerns, to the extent possible, with cultural and environmentally sensitive sites.

Manitoba Hydro will obtain licenses, permits, authorizations and other approvals, including property agreements, right-of-way easements and releases, prior to commencement of construction of each project component. Additional terms and conditions of these approvals will be incorporated into the construction environmental protection plan. Additional approval requirements to be obtained by the contractors will be identified and communicated to the successful bidders.

The Transmission & Distribution Environment and Engagement Department will typically participate in the tender / direct negotiated contract development process to make sure environmental requirements are included as contract specifications. Bidders are required to list and defend their environmental record and must have an environmental policy, including a commitment to environmental protection.

Meetings will be held with the contractors to review the environmental protection requirements, establish roles and responsibilities, management, monitoring and other plans, inspection and reporting requirements, and other submittals. Prior to the start of construction, contractor employees will be trained and/or oriented on environmental protection requirements.

17.10 Work stoppage

The duty to stop work rests with everyone encountering situations where the environment, including biophysical, socio-economic and heritage sites / objects, are threatened by an activity or occurrence that has not been previously identified, assessed, and mitigated. Work stoppage is also to occur in the event of an environmental accident, extreme weather event or exposed human remains. Individuals discovering such situations are to inform their supervisor who will report the matter to the contract administrator or environmental inspector/officer immediately. The contractor is also required to stop work voluntarily where construction activities are adversely affecting the environment or where mitigation measures are not effective in controlling environmental effects. Remedial action plans or other environmental protection measures will be developed and implemented immediately after discussion and prior to resumption of work if previously halted. Work is not to resume until the situation has been assessed and responded to and Manitoba Hydro approves the resumption of work. Stop work orders will be documented, reported to regulatory authorities (if applicable) and reviewed at construction meetings.

17.11 Review and updating

17.11.1 Incident reviews

The CEnvPP will be subject to review in the event of an incident, including environmental accidents, fires and explosions, reportable releases of hazardous substances and non-compliance situations.

17.11.2 Auditing

Auditing is a systematic approach to defining environmental risk and/or determining the conformance of an operation with respect to prescribed criteria. An environmental audit typically involves a methodical examination of evidence that may include interviews, site visits, sampling, testing, analysis, and verification of practices and procedures. Environmental protection plans for the project will be subject to internal and external audits. The audit results will help to evaluate the effectiveness of environmental protection measures, to learn from inspection and monitoring programs, and to improve project planning and environmental assessment performance.

17.11.3 List of revisions

A list of revisions will be maintained at the beginning of each environmental protection plan that identifies the nature of the revision, section revised and dates.

18.0 Conclusion

The environmental assessment outlined in this report evaluated the potential biophysical and socio-economic effects of the proposed Radisson to Henday transmission line project.

Feedback and perspectives shared by First Nations people and Métis citizens directly influenced the selection of valued components and informed the assessment of project effects on the environmental and socio-economic elements discussed throughout this report.

Manitoba Hydro understands that effects on all aspects of the environment have the potential to be experienced by First Nations people and Métis citizens and that the severity of the residual effects by experienced uniquely by different nations and individuals.

The primary mechanism to mitigate potential adverse effects was the routing of the proposed transmission line in an existing right-of-way corridor with other existing transmission lines. Beyond routing, other mitigation measures informed by Manitoba Hydro's experience with similar projects in Northern Manitoba as well as feedback from this and other transmission projects, will be implemented to further reduce adverse effects of the project.

Residual effects to the biophysical environment consist mainly of changes to vegetation and the associated effects to wildlife (e.g., fish, mammals, and birds), through changes to habitat. Residual effects to the socio-economic environment include:

- impacts to harvested resources, access for harvesting and recreational areas, and harvesting and recreational experiences
- a decrease in the number of heritage resources due to project-related ground disturbances, encounter of important sites, and changes to intangible cultural heritage and experiences at important sites
- increase in traffic
- strain on health and emergency response services
- localized decrease in air quality and increase in noise
- decline in sense of community safety and increase in psychological stress

The project is expected to result in positive economic benefits to the region, mainly through the presence of the workforce and the potential for employment.

Based on the routing process, and the measures developed to mitigate and manage any potential adverse effects, the residual effects of the project are predicted to be not significant.

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Appendix A: Engagement materials

Appendix B: Vegetation technical report

Appendix C: Avian technical report

Appendix D: Greenhouse gas mitigation assessment

Appendix E: Construction environmental protection plan

Appendix A

Engagement Materials

Radisson to Henday (R44H) transmission project environmental assessment

Engagement appendix

Prepared by Manitoba Hydro

Asset Planning and Delivery

Transmission & Distribution Environment and Engagement

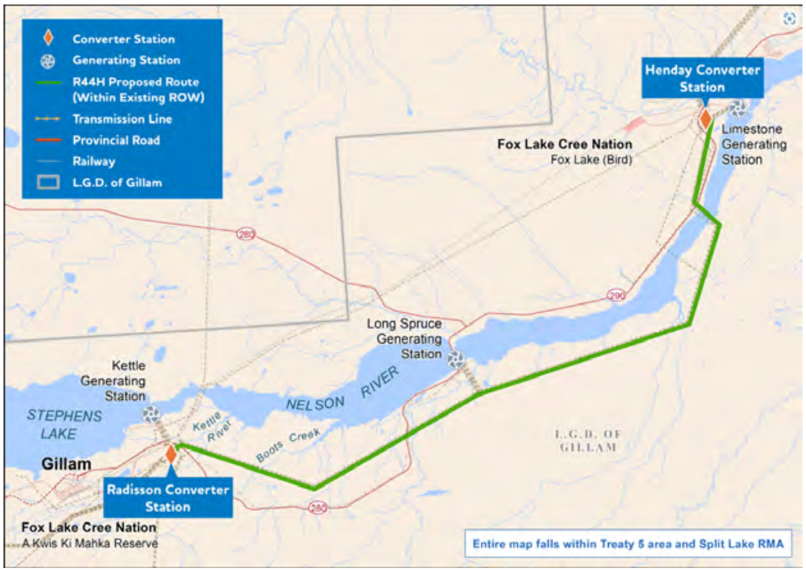
Engagement materials

Project information sheet

Round 1 presentation

Round 2 presentation

Radisson to Henday transmission line (R44H) project



What is it?

We are proposing to build a 230kV transmission line in northern Manitoba starting at Radisson converter station and ending at Henday converter station. The line will be known as the Radisson to Henday transmission line (R44H).

The proposed route for the transmission line is within an existing right-of-way corridor. The route has a total length of approximately 42 kilometers with an estimated width requirement of 60 meters. The work will also include electrical connections within the Radisson and Henday converter stations.

Why do we need it?

We generate more than 70% of the electricity delivered to our customers at our northern generating stations. The northern collector system links the generating stations to our high voltage direct current (HVDC) system, which includes converter stations and the Bipole transmission lines.

Due to ageing infrastructure of the HVDC system, we need more capacity within the northern collector system to transfer power between the northern converter stations. The proposed R44H line would improve transmission reliability and reduce the risk of not being able to move electricity on to you. This line will also be needed for future work modernizing Manitoba Hydro's HVDC system referred to as HVDC Modernization (previously referred to as Bipole I and II Modernization).

How can you get involved?

We welcome feedback as it helps inform the environmental assessment for the project.

Manitoba Hydro
energy for life

What regulatory approvals are required?

The proposed new transmission line will need approval as a Class 2 development under The Environment Act (Manitoba) before construction starts. We will submit an environmental assessment report to Manitoba Environment and Climate to seek approval.

Engagement process

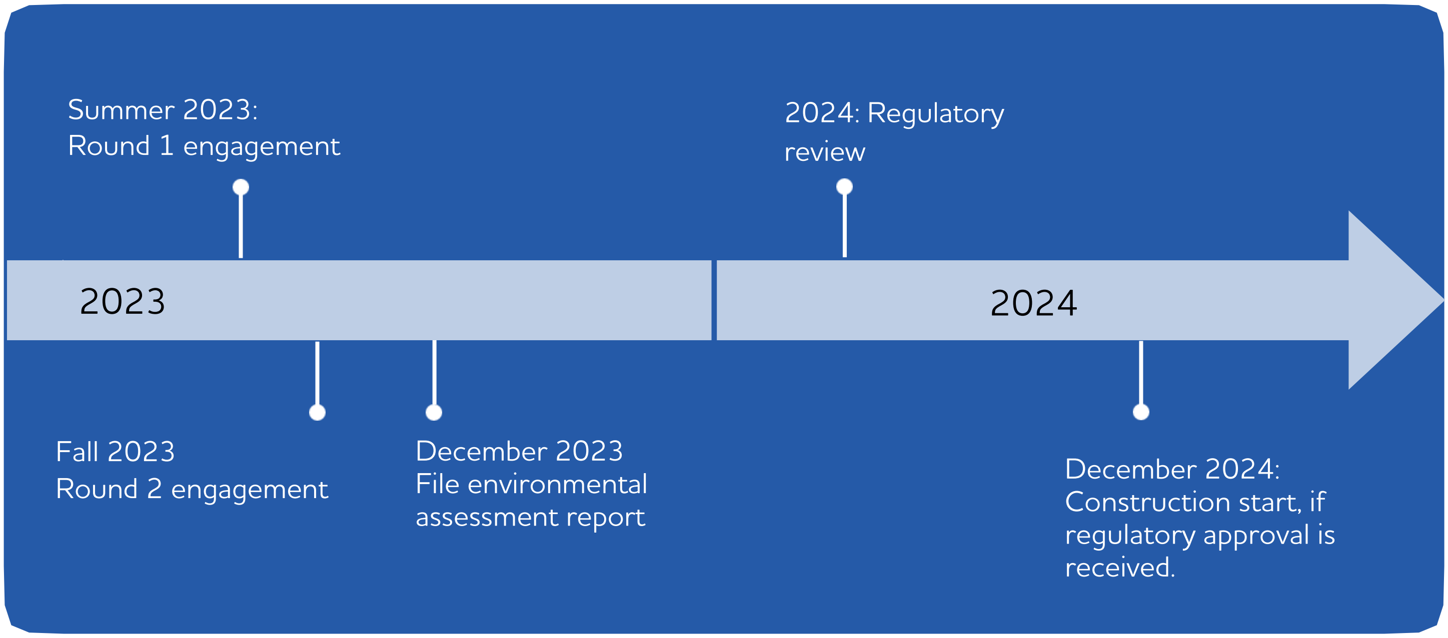
We will work directly with Indigenous communities and interested parties to better understand, and consider concerns and interests, in project decisions.

There will be opportunities for community members to share feedback through different engagement activities, take part in field investigations, and/or potential business or employment opportunities in the future.

What we heard during pre-engagement

Question / comment	Summary of response
How does this line connect to the Kivalliq Hydro-Fibre Link?	This project is separate from the Kivalliq Hydro-Fibre Link.
What is the difference between Manitoba Hydro's engagement process and the Province's Section 35 consultation process. Does Manitoba Hydro assist the province with their Section 35 consultation process?	Manitoba Hydro's process is considered engagement rather than Section 35 consultation. As the proponent, we undertake engagement on the project. Our engagement process is separate from the section 35 Crown consultation process that may be initiated by the Province of Manitoba, who has not delegated their duty to consult to Manitoba Hydro. We understand that the Crown may rely on the feedback received through our engagement activities to inform their consultation process.
Will there be job opportunities associated with this work?	We do not yet have details regarding job opportunities. We are committed to sharing information as it becomes available.
Will the R44H line replace any existing lines due to ageing.	This line is in addition to any existing lines.
What types of project impacts are anticipated and will impacts to caribou be considered?	Impacts to wildlife and wildlife habitat as result of the project will be assessed.

Schedule

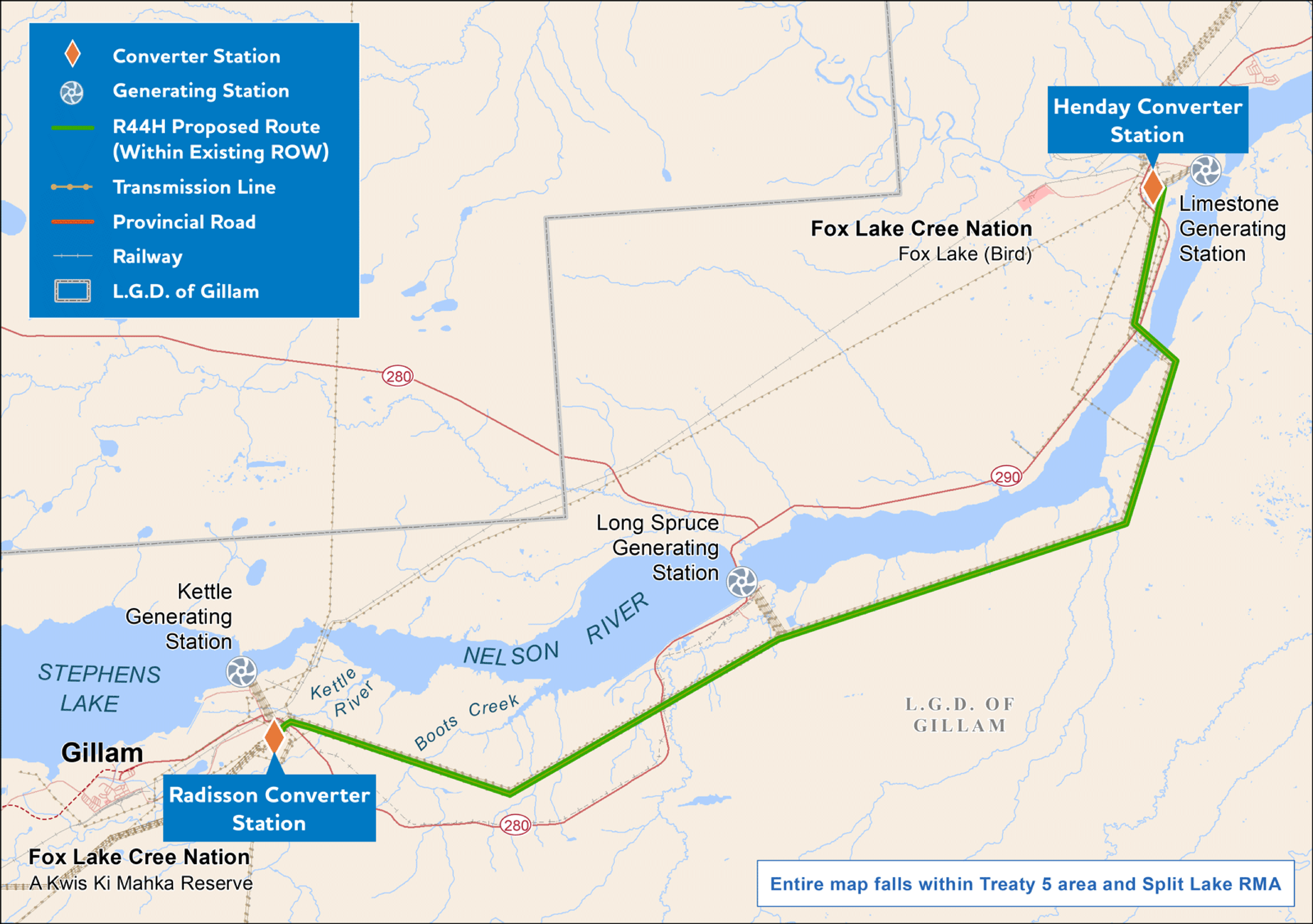


* Please note schedule is subject to change

Have more questions?

We would like to hear from you. For more information about the Radisson to Henday transmission line (R44H), please visit https://www.hydro.mb.ca/corporate/facilities/expansion/radisson_to_henday_transmission_line/

Contact us at projects@hydro.mb.ca or call 1-877-343-1631



Converter Station
Generating Station
R44H Proposed Route (Within Existing ROW)
Transmission Line
Provincial Road
Railway
L.G.D. of Gillam
Henday Converter Station
Limestone Generating Station
Fox Lake Cree Nation
Fox Lake (Bird)
280
290
Long Spruce Generating Station
Kettle Generating Station
STEPHENS LAKE
NELSON RIVER
Kettle River
Boots Creek
L.G.D. OF GILLAM
Gillam
Radisson Converter Station
Fox Lake Cree Nation
A Kwis Ki Mahka Reserve
Entire map falls within Treaty 5 area and Split Lake RMA

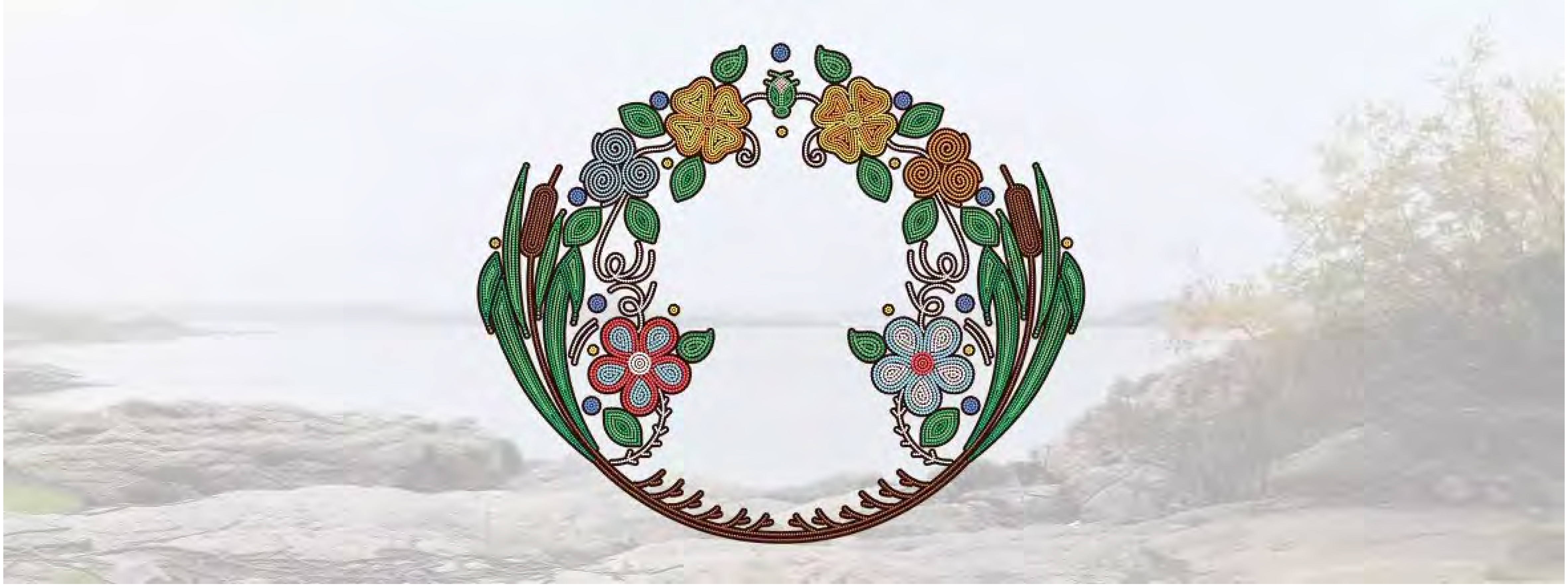
Radisson to Henday transmission line (R44H)

(Name of who you are meeting with)

(Date)

Manitoba Hydro

Land acknowledgement



Manitoba Hydro

Purpose of the session

Share project information

Answer questions

Listen to feedback

Manitoba Hydro

Converter Station
Generating Station
R44H Proposed Route (Within Existing ROW)
Transmission Line
Provincial Road
Railway
L.G.D. of Gillam
Henday Converter Station
Limestone Generating Station
Fox Lake Cree Nation
Fox Lake (Bird)
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290
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Kettle Generating Station
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NELSON RIVER
Kettle River
Boots Creek
L.G.D. OF GILLAM
Gillam
Radisson Converter Station
280
Fox Lake Cree Nation
A Kwis Ki Mahka Reserve
Entire map falls within Treaty 5 area and Split Lake RMA

Why is this project needed?

Manitoba Hydro

HVDC system

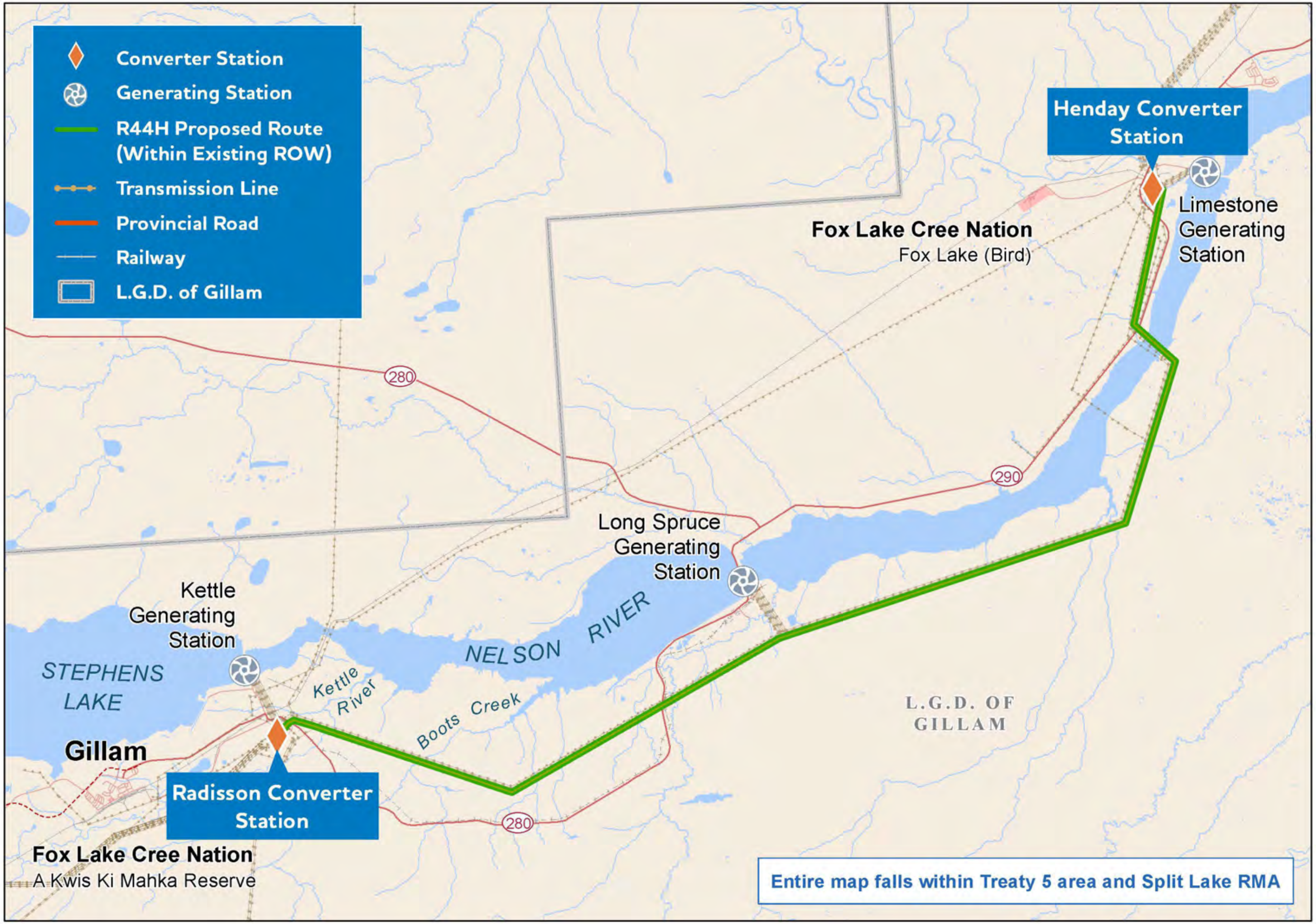
Northern stations:
Radisson (BP1)
Henday (BP2)
Keewatinohk (BP3)

Transmission lines:
BP1
BP2
BP3

Southern stations:
Dorsey (BP1 & BP2)
Riel (BP3)

Manitoba Hydro


VALVE GROUP 12


Converter Station
Generating Station
R44H Proposed Route (Within Existing ROW)
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Provincial Road
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L.G.D. of Gillam
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Boots Creek
L.G.D. OF GILLAM
Gillam
Radisson Converter Station
280
Fox Lake Cree Nation
A Kwis Ki Mahka Reserve
Entire map falls within Treaty 5 area and Split Lake RMA

Corridor between Radisson and Nelson River

Manitoba Hydro

Nelson River crossing facing north

Corridor going into Henday

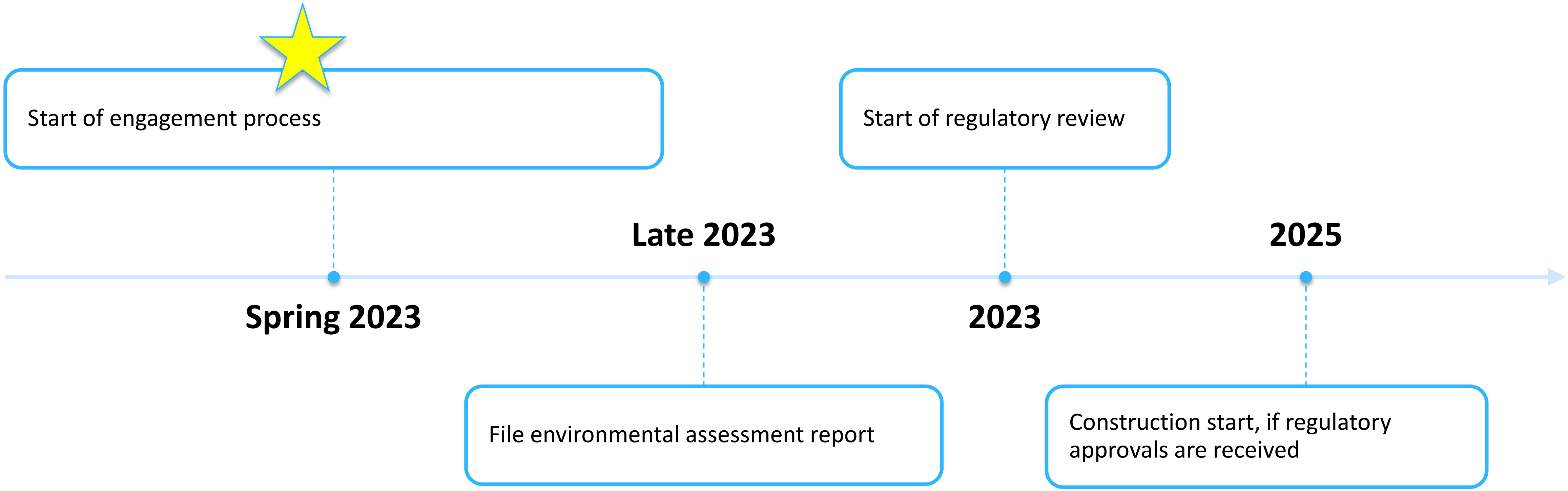
Field work

- May – July 2022:
  - Bird field study to identify nests or heron rockeries
  - Vegetation field study
- May – July 2023
  - Bird collision survey
  - Vegetation field study

Engagement process

We want to work with your community in the manner preferred by you.

Schedule


Start of engagement process
Spring 2023
Late 2023
File environmental assessment report
Start of regulatory review
2023
2025
Construction start, if regulatory approvals are received

Thank you

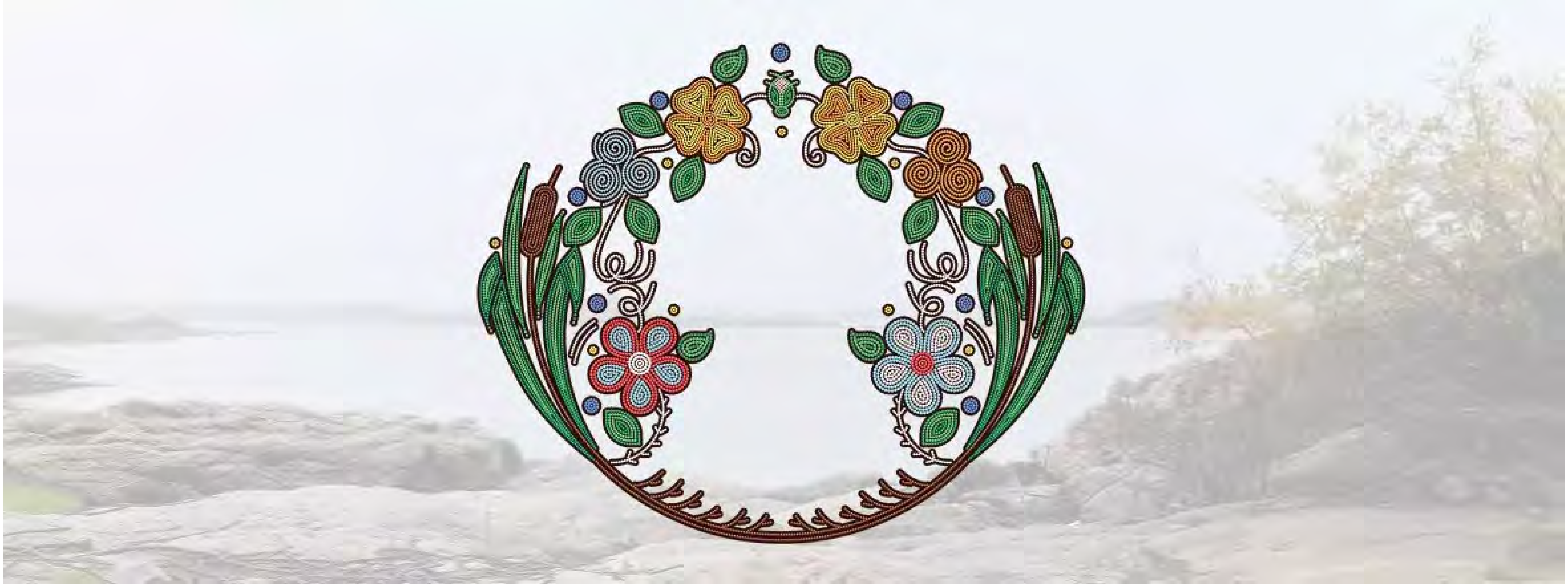
Radisson to Henday transmission line (R44H)

Community

Date

Manitoba Hydro

Land acknowledgement



Purpose of the meeting

Share project information

Answer questions

Listen to feedback

Project overview

- A proposed new 230kV transmission line
- Between Radisson and Henday Converter Stations
- Approximately 42 km in an existing corridor
- Includes electrical connection work within the converter stations

Converter Station
Generating Station
R44H Proposed Route (Within Existing ROW)
Transmission Line
Provincial Road
Railway
L.G.D. of Gillam
Henday Converter Station
Limestone Generating Station
Fox Lake Cree Nation
Fox Lake (Bird)
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STEPHENS LAKE
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Gillam
Radisson Converter Station
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Fox Lake Cree Nation
A Kwis Ki Mahka Reserve
Entire map falls within Treaty 5 area and Split Lake RMA

Why is this project needed?

Manitoba Hydro

HVDC system

Northern stations:

Radisson (BP1)
Henday (BP2)
Keewatinohk (BP3)

Transmission lines:

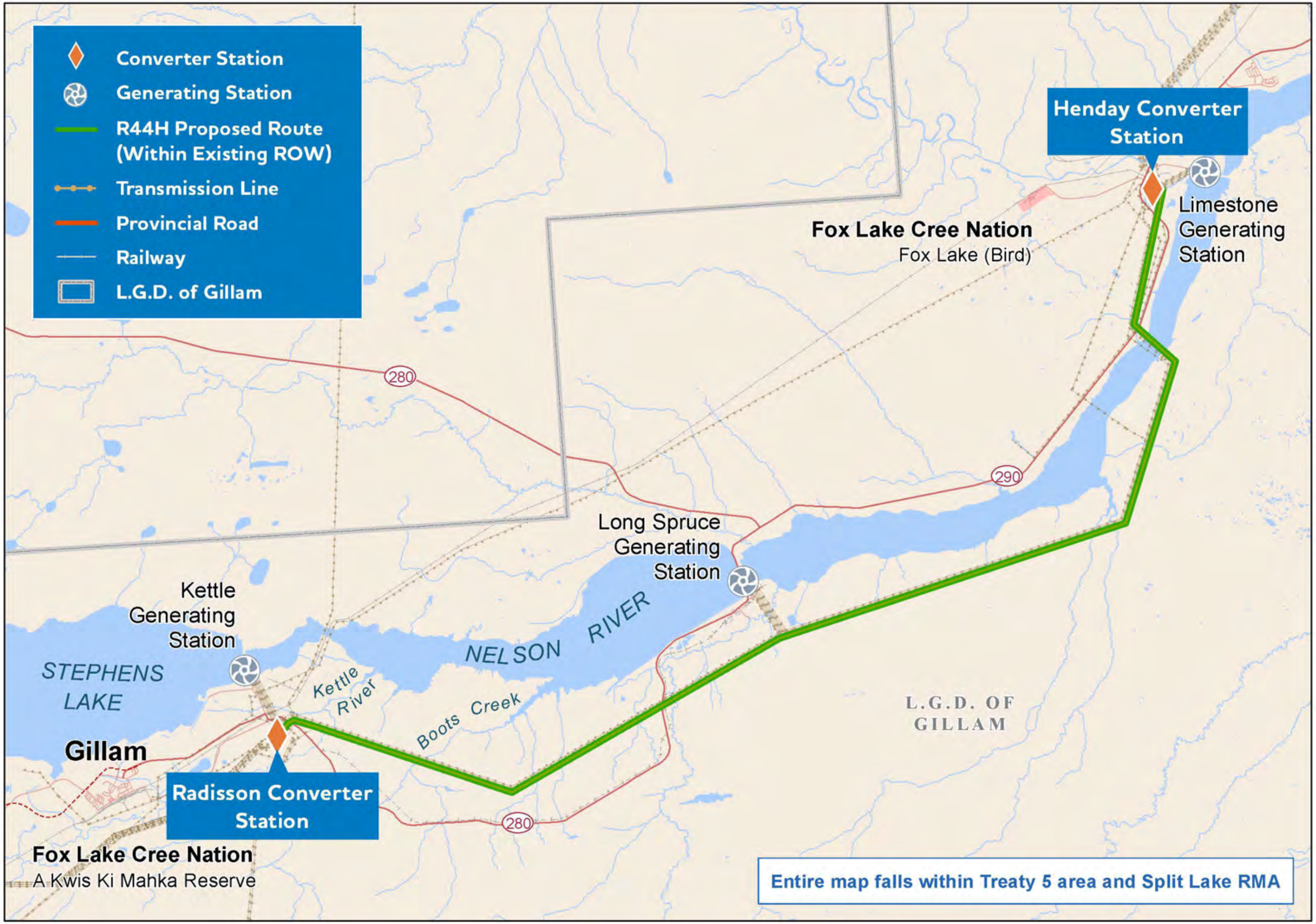
BP1
BP2
BP3

Southern stations:

Dorsey (BP1 & BP2)
Riel (BP3)

Manitoba Hydro


VALVE GROUP 12



Converter Station
Generating Station
R44H Proposed Route (Within Existing ROW)
Transmission Line
Provincial Road
Railway
L.G.D. of Gillam
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STEPHENS LAKE
Kettle River
Boots Creek
L.G.D. OF GILLAM
Gillam
Radisson Converter Station
280
Fox Lake Cree Nation
A Kwis Ki Mahka Reserve
Entire map falls within Treaty 5 area and Split Lake RMA

Corridor between Radisson and Long Spruce

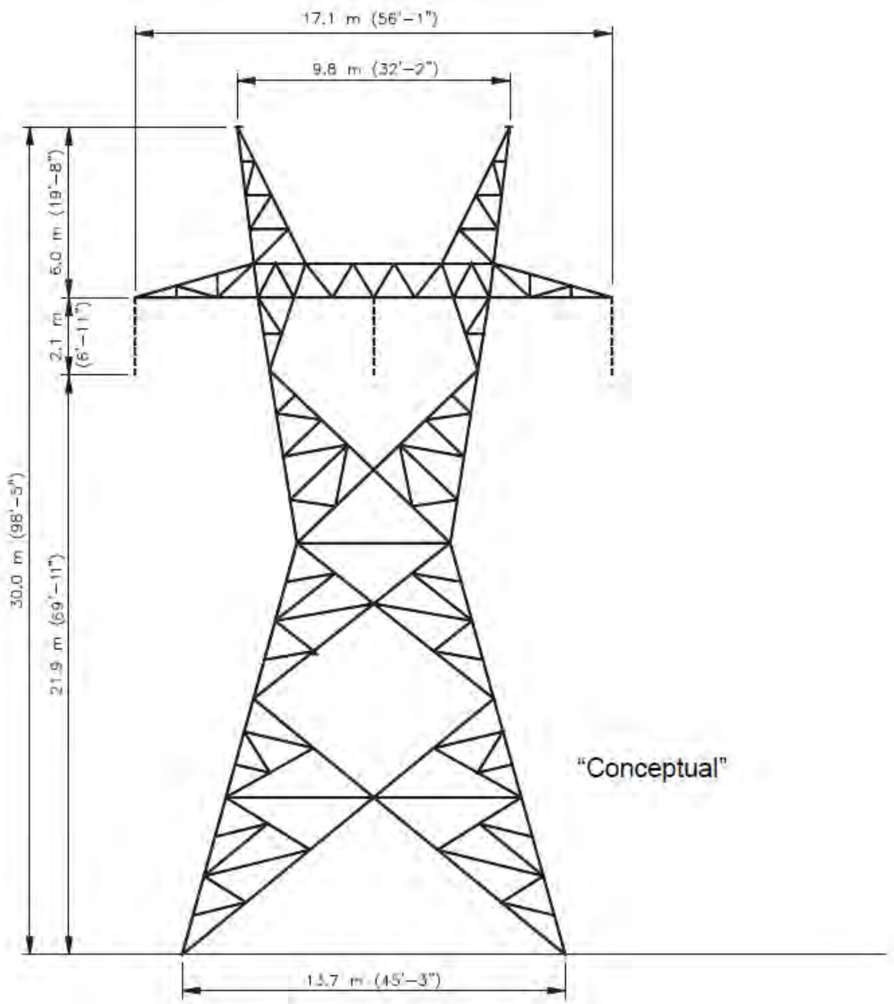
Corridor between Radisson and Long Spruce

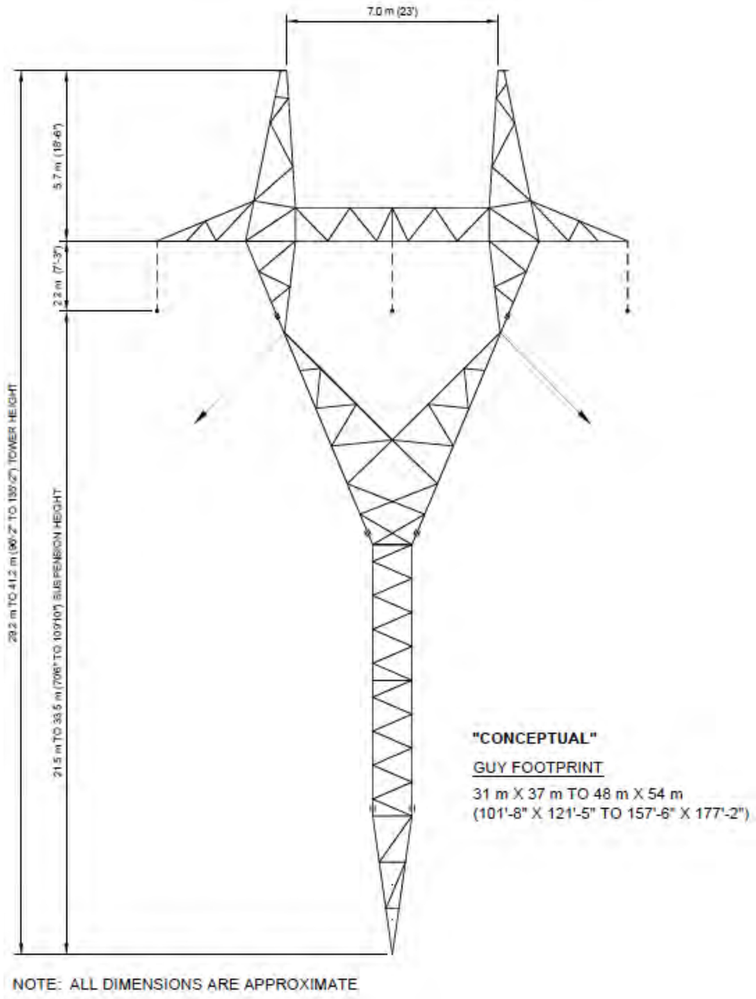
Nelson River crossing facing north

Manitoba Hydro

Corridor going into Henday

Typical towers





Engagement process

We want to work with your community in the manner preferred by you.

Engagement activities to date

In person meetings with 2 communities

Virtual meetings with 2 communities

Online survey

Helicopter tours and field visits

What we've heard and how it will impact what we assess?

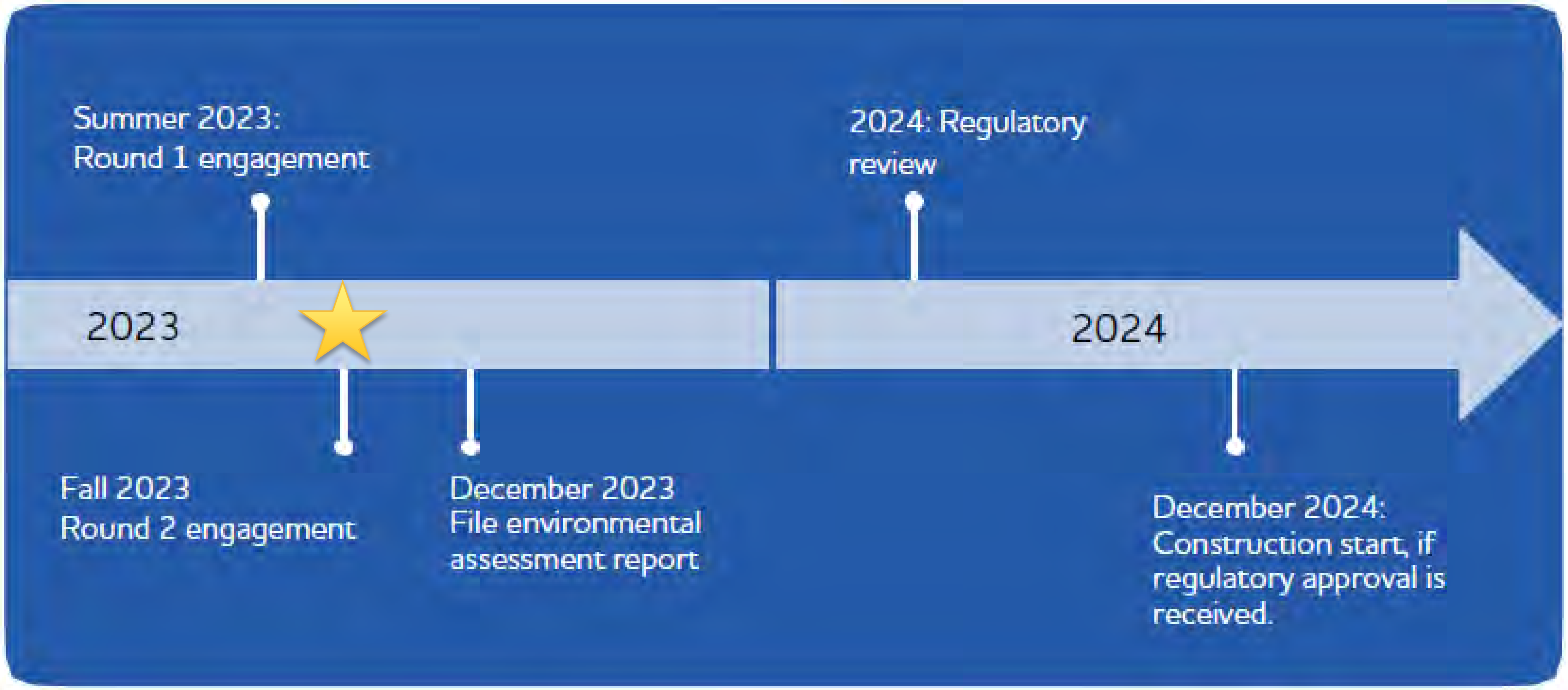
- Concerns about impacts to caribou – impacts to wildlife will be assessed in the environmental assessment
- Interest in employment and economic opportunities – we will share more information as it becomes available
- Preference to avoid clearing new areas of vegetation to use for storage or other project-related activities
- Concerns regarding impacts to hunting, trapping and harvesting activities in the area

How will feedback be used?

- To inform the environmental assessment of the project
  - Wildlife and wildlife habitat
  - Fish and fish habitat
  - Vegetation
  - Harvesting
  - Heritage sites
  - Infrastructure and services
  - Economic activities
  - Land and resource use
  - Well-being
- To inform mitigation

Manitoba Hydro

Schedule


Summer 2023:
Round 1 engagement
2024: Regulatory
review
2023
2024
Fall 2023
Round 2 engagement
December 2023
File environmental
assessment report
December 2024:
Construction start, if
regulatory approval is
received.

Thank you

Appendix B

Vegetation technical report

R44H RADISSON TO HENDAY TRANSMISSION PROJECT VEGETATION MONITORING

TECHNICAL REPORT – YEAR II

Prepared for:
Manitoba Hydro

Prepared by:

Szwaluk Environmental Consulting Ltd.

and

K. Newman

September 2023

SUMMARY

Botanical and vegetation resources were assessed in 2022 and 2023 for the R44H Transmission Project Vegetation Monitoring. The vegetation monitoring occurred along an existing right-of-way (RoW) corridor (developed) between Radisson and Henday Electrical Converter Stations. The RoW also included an undeveloped area (>30m width) along its southern edge.

Existing biophysical and botanical information was used to describe the environment and included a description of the ecological land classification, land cover classification, and landscape level vegetation.

The vegetation monitoring study area is located in the Knee Lake and Winisk River Lowland Ecodistricts. The landscape consists largely of coniferous forest occurring dominantly on organic soils with black spruce as the dominant forest cover. Mineral soils occupy stands of improved black spruce growth that support an understory of low and tall shrubs with mosses and lichens. Stunted black spruce with ericaceous shrub growth and peat mosses occupy the bog vegetation. Fens support stunted tamarack, shrubs, sedges and brown mosses.

In 2022, 22 forest and wetland sites were sampled between the electrical converter stations along the RoW monitoring area. With an opportunity to build on previous data collection and record plant species diversity in the study area, 14 additional sites were sampled in 2023. Three community types were identified based on species composition, abundance and structure, with botanical summaries presented. Seven additional sites were qualitatively surveyed in the study area (e.g., near converter stations, waterways), where species composition was recorded, within both developed and undeveloped areas of the RoW.

A total of 168 plant taxa were observed, recorded at 43 sites along the RoW monitoring area. At least 36 plants, with traditional value according to the local Cree Nations and communities (Fox Lake Cree Nation, Tataskweyak Cree Nation, Manitoba Metis Federation) were recorded during vegetation sampling in the study area. The most frequent species observed in monitoring plots were trees, black spruce and tamarack, and low shrubs including Labrador tea, bog cranberry, small cranberry, cloudberry, and bog whortleberry. Traditional use plants are found throughout all vegetation community types, with greatest cover in forested sites.

Nine non-native, invasive or noxious species were observed incidentally during surveys, mainly along existing roadways and trails. Only common dandelion was present as a single occurrence in a sampling quadrat on the developed RoW. Three non-native plants recorded are listed as noxious, including oxeye daisy (Tier 2) and two Tier 3 plants. Five plants are

considered invasive due to their tendency to outcompete native species and dominate habitats once introduced.

Twelve species of conservation concern were observed during surveys along the monitoring area. Small-flowered lousewort and shrubby willow are ranked Imperilled to Vulnerable (S2S3) throughout their range, while floating marsh-marigold is ranked Imperilled to Apparently Secure (S2S4). The remaining nine species are ranked Vulnerable (S3 to S3S5). No species listed provincially under Manitoba's *Endangered Species and Ecosystems Act*, or federally under the *Species at Risk Act* or by the Committee on the Status of Endangered Wildlife in Canada were observed during field studies.

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ACKNOWLEDGEMENTS

The authors would like to thank Manitoba Hydro for providing supporting information and documentation for the project; Brad Kennedy for providing assistance in the field and project related tasks; Vincent Anderson of Fox Lake Cree Nation for providing field assistance in 2022 with tree measurements and species searches; and Prairie Helicopters for transporting the field crew to the monitoring sites.

1.0 INTRODUCTION

1.1 Background

Botanical and vegetation resources were assessed for Manitoba Hydro in 2022 and 2023 for the R44H Transmission Project Vegetation Monitoring, between Radisson and Henday Electrical Converter Stations (Map 1-1, Appendix II). The vegetation monitoring occurred along an existing right-of-way (RoW) corridor between both electrical converter stations. This is a 42 km RoW along the south side of the Nelson River (primarily) that supports numerous transmission lines including L48H, L47H, L46H, L61K, L41R, L42R and L43R. The RoW also includes an undeveloped area (>30m width) along its southern edge.

Manitoba Hydro is interested in understanding the existing vegetation communities and botanical resources in both the developed and undeveloped portions of the RoW. Existing ecological, botanical and vegetation information of the monitoring area will be compiled and reviewed.

Additional sampling along the developed and undeveloped RoW in 2023, will allow an opportunity to refine community types previously delineated (with increased samples) and to document further species potentially occurring in the study area (e.g., traditional use plants, species of concern, invasives), increasing species richness and further understanding of the vegetation resources. According to McCabe (2011), additional samples may increase the number of species documented, and overall diversity estimates improve as samples are added.

Due to limited sampling in 2022, an increase in sampling effort was anticipated to occur in 2023, including sites near Radisson and Henday Converter Stations with greater accessibility and potential local use; the Nelson River crossing location; and other sites identified as being more likely to support rare/traditional use plants, that may require environmentally sensitive site status.

The specific objectives established for this study in 2023 were as follows:

- Sample additional sites in 2023 to fill-in gaps in understanding the vegetation and botanical resources along the RoW (e.g., traditional use plants, species of conservation concern, and invasives); and
- Develop a technical report (Year 1 and 2 sampling) that could be used to assist the development of a Manitoba Hydro Class 2 Environmental Assessment.

1.2 Review of Literature

Existing biophysical and botanical information was used to describe the existing environment for the R44H Transmission Project vegetation monitoring study (e.g., Smith et al. 1998; Manitoba Government 2023a). Botanical and vegetation information that has been previously collected from other work in the vicinity of the monitoring study area was reviewed to assist with the environment description and sample site selection.

In 2011, an assessment of terrestrial ecosystems and vegetation was conducted for the Bipole III Transmission Project (Szwaluk Environmental Consulting et al. 2011). This study overlapped with the proposed R44H Transmission Project, and provided information on vegetation community types, Aboriginal Traditional Knowledge, and distribution of plant species. Surveys for plant species of conservation concern occurred in 2012 for the Bipole III northern project components (Szwaluk Environmental Consulting and Calyx Consulting 2012). Here, a total of 187 vascular and non-vascular plant species were observed during surveys, with 10 listed as species of conservation concern.

From 2014 through to 2019, environmental monitoring of vegetation occurred for the Bipole III Project, which corresponded with the current R44H Transmission Project and surrounding area (Szwaluk Environmental Consulting et al. 2015 to 2019). These monitoring studies were a result of the Project Licence conditions (Manitoba Conservation and Water Stewardship 2013), report on Public Hearing recommendations (Manitoba Clean Environment Commission 2013), and the Environmental Impact Statement commitments (Manitoba Hydro 2011). Detailed surveys were completed for terrestrial vegetation (forested areas), wetlands, plants/communities important to aboriginal people, invasive and non-native species, and species of conservation concern, each with botanical summaries presented.

Botanical and vegetation resources were assessed in 2022 for the proposed R44H Transmission Project (Szwaluk Environmental Consulting and Newman 2022). Twenty-two forest and wetland sites (four on the developed RoW and 18 on the undeveloped RoW) were sampled between the electrical converter stations, and one additional site was sampled along the Kettle River. A total of 130 plant taxa were observed, recorded at 23 sites along the RoW monitoring area, including plants with traditional value, species of conservation concern, and non-native species.

Vegetation communities identified and plant information previously recorded in assessment and monitoring studies, in the current monitoring and surrounding area, are provided in the Existing Environment and Results of this report (Section 3.0). Also provided, is information on ecological land classification, land cover classification, landscape level vegetation, and vegetation and botanical resources.

2.0 METHODS

2.1 Sample Site Selection

The existing ecological land classification developed for the province (Smith et al. 1998) was used to view the study area at a regional and district level. To identify potential sample sites for vegetation monitoring, spatial data (e.g., kmz files on Google maps) provided by Manitoba Hydro was used to view the developed and undeveloped RoW footprint. Satellite imagery of the landscape, infrastructure, and broad land/vegetation cover (i.e., Earth Observation for Sustainable Development, EOSD) were available. The land cover classification (EOSD) used is a national land cover spatial dataset developed by the federal government, previously used for the Bipole III Project (Szwaluk Environmental Consulting et al. 2011).

Approximately 12 new sites were anticipated to be established for sampling in 2023. Suitable sites were selected based on an assessment of the previous years' fieldwork, importance of vegetation types, accessibility and disturbance. All fieldwork was conducted within the developed and undeveloped 42 km RoW, between Radisson and Henday electrical converter stations. Fieldwork occurred mid-July 2023.

2.2 Native Vegetation Survey

Sites selected for vegetation surveys have plots established for future vegetation monitoring. The vegetation survey consisted of establishing sample plots on sites with relatively homogenous vegetation. Vegetation was sampled for composition, abundance and structure. Sampling of selected sites followed methods outlined by Redburn and Strong (2008) and involved the establishment of five 2.5 m by 2.5m 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 was placed at the 5 m mark. The composition of tree cover >2.5 m tall was estimated using a 20 m by 30 m plot centered on each transect. Plant cover was estimated to the nearest 1% for species <15% cover and nearest 5% for those with higher cover. Other incidentally observed species were recorded. Ground cover estimates (%) were recorded and included exposed soil, litter, rock, water and wood. Tree heights, ages and diameter at breast height (dbh) were measured. Site condition measurements included slope and aspect. GPS coordinates and photographs were taken at each sampling site. Plots were staked with conduit pipe (30 cm) and flagged. Permanently located sampling areas can be used to record the change in vegetation that can be systematically monitored through time.

2.3 Botanical Survey

The botanical survey of the study area involved identification and tabulation of all observed vascular plant species including trees, shrubs, forbs and graminoids, and mosses and lichens.

Initially, searches for species of conservation concern involved the review of species previously documented in the vicinity of the study area from past studies (e.g., Szwaluk Environmental Consulting et al. 2011 and 2012). Species of conservation concern that can be expected to range within the ecoregions of the study were requested August 8, 2023 from the Manitoba Conservation Data Centre (MBCDC). Species of conservation concern encompass plants tracked by the MBCDC, and include those listed provincially under Manitoba's *Endangered Species and Ecosystems Act* (ESEA), or federally under the *Species at Risk Act* (SARA) or by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Species are ranked provincially by the MBCDC according to a standardized procedure used by Conservation Data Centres and Natural Heritage Programs in North America on a five-point scale from Critically Imperilled to Secure. Listed below are definitions for interpreting conservation status ranks at the subnational or provincial (S) level. Ranks may also be intermediary between levels.

CRITICALLY IMPERILLED (S1): At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.

IMPERILLED (S2): At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.

VULNERABLE (S3): At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

APPARENTLY SECURE (S4): At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.

SECURE (S5): At very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundant populations or occurrences, with little to no concern from declines or threats.

Under ESEA, SARA and COSEWIC, species at risk are designated into the following categories: Endangered, Threatened, Extirpated, and Special Concern (See Appendix I).

In the field, searches for species of conservation concern concentrated on uncommon plant communities, areas of difficult terrain, and unusual habitats and landscape features. Species of conservation concern include all provincially and federally listed species, as well as Critically Imperilled to Vulnerable species, (i.e., those ranked S1 through S3). A meander search pattern was used when surveying for species of conservation concern, following methods outlined by the Alberta Native Plant Council (2012). Where tracked plants were observed, the following information was recorded: GPS coordinates, number of individuals, population extent (metres), phenology and photographs.

Other plant species of importance, such as traditional use plant species, and invasive and noxious species were reviewed from existing studies (e.g., Szwaluk Environmental Consulting et al. 2011 through 2019).

2.4 Data Preparation and Analyses

All vascular plants were recorded and voucher specimens were collected for those unidentifiable in the field, where the population size permits. Specimens were collected following guidelines of the Alberta Native Plant Council (2006). Identification of vascular plants followed Flora of North America (1993+), and other flora as needed. Plant nomenclature followed the Manitoba Conservation Data Centre provincial species list (Manitoba Government 2023a).

Upon completion of field sampling, the data was digitized and verified for accuracy. For each plot with quantitative sampling, mean values for vegetation percent cover were calculated in plots for tree and tall shrub strata, herb and low shrub understory, the non-vascular stratum, as well as inanimate ground cover.

Total species cover (summed % plant cover) and species richness (actual number of species present) were determined for each plot. Species diversity was calculated using the Shannon diversity index which combines species richness with relative abundance. Equitability was calculated to determine the evenness of species in their distribution within the site.

The Shannon diversity index (1) and equitability (2) are calculated as shown below. The diversity index values fall generally between 1.5 (i.e., low diversity) and 3.5 (Kent and Coker 1996, p97). The equitability (or evenness) value, with an upper limit of 1, is a measure of whether species abundance in a community is evenly distributed.

(1) $$\text{Diversity } H' = -\sum_{i=1}^{s} p_i \ln p_i$$

where s = the number of species
p_i = the proportion of individuals or the abundance of the *i*th species expressed as a proportion of total cover
ln = log base_n

(2) $$\text{Equitability } J = \frac{H'}{H'_{max}} = \frac{\sum_{i=1}^{s} p_i \ln p_i}{\ln s}$$

where s = the number of species
p_i = the proportion of individuals of the *i*th species or the abundance of the *i*th species expressed as a proportion of total cover
ln = log base_n

Although recent research suggests that H' is becoming an expected standard for assessing biological diversity, Strong (2016) suggests that this measure be accompanied by independent analyses of richness and evenness to ensure proper representation of abundance data in ecology.

Sites were described by classifying community types based on plant species composition and abundance using hierarchical cluster analysis. Ward's method was used as the clustering algorithm, with squared Euclidean distance as the dissimilarity measure. Where vegetation community types are listed, naming was based on their structure and species dominance by stratum. Species separated by a slash (/) indicates a change in stratum, while co-dominant species are separated by a dash (-) indicating similar abundance within the stratum. Stand cover followed categories identified in The Canadian Vegetation Classification System (Strong et al. 1990) and included closed (>60%), open (>25-60%), and sparse (≤25%).

Diversity and evenness measures were calculated in Excel. Cluster analysis was performed using the R Statistical Package (R Core Team 2019).

3.0 EXISTING ENVIRONMENT AND RESULTS

3.1 Ecological Land Classification

Ecological classification in Canada is a hierarchical designation describing ecologically distinct areas based on interrelationships of geology, landform, soil, water, vegetation, and human factors, with the ecozone at the coarsest level. The study area occurs within two ecozones, the Boreal Shield to the west and the Hudson Plains to the east. Within the Boreal

Shield Ecozone, the study area overlies the Hayes River Upland Ecoregion, and in the Hudson Plains Ecozone, the study area occurs in the Hudson Bay Lowland Ecoregion. At the ecodistrict level, the study area overlaps the Knee Lake Ecodistrict to the west and the Winisk River Lowland to the east (Map 3-1, Appendix II). Table 3-1 shows the area and proportion of the ecodistricts in the study area.

Table 3-1. Area and proportion of ecodistricts within the study area.

Ecodistrict	Area (ha)	Proportion
Knee Lake	725.4	0.35
Winisk River Lowland	1,319.0	0.65
Total:	**2,044.4**	**1.0**

Ecodistrict Climate

The climate in the Knee Lake and Winisk River Lowland Ecodistricts are characterized by short, cool summers and winters that are very long and cold. Within the Knee Lake Ecodistrict, the mean annual temperature is -4.1°C and the average annual precipitation is approximately 500 mm, with the greatest amount occurring over the summer months.

The Winisk River Lowland Ecodistrict has a very cold, humid subarctic climate with a mean annual temperature of -2.5°C. The average annual precipitation is approximately 690 mm, occurring mostly during the growing season.

3.2 Land Cover Classification

The Land Cover Classification, generated from remote sensing satellite data, details the vegetation classes in the study area (Natural Resources Canada 2000). Ten cover classes occur within the study area, including coniferous and mixedwood forests, wetlands and shrublands. The water class includes rivers and creeks, while the exposed land class occurs primarily on existing transmission line RoWs. The distribution of land cover classes is illustrated in Map 3-2 (Appendix II). The area and proportion of classes in shown in Table 3-2.

Table 3-2. Area and proportion of cover classes within the study area.

Cover Classification	Area (ha)	Proportion
Coniferous Dense	47.5	0.02
Coniferous Open	80.2	0.04
Coniferous Sparse	258.0	0.13
Exposed Land	710.6	0.35
Mixedwood Dense	57.7	0.03
Shrub Tall	186.1	0.09
Water	84.5	0.04
Wetland Herb	13.6	0.01

Wetland Shrub	595.2	0.29
Wetland Treed	10.9	0.01
Total:	**2,044.4**	**1.0**

Within the study area, the dominant cover is exposed land with 710.6 ha (35% of the total area). This cover class exists as sparse vegetation with a mixture of moss, lichen and litter ground cover, where upper canopies have been previously removed for transmission line development. Wetlands occupy 619.7 ha (30%) of the study area, dominated by wetland shrub vegetation (595.2 ha). Coniferous forests occur as sparse, open and dense, representing 385.7 ha (19%), while mixedwood forests occupy 57.7 ha (3%). Tall shrub vegetation makes up 186.1 ha (9%), while waterbodies occupy 84.5 ha (4%) of the study area. A network of rivers, streams and creeks occur in the study area, with the Nelson River being the major drainage system.

3.3 Landscape Level Vegetation

The vegetation across this landscape is primarily coniferous forest, occurring dominantly on organic soils with areas of imperfectly drained mineral soils. The ecodistricts are used here as a detailed level of ecological reference, to describe the existing environment (Smith et al. 1998). In the western portion of the study area, the Knee Lake Ecodistrict is an undulating to ridged morainal plain. Dominant soils in this ecodistrict are Organic Cryosols that are found in peatlands with permafrost. Non-frozen organic soils such as shallow and deep Fibrosols and Mesisols can also be found in veneer bogs, flat bogs and patterned fens. There are also significant areas of mineral soils comprised of Eluviated Eutric Brunisols on imperfectly loamy to sandy calcarious till and sandy to gravelly fluvioglacial deposits and Gray Luvisols on well to imperfectly drained sites. Black spruce (*Picea mariana*) is the dominant forest cover, with jack pine (*Pinus banksiana*) occurring as a common component on dry sandy soils and bedrock outcrops. River valleys and lake shores support white spruce, while trembling aspen occurs where soil conditions are favourable. Stunted black spruce with ericaceous shrub growth and peat mosses (*Sphagnum* spp.) occupy the bog vegetation. Fens support stunted tamarack (*Larix laricina*), shrubs, sedges (*Carex* spp.) and brown mosses.

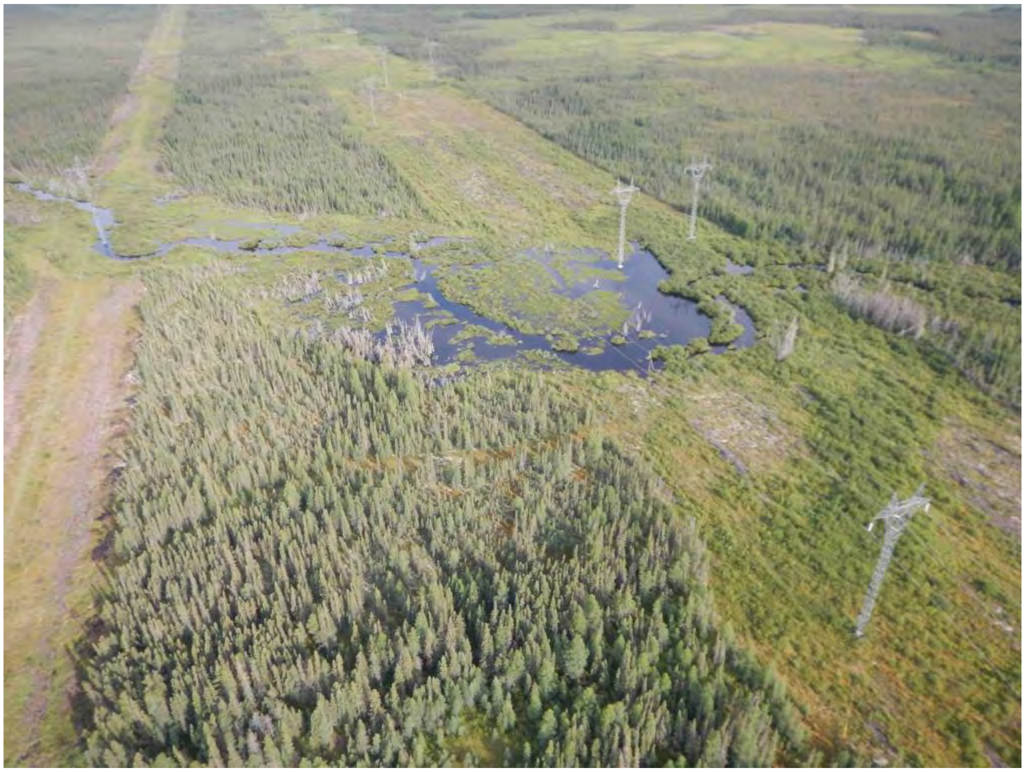
Towards the east, the Winisk River Lowland Ecodistrict is a flat, wetland-dominated plain with widespread permafrost. Organic soils characterized as Cryosols, Mesisols and Fibrisols are the dominant soils found in this ecodistrict, occurring over glaciolacustrine and marine sediments. The Organic Cryosols are typically associated with peat plateau bogs, while Mesisols and Fibrisols are found in horizontal and ribbed fens and string bogs. The vegetation is characterized by open stunted black spruce forest, associated with Labrador tea (*Rhododendron groenlandicum*) and other ericaceous shrubs, mosses and lichens, found on peatlands. Fens support stunted tamarack, bog birch (*Betula pumila*), willows (*Salix* spp.), sedges and mosses. Areas of dominant minerals soils, composed of well to imperfectly drained Eluviated Eutric Brunisols, are found on marine beaches and fluvioglacial deposits. Mineral soils support stands of improved black spruce growth that support an understory of alder (*Alnus* spp.) or willow, with ericaceous shrubs, mosses and lichens.

3.4 Native Vegetation Resources

3.4.1 Vegetation Community Typing

From 2014 through 2019, 12 sites were sampled and monitored (Bipole III Project) in the vicinity of the R44H Transmission Project study area. Terrestrial community types off-RoW were classified as Sparse Black Spruce/Black Spruce Sapling/Labrador Tea/Reindeer Lichens - Sphagnum Mosses, while on-RoW sites were classified as Cloudberry - Labrador Tea/Reindeer Lichen communities (Szwaluk Environmental Consulting et al. 2014). Total percent cover and species richness were recorded at each site, and the diversity index and evenness measures were calculated. Three other sites nearby were qualitatively assessed with species composition and described as black spruce stands with a generally sparse understory (Szwaluk Environmental Consulting et al. 2011).

In 2022, 22 sites were sampled between Radisson and Henday Electrical Converter Stations along the RoW monitoring study area. Four sites were situated on the developed RoW (R44H-13, -21, -22, -23), while all others occur along the undeveloped portion of RoW (Field Activity ID: BPM_EA_Terrestrial_Vegetation_EA_13). With an opportunity to build on previous data collection and record plant species diversity in the study area, 14 additional sites were sampled in 2023. Of these, seven were located on the developed RoW (R44H-26, 27, 29, 32, 33, 35, 36), while the remaining sites were sampled along the undeveloped RoW (Field Activity ID: BPM_EA_Terrestrial_Vegetation_EA_800). Photograph 3-4a shows the developed and undeveloped sampling areas of the RoW. Sites located in the undeveloped RoW are approximately within 60m of the developed RoW. The field data collected includes vegetation composition, abundance (percent cover) and structure from four strata where present, i.e., trees, tall shrub canopy, herb and low shrub understory, and non-vascular ground cover. Based on hierarchical cluster analysis of the quantitative field data, the plant communities from 36 sites were classified into broad vegetation types, see Table 3-4.1a. Existing classification systems were used to support community types where applicable (e.g., Zoladeski et al. 1995; National Wetlands Working Group 1997). An overview of the botanical descriptions in each community type is shown in Table 3-4.1b, (see following Section 3.4.2 for expanded details). Seven additional sites were visited in 2022 and 2023 (R44H-24, 25, 31, 37, 40, 41, 44) to record species composition including traditional use plants, species of conservation concern, and invasive species, within both developed and undeveloped areas of the RoW. Map 3-4 (Appendix II) shows the distribution of monitoring sites along the study area.



Photograph 3-4a. Field study area along the developed (cleared) and undeveloped (centre) portion of the RoW, 2023.

Table 3-4.1a. Three community types in the R44H study area, sampled from 36 sites in 2022 and 2023.

Community Type	Surveys	Species, total	Species, mean
A. Forest Type: Black Spruce Tree/ Sapling/ Seedling- Labrador Tea/Feathermoss- Reindeer Lichens	19	81	21.4
B. Fen Type: Sparse Sapling Tamarack - Bog Birch/ Seedling Bog Birch-Tamarack-Herb Rich- Sedges/ Non-Sphagnum Mosses	12	79	22.3
C. Bog Type: Sparse Tamarack- Black Spruce/ Sparse Sapling Tamarack - Bog Birch/ Bog Birch Seedlings- Leatherleaf- Three-leaved Solomon’s-seal/ Sphagnum Mosses	5	40	19.8

Table 3-4.1b. An overview of mean botanical measures in 36 sites, by vegetation canopy and community type, 2022 and 2023.			
	Community Type		
Vegetation Canopies	**A (Forest)**	**B (Fen)**	**C (Bog)**
Understory (herbs, low shrubs, seedlings)			
Understory Cover (%)	28.1	34.9	32.8
Species Richness	12.0	19.3	15.6
Diversity	1.63	2.26	2.14
Evenness	0.67	0.78	0.79
Mid-canopy (tall shrubs, saplings)			
Tall Shrub Cover (%)	8.0	5.1	3.0
Species Richness	2.0	3.0	2.5
Diversity	0.53	0.85	0.80
Evenness	0.51	0.77	0.91
Tree canopy (>2.5m tall shrubs, trees)◊			
Tree Cover (%)	16.9	3.8	3.4
Species Richness	2.1	1.5	2.0
Diversity	0.61	0.44	0.63
Evenness	0.73	0.64	0.91
Number of Surveys	19	12	5

◊ Five (of 19) forest sites and six (of 12) fen sites are situated on the cleared RoW. Cleared sites are not included with the tree canopy mean values.

3.4.2 Vegetation Community Descriptions

The following descriptions of three community types provide a picture of the dominant vegetation communities, with plant composition and structure. A table following each description shows the overall plant cover, species richness and diversity in the understory vegetation, in the mid-canopy and the tree canopy for all sites within the community type group (Tables 3-4.2a, b and c).

A. Forest type: Black Spruce Tree/ Sparse Black Spruce Sapling/ Black Spruce Seedling-Labrador Tea/Feathermoss- Reindeer Lichens

Vegetation within this community type is classified as Vegetation Type 30, Black Spruce/Labrador Tea/Feathermoss (Zoladeski et al. 1995). These communities are successionally mature and long-lived with abundant black spruce reproduction. Typical soils in these communities include Organics, while Gleysols, Brunisols or Luvisols may be encountered where conditions are suitable.

Nineteen sites make up this group sampled in 2022 (R44H-01, -02, -04, -05, -08 to -10, -13 to -15, -19, -21) and 2023 (R44H-29, -30, -35, -36, -38, -39, -43) (Table 3-4.2a; Photograph 3-4b). Five of these sites are on the developed RoW (R44H-13, -21, -29, -35, -36), while all others are adjacent to the RoW, uncleared. Sites on the developed RoW had no cover values in the tree canopy and are excluded from mean values in the upper canopy (tree) layer. In sites off the RoW, black spruce (*Picea mariana*) along with occasional tamarack (*Larix laricina*) occur in almost every site. The mean total cover of black spruce (*Picea mariana*) is sparse, divided among mature trees (14%), saplings (7%) and seedlings (5%). Within the understory, sites have a relatively well-developed low shrub component, dominated by Labrador tea (*Rhododendron groenlandicum,* 13%). Mountain cranberry (*Vaccinium vitis-idaea*) is sparse (1.4%) but occurs in every site, while bog whortleberry (*V. uliginosum*) and small cranberry (*V. oxycoccos*) are sparse and occur in most sites.

Table 3-4.2a. Black Spruce/ Feathermoss- Reindeer Lichen: Botanical measures in 19 sites, 2022 (R44H-1 through -21) and 2023 (R44H-29 through -43).

	Understory						Mid-canopy		Tree canopy	
	Herbs and woody growth				Lichen-Moss		Tall Shrubs, saplings		Trees, very tall shrubs	
Site	**Cover**	**Rich**	**Div**	**Even**	**Cover**	**Rich**	**Cover**	**Rich**	**Cover**	**Rich**
R44H-01	50.2	19	1.89	0.64	82.2	9	32	4	15	3
R44H-02	23.8	22	2.68	0.87	56.6	8	8.4	6	40	4
R44H-04	14.6	11	1.99	0.83	94.2	7	4.0	1	24	2
R44H-05	24.4	13	1.88	0.73	93.4	6	10.6	2	7	3
R44H-08	28.0	8	1.46	0.70	87.2	9	8.6	1	4	2
R44H-09	25.8	9	1.25	0.57	76.2	8	8.8	2	18	2
R44H-10	24.0	9	1.33	0.60	96.4	9	13.4	2	17	2
R44H-13◊	18.4	7	1.11	0.57	22.6	7	0	-	-	-
R44H-14	31.6	6	0.95	0.53	99.4	7	6.6	1	15	1
R44H-15	24.6	19	2.13	0.72	95.0	9	5.6	3	33	2
R44H-19	23.8	9	1.77	0.80	95.4	7	0.2	1	0	-
R44H-21◊	48.2	6	0.55	0.31	47.4	5	0.2	1	-	-
R44H-29◊	29.4	30	2.60	0.76	33.6	8	2.6	2	-	-
R44H-30	30.6	11	1.81	0.76	96.6	11	3.2	1	8	1
R44H-35◊	24.8	11	1.60	0.67	23.2	10	0.8	1	-	-
R44H-36◊	21.8	8	0.92	0.44	70.6	14	0.2	1	-	-
R44H-38	40	10	1.57	0.68	99.4	10	9.6	3	9	2
R44H-39	22	6	1.33	0.74	94	12	30.4	3	40	1
R44H-43	28.4	14	2.09	0.79	100.4	10	6.2	1	7	2
Mean	**28.1**	**12.0**	**1.63**	**0.67**	**77.0**	**8.7**	**8.0**	**2.0**	**16.9**	**2.1**

◊ Site is situated on the cleared RoW, and not included in the tree canopy mean values.

Photograph 3-4b. Black spruce forest community with Labrador tea, feathermosses and lichens (Site R44H-38), 2023.

In the understory, seedlings of tall shrubs are absent or sparse (0.7% cover) and consist of bog birch (*Betula pumila*). Occasional and sparse (<2% cover) willows (*Salix* spp), soapberry (*Shepherdia canadensis*) or mooseberry (*Viburnum edule*) occur in eight of 19 sites. The sparse understory is herb-poor, cloudberry (*Rubus chamaemorus*) is frequent, while woodland horsetail (*Equisetum sylvaticum*), fireweed (*Chamaenerion angustifolium*) and three-leaved Solomon's seal (*Maianthemum trifolium*) are common. Sedges and grass are generally absent, and account for <1% cover in eight of 19 sites.

The nearly continuous non-vascular cover consists of lichens (43% cover), primarily green reindeer lichen (*Cladonia arbuscula* ssp. *mitis*) and (*C. rangiferina*), and bryophytes (34% cover). The mosses are primarily red-stemmed feathermoss (*Pleurozium schreberi*, 16%), with peat (*Sphagnum* spp, 8%) and/or other mosses occurring in most sites.

This forest group has relatively moderate woody growth in the mid- and upper- canopies. Though tall shrubs are generally absent, tree saplings (7%) dominate the mid-canopy cover. The tree canopy (17% cover in sites off RoW) frequently consists of black spruce (10%) and tamarack (1%), while four of 19 sites also contain jack pine (*Pinus banksiana*) or paper birch (*Betula papyrifera*). Six sites have no woody growth in the tree canopy, five of which are situated on the cleared RoW.

Of trees aged, black spruce are oldest, averaging 63y, to a maximum of 101y. In these forested sites, the black spruce average 11m tall (15cm dbh), with a maximum height of 18m (dbh 27cm). Tamarack on average are 50y, with a maximum of 91y. The less frequently occurring jack pine are 38y on average (see Photograph 3-4c). Both the jack pine and tamarack tend to be smaller trees average 8m tall, with a dbh of 16cm (jack pine) and 11cm (tamarack). A single paper birch measured was 38y and 12m tall (16cm dbh).

Photograph 3-4c. Tree measurements along the undeveloped RoW (Site R44H-04), 2022.

<u>B. Fen Type:</u> <u>Sparse Sapling Tamarack - Bog Birch/ Seedling Bog Birch -Tamarack -Herb Rich- Sedges/ Non-Sphagnum Mosses</u>

Vegetation within this community type can be classified as Horizontal Fen or Collapse Scar Fen (National Wetlands Working Group 1997). Soils in these communities are mainly Mesisols, Humisols or Organic Cryosols.

This wetland group consists of 12 sites (R44H-06, -07, -11, -12, -22, -23, -26, -27, -32, -33, -34, -42) (Table 3-4.2b; Photograph 3-4d) characterized by an abundant cover of non-sphagnum mosses (62%). Six sites are situated on the cleared RoW (R44H-22, -23, -26, -27, -32, -33), and not included with tree canopy means. The understory is moderately well-developed (35% cover), with relatively high components of herbs (14%), sedges (9%) and low shrubs (7%). Herbaceous cover is diverse, most frequently occurring are swamp horsetail (*Equisetum fluviatile*), three-leaved Solomon's-seal and marsh cinquefoil (*Comarum palustre*), while bogbean (*Menyanthes trifoliata*) is abundant in half the sites.

Sedges are diverse, including mud sedge (*Carex limosa*), sparse-flowered sedge (*C. tenuiflora*), prostrate sedge (*C. chordorrhiza*) and boreal bog sedge (*C. magellanica*). Non-vascular brypohyte cover is almost continuous (78%), predominantly non-sphagnum mosses (62%), while lichens occur in just three sites, <2% cover.

Table 3-4.2b. Tamarack-Bog Birch/ Herb rich- Sedges/ non-Sphagnum mosses: Botanical measures in 12 fen sites, 2022 (R44H-06 through -23) and 2023 (R44H-26 through -42).

	Understory						Mid-canopy		Tree canopy	
	Herbs and woody growth				Moss (lichen)		Tall Shrubs, saplings		Trees, very tall shrubs	
Site	**Cover**	**Rich**	**Div**	**Even**	**Cover**	**Rich**	**Cover**	**Rich**	**Cover**	**Rich**
R44H-06	48.0	22	2.43	0.79	94.2	4	26.4	3	6	2
R44H-07	34.8	22	2.61	0.84	89.0	2	6.2	5	1	1
R44H-11	41.8	17	1.98	0.70	69.0	1	0.2	1	1	1
R44H-12	33.2	24	2.36	0.74	80.0	3	4.6	2	2	1
R44H-22◊	12.2	10	2.01	0.87	65.0	1	0	-	-	-
R44H-23◊	36.2	33	2.69	0.77	62.4	3	0.4	2	-	-
R44H-26◊	32.6	20	2.12	0.71	72	1	0	-	-	-
R44H-27◊	30.6	18	2.32	0.80	94.6	5	0	-	-	-
R44H-32◊	42	18	1.87	0.65	74	1	0	-	-	-
R44H-33◊	37.6	14	2.03	0.77	61	1	0	-	-	-
R44H-34	31.4	19	2.49	0.85	99	2	18.2	4	5	2
R44H-42	37.8	15	2.25	0.83	85	8	5.2	4	8	2
Mean	**34.9**	**19.3**	**2.26**	**0.78**	**78.8**	**2.7**	**5.1**	**3.0**	**3.8**	**1.5**

◊ Site is situated on the cleared RoW, and not included in the tree canopy mean values.

Photograph 3-4d. Fen wetland vegetation, with sparse tamarack tree cover (Site R44H-42), 2023.

Woody growth is sparse both in the understory and the upper canopies. Within the understory, low shrub cover (7%) includes the low-growing bog willow (*Salix pedicellaris*), Labrador tea and bog rosemary (*Andromeda polifolia*). Seedlings of tall growing species have very sparse cover, in 10 of 12 sites. Tree seedlings (3% cover) are primarily tamarack and black spruce, while tall shrub seedlings (2%) include tall-growing willows (e.g., *Salix planifolia*) or bog birch.

The upper canopies of the fen sites are poorly developed. The sparse mid-canopy (5% cover) consists of tamarack saplings, bog birch and occasional black spruce saplings. The tree canopy in the undeveloped RoW is sparse (4%), made up of tamarack and occasional black spruce. The oldest tree measured was a single black spruce, 86y and 5 m tall (5.6cm dbh). The oldest tamarack was aged in the field at 83y, average age for tamarack is 52y and 7m tall (9cm dbh).

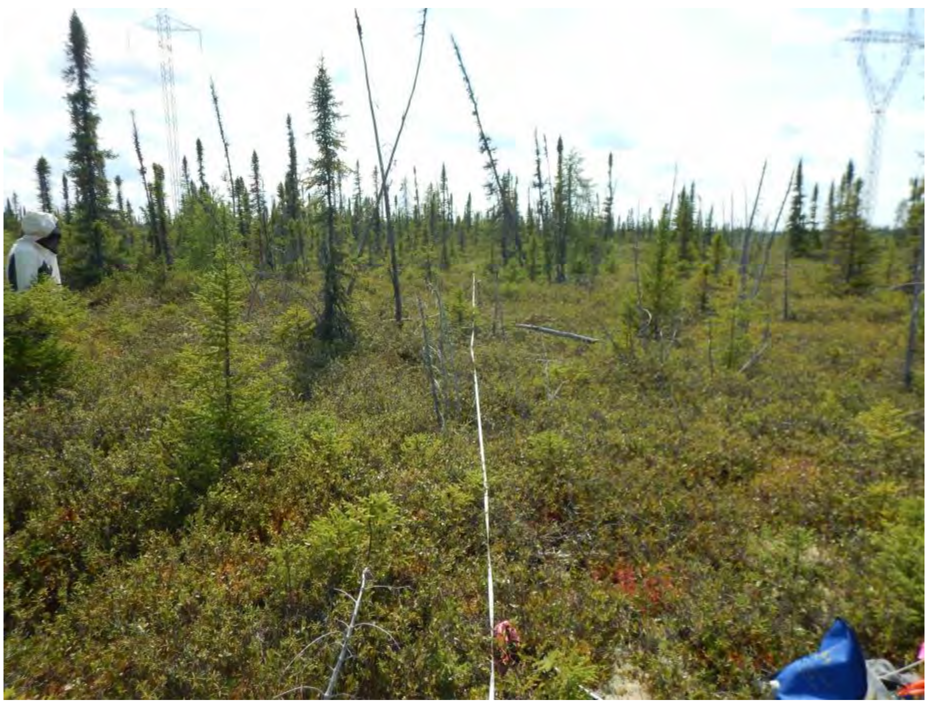
C. Bog Type: Sparse Tamarack- Black Spruce / Sparse Sapling Tamarack - Bog Birch/ Bog Birch Seedlings- Leatherleaf- Three-leaved Solomon's-seal/ Sphagnum Mosses

Vegetation within this community type can be classified as Vegetation Type 33, Black Spruce/Sphagnum (Zoladeski et al. 1995). As a result of nutrient-poor and wet site conditions, processes of vegetational development are slow. Soils in these communities are organic and can be classified as Fibrisols, Mesisols or Humisols. Organic Cryosols may be encountered within the discontinuous zone of permafrost.

Five sites (R44H-03, -17, -18, -20, -28) are categorized in this group, characterized by their abundant cover of Sphagnum mosses (Table 3-4.2c; Photograph 3-4e). Sites have a moderately well-developed understory (33% cover), dominated by low shrubs (13%) such as bog rosemary, leather-leaf (*Chamaedaphne calyculata*) and small cranberry, herbs (11%) such as round-leaved sundew (*Drosera rotundifolia*) and three-leaved Solomon's-seal (*Maianthemum trifolium*). Sedges are very sparse (3%) with boreal bog sedge and prostrate sedge occurring frequently. Woody seedlings are also a minor understory component, including tree seedlings (<3%) of tamarack and black spruce, and tall shrub seedlings (<3%), mainly bog birch. Non-vascular cover is continuous bryophyte (95%), primarily Sphagnum (86%) and other mosses, while lichens (2%) are sparse and infrequent.

The upper woody canopies are sparsely developed. The mid canopy (5%) consists of bog birch, and saplings of tamarack, with black spruce. The tree canopy (4%) is evenly split between tamarack and black spruce cover. Sites in this group contained the oldest trees measured. A single tamarack was aged in the field at 172y, and on average tamarack range between 3.6-7m tall, and 3.5-9cm dbh. Black spruce were aged between 55-144y (106y average), and measured 5.9m tall (5.4-6.6m) and 5.6cm dbh (3-8cm).

Table 3-4.2c. Tamarack-Black Spruce/ Sphagnum: Botanical measures in five bog sites, 2022 (R44H-03 through -20) and 2023 (R44H-28).										
	Understory						**Mid-canopy**		**Tree canopy**	
	Herbs and woody growth				**Moss (lichen)**		**Tall Shrubs, saplings**		**Trees, very tall shrubs**	
Site	**Cover**	**Rich**	**Div**	**Even**	**Cover**	**Rich**	**Cover**	**Rich**	**Cover**	**Rich**
R44H-03	35.8	17	2.34	0.83	94.2	2	2.4	2	2	2
R44H-17	26.8	11	1.86	0.78	94.6	6	2	2	3	2
R44H-18	44.6	17	2.13	0.75	98.2	2	7.2	3	7	2
R44H-20	45.6	24	2.71	0.85	97	7	3.6	3	5	2
R44H-28	11	9	1.65	0.75	100	1	0	-	0	-
Mean	**32.8**	**15.6**	**2.14**	**0.79**	**96.8**	**3.6**	**3.0**	**2.5**	**3.4**	**2.0**



Photograph 3-4e. Sparse treed vegetation with low shrubs, herbs and Sphagnum mosses (Site R44H-17), 2022.

Other Sites Visited

Seven other sites were visited which involved the identification and tabulation of vascular and non-vascular plant species in the study area. Sites were purposefully selected to record traditional use plants, species of conservation concern, and invasive species.

Site R44H-24, along the Kettle River (visited in 2022), was characterized as riparian shrub (Photograph 3-4f). Vegetation consisted of tall shrubs including speckled alder (A*lnus incana*), tea-leaved willow (*Salix planifolia*) and bog birch (*Betula pumila*). In the understory, tall mannagrass (*Glyceria grandis*) and marsh reed grass (*Calamagrostis canadensis*) were widespread graminoids, while fireweed (*Chamaenerion angustifolium*) was frequently occurring. Other species observed were scattered in occurrence, including red baneberry (*Actaea rubra*), veiny meadow-rue (*Thalictrum venulosum*), common mint (*Mentha canadensis*), American purple vetch (*Vicia americana*), common bearberry (*Arctostaphylos uva-ursi*), and bulrush (*Scirpus* sp.).

Photograph 3-4f. Riparian vegetation along the Kettle River, captured in 2023.

Six other sites were visited in 2023. Site R44H-25 was assessed off Provincial Road 290, near Henday Converter Station (Photograph 3-4g). Roadside, shrub cover consisted of willows, bog birch, highbush-cranberry (*Viburnum opulus*), and soapberry (*Shepherdia canadensis*). The ditch was crossed to access the forest composed of tamarack (*Larix laricina*), trembling aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*), and black spruce (*Picea mariana*) in the tree canopy. Several berry species were recorded including red raspberry (*Rubus idaeus*), dewberry (*Rubus pubescens*), stemless raspberry (*Rubus arcticus*), smooth wild strawberry (*Fragaria virginiana*), and common bearberry. Invasive white sweet clover (*Melilotus albus*) and noxious common dandelion (*Taraxacum officinale*) were present roadside (Section 3.5.3). Two species of conservation concern were recorded, common moonwort (*Botrychium lunaria*, S3S4) and rock willow (*Salix vestita,* S3), discussed in Section 3.5.4. Fifty-five species were recorded at this site.

Photograph 3-4g. Site R44H-25 near Henday Converter Station, 2023.

The south side of the Nelson River was open-canopied black spruce forest vegetation (R44H-31.). Sparse tamarack, paper birch (*Betula papyrifera*) and trembling aspen were present in the tree canopy. A sparsely developed tall shrub stratum consisted of green alder (*Alnus alnobetula*) and willows (*Salix* spp.). The low shrub stratum was dominated with Labrador tea (*Rhododendron groenlandicum*). Also present in the understory were wild red currant (*Ribes triste*), prickly rose (*Rosa acicularis*), red raspberry, dewberry, bog cranberry (*Vaccinium vitis-idaea*) and bog whortleberry (*Vaccinium uliginosum*) (see Section 3.5.2 for traditional use plants). A total of 34 vascular and non-vascular species were recorded (Photograph 3-4h).

Photograph 3-4h. Site R44H-31 south side of the Nelson River, 2023.

Boots Creek was surveyed on the developed RoW (R44H-37). Deciduous shrub cover (1 to 3 m height) along the water's edge consisted mainly of willows, speckled alder, and bog birch. Forty-eight species were recorded at this location, with 38 plants in the herb and low shrub stratum. Vegetation was relatively diverse compared to some other sites partially due to the transition between previous forest cover and lowland habitat (Photograph 3-4i). Species of conservation concern floating marsh-marigold (*Caltha natans*, S2S4) was observed at this site (see Section 3.5.4).

Photograph 3-4i. Boots Creek surveyed along the developed RoW (Site R44H-37), 2023.

Site R44H-40 was surveyed roadside (west side of Provincial Road 280) near Radisson Converter Station. Crossing at this location was unsafe due to the water in the ditch and soft ground conditions. Deciduous tall shrubs were dominated by a mixture of willows (*Salix bebbiana, S. discolor, S. glauca*) with bog birch. Abundant herbs and low shrubs consisted of smooth wild strawberry, common bearberry, common yarrow (*Achillea millefolium*), great red paintbrush (*Castilleja miniata*) and various grasses and sedges. Noxious common dandelion and invasive white sweet clover were recorded along the road edge. Adjacent to the ditch, forest vegetation was composed of tamarack with a presence of black spruce and balsam poplar in the tree canopy.

Located near Radisson Converter Station, site R44H-41 (east side of Provincial Road 280) consisted of forest vegetation with a mixture of open shrub in an existing transmission distribution RoW (Photograph 3-4j). Vegetation at this site was non-homogenous with 47 species recorded. The forest canopy supported tamarack and black spruce with an understory of Labrador tea and feathermoss. Paper birch had a minor component in the tree canopy. Areas of tall shrubs supported green alder, bog birch, and various willows. The herb and low shrub stratum was composed of various forbs and graminoids, but with prominent species such as common bearberry, bog cranberry, bog whortleberry and stemless raspberry (*Rubus arcticus*). Vulnerable species little-leaved pussytoes (*Antennaria microphylla,* S3S5) was observed at this location. Roadside, notable non-native species were alsike clover (*Trifolium hybridum*), white sweet clover and common dandelion.

Photograph 3-4j. Site R44H-41 near Radisson Converter Station, 2023.

Site R44H-44 was established near Provincial Road 290 to document a unique and incidental observation of invasive species smooth catchfly (*Silene csereii*) on the developed RoW, see Section 3.5.3.

3.5 Botanical Resources

3.5.1 Plants and Distribution of Species

Vegetation composition was recorded at 43 sites along the RoW monitoring area, with a total of 168 plant taxa observed, including 148 vascular plants and 20 non-vascular species (Field Activity IDs: BPM_EA_Terrestrial_Vegetation_EA_13 and 800). The flora in Appendix V presents plants grouped alphabetically by family and within order of taxonomic groupings: primitive vasculars (e.g., ferns and horsetails), gymnosperms (conifers), angiosperms (flowering plants) and non-vascular plants (lichens and mosses). The Angiosperms included 141 taxa, 82% of all species recorded. These are the monocotyledons (e.g., graminoids, lilies, orchids; 40 taxa) and the dicotyledons (broadleaf herbs and shrubs; 101 taxa). Six primitive vasculars, four gymnosperms, and 20 non-vascular plants were also identified.

Vascular plants were distributed among 39 families, 35 of which are angiosperms. The sedge (Cyperaceae) family was the best represented with 23 plant taxa, followed by the aster (Asteraceae, 14 taxa), heath (Ericaceae, 13 taxa) and willow (Salicaceae, 12 taxa) families. Nine species were observed in each of the grass (Poaceae) and rose (Rosaceae) families. The primitive vasculars are horsetail (Equisetaceae), club-moss (Lycopodiaceae) and adders-tongue (Ophioglossaceae) families, while species within the gymnosperms are members of the pine (Pinaceae) family. Nine non-vascular families were recorded. Photograph 3-5a shows sampling of vegetation along the RoW.

Photograph 3-5a. Sampling of vegetation along the developed RoW, 2023.

3.5.2 Traditional Use Plant Species

Aboriginal traditional knowledge can be considered a dynamic process of learning from elders and observing from nature, while adapting this knowledge to enhance the quality of life (Marles et al. 2000). Primarily preserved by indigenous oral traditions passed down through generations, the written documentation of traditional knowledge, particularly when led by individual Indigenous communities, can help preserve local knowledge and culture. Indigenous people have been sustainably gathering and harvesting plants from the boreal forest in Canada for thousands of years (Marles et al. 2000). Traditional knowledge often centers around plants and their use as food and medicines, for handicrafts and technology. Communities in and around the study area have long histories of living on the land with a deep knowledge and appreciation for the plants growing in their resource areas.

Several previous self-directed Aboriginal Traditional Knowledge studies completed by Fox Lake Cree Nation (Ross and Fox Lake Cree Nation 2011), Tataskweyak Cree Nation (Tataskweyak Cree Nation 2011) and the Manitoba Metis Federation (Manitoba Metis Federation 2011) were used as the foundation for identifying Traditional Use plants in the study area. An outcome of a subsequent study (Szwaluk Environmental Consulting et al. 2011) cross-referenced an occurrence list of plant species in the R44H Transmission Project monitoring area, with the previously documented traditional use plants. This list identifies greater than 20 different species of trees, shrubs, herbs and other plants that have been used for sustenance and in traditional cultural practices (Table 3-5.2a). However, the table is considered a conservative account of traditional use plants in the area, due to multiple various unknown species included, and additional traditional use species identified by surrounding communities outside the study area.

Table 3-5.2a. Selected traditional use plant species identified from self-directed studies, completed by Fox Lake Cree Nation, Tataskweyak Cree Nation, and the Manitoba Metis Federation.

Growth Form	Scientific Name	Common Name
Tree	*Populus balsamifera*	Black poplar buds
Tree	Various species	Balsam bark
Tree	Various species	Fuel wood
Tall Shrub	*Amelanchier alnifolia*	Saskatoon
Tall Shrub	*Cornus sericea*	Red willow
Tall Shrub	*Sambucus racemosa*	Elderberry
Tall Shrub	*Prunus pensylvanica*	Pincherry
Tall Shrub	*Prunus virginiana*	Chokecherry
Tall Shrub	*Viburnum lentago*	Nana/ nanny berry
Low Shrub	*Rhododendron groenlandicum*	Labrador tea
Low Shrub	*Ribes* spp.	Gooseberry, blackberry
Low Shrub	*Rubus chamaemorus*	Cloudberry
Low Shrub	*Rubus idaeus*	Raspberry
Low Shrub	*Vaccinium* spp.	Blueberry, moss berry
Low Shrub	*Viburnum* spp.	Cranberry
Herb	*Acorus americanus*	Weeka root
Herb	*Anthoxanthum hirtum*	Sweet grass
Herb	*Armoracia rusticana*	Horse radish
Herb	*Artemisia* spp.	Sage
Herb	*Fragaria virginiana*	Strawberry
Herb	*Sarracenia purpurea*	Pitcher plant
Various Species	Various species	Wild tea, medicinal plants, berries, bear nuts, frog leaf, fiddle heads, mushrooms

At least 36 plants, with traditional value according to the local Cree Nations and communities of the area, were recorded during vegetation sampling in the study area in 2022 and 2023 (Field Activity IDs: BPM_EA_Terrestrial_Vegetation_EA_13 and 800). Twenty-seven species were recorded in or adjacent to quantitative sampling plots, an additional nine species were recorded from visits to qualitative sites. Traditional use species included seven trees, five tall shrubs and 24 herbs and low shrubs. The most frequent species observed were trees, black spruce (35 sites) and tamarack (28 sites), and low shrubs, Labrador tea (32 sites), bog cranberry (26 sites), small cranberry (25 sites), cloudberry (21 sites), and bog whortleberry (16 sites). Photograph 3-5b shows a black spruce stand with traditional use plant species recorded during field studies. Additional traditional use species include trees, paper birch, jack pine, white spruce (*Picea glauca*), balsam poplar (*Populus balsamifera*), and trembling aspen (*Populus tremuloides*), and tall shrubs Bebb's willow (*Salix bebbiana*), highbush-cranberry (*Viburnum opulus*), and soapberry. Low shrubs and herbs with traditional value include common bearberry, alpine bearberry (*Arctous rubra*), bunchberry (*Cornus canadensis*), black crowberry (*Empetrum nigrum*), smooth wild strawberry (*Fragaria virginiana*), common mint, one-sided wintergreen (*Orthilia secunda*), pink pyrola (*Pyrola asarifolia*), dwarf Labrador-tea (*Rhododendron tomentosum*), wild red currant (*Ribes triste*), prickly rose (*Rosa acicularis*), stemless raspberry (*Rubus arcticus*), red raspberry (*Rubus idaeus*), pitcher plant (*Sarracenia purpurea*), velvet-leaf blueberry (*Vaccinium myrtilloides*), mooseberry, red osier dogwood (*Cornus sericea*), dewberry (*Rubus pubescens*), and common yarrow (*Achillea millefolium*).

The number of traditional use species per site is similar across the developed (1.5 species/ site) and undeveloped (1.2 species/ site) RoW. As traditional use includes several tall woody species (tall shrubs and trees), RoW sites that are developed (5.2 observations/site) have fewer observations of traditional use species than undeveloped sites (9.8 observations/ site). The development of the R44H RoW would likely show similar results for the occurrence of traditional use species to the existing developed RoW monitored. Photograph 3-5c shows traditional use plant species recorded at site R44H-43.

Traditional use plants are found throughout all vegetation community types, with greatest cover in forested sites, as many of the previously documented valued species are trees and low shrubs, see Table 3-5.2b for overview.

Photograph 3-5b. Black spruce forest with traditional use species including Labrador-tea, cloudberry and bog cranberry, 2023.

Photograph 3-5c. Traditional use plant species recorded during field studies including Labrador tea, dwarf Labrador-tea, and bog whortleberry, 2023.

Table 3-5.2b. An overview of traditional use species, mean percent cover and species richness, by canopy level in three vegetation community types, 2022 and 2023.						
	Understory		**Mid-canopy**		**Tree Canopy**	
Vegetation Type	**Cover**	**Rich**	**Cover**	**Rich**	**Cover**	**Rich**
A. Forest Type: Black Spruce/ Feathermoss-Reindeer Lichen	23.5	6.5	7.4	1.6	16.9	1.9
B. Fen Type: Tamarack Bog Birch/Sedge/ non-Sphagnum	6.3	3.4	3.7	0.8	3.8	1.5
C. Bog type: Tamarack-Black Spruce/Sphagnum	8.2	3.8	1.6	1.4	3.4	1.6

Table 3-5.2c, below, shows the mean percent cover of each plant growth form by vegetation community type. The understory of forest sites has the greatest mean cover of traditional use species (24%), primarily consisting of low growing shrubs (15%; such as Labrador tea, various berries and rose), tree seedlings (5%) and herbs (3%; including cloudberry, bunchberry). All canopy trees in forest sites (17% cover in uncleared sites) are considered traditional use species (generally coniferous trees, but also paper birch and poplars). The greatest tree cover reaches 40% black spruce cover (R44H-39), and 38% cover of black spruce mixed with paper birch and tamarack (R44H-02).

The lower mean abundance (by cover) of traditional use plants in wetland communities is due in part to the lack of trees in all canopy layers (mature trees, saplings and seedlings), as well as the absence or much reduced cover of the low shrub Labrador tea. In fen type sites, traditional use species provide 6% cover in the understory, evenly split between low shrubs (Labrador tea, small cranberry, bog whortleberry) and tree seedlings (black spruce and tamarack). There are few forbs and no tall shrub seedlings. Traditional use species in the understory of Sphagnum bog type sites provide 8% cover, which consists of low shrubs (4%; Labrador tea and small cranberry), tree seedlings (<3%; black spruce and tamarack) and one herb (<2%; cloudberry).

Sparsely occurring, traditional herbs are a relatively minor component in all sites, accounting for <3% mean cover in the forest understory and <2% cover in the bog sites. While fen sites have slightly higher forb diversity, traditional herbs such as stemless raspberry, pink pyrola and pitcher plant provide 0.5% cover. Tall shrubs, including those with traditional uses, are absent in wetlands. Very sparse Bebb's willow, soapberry, and mooseberry occur in forested sites as seedlings or in the upper canopies. Instead, black spruce and tamarack saplings account for the mid-canopy cover in all sites, see Table 3-5.2c.

Table 3-5.2c. Distribution of traditional use plants in 36 sites (2022 and 2023), by plant growth form in three canopies. Mean percent cover is shown for each vegetation community type.

	Veg. Community Type		
Canopy, plant form	**A: Black Spruce Feathermoss**	**B: Tamarack Sedge Fen**	**C: Tamarack Black Spruce Sphagnum Bog**
Understory			
Herbs	2.6	0.5	1.5
Low shrubs	15.4	3.1	4.1
Tall shrub seedlings	0.2	-	-
Tree seedlings	5.3	2.7	2.6
Total cover, understory:	*23.5*	*6.3*	*8.2*
Mid Canopy			
Tall shrubs	0.1	-	-
Tree saplings	9.7	7.3	1.6
Total cover, mid-canopy:	*9.8*	*7.3*	*1.6*
Tree Canopy			
Tall shrubs	0.1	-	-
Trees	16.8	3.8	3.4
Total cover, tree canopy:	*16.9*	*3.8*	*3.4*

3.5.3 Invasive Plant Species

A number of invasive and non-native species may occur along the RoW monitoring area. While uncommon in undisturbed boreal forest habitats, non-native species can be introduced along roads, rivers and RoWs, and often follow human activities. Introduced species grow outside of their region of origin and generally thrive on disturbed sites, are often prolific seed producers, and can tolerate poor or disturbed soils (Langor et al. 2014). Where established, invasive and non-native plants can impact ecosystem diversity, structure and function. Invasive species compete with native species and can form dense patches that may subsequently spread to other areas. Displacement of native species changes the floristic composition of an ecosystem, and can render habitat unsuitable for native species and invasive species have been cited as risk factors for species of concern (Canadian Food Inspection Agency 2008). Invasive and non-native plants in the boreal are commonly perennial herbs and grasses, particularly among the Asteraceae (composites), Fabaceae (legumes), and Poaceae (grasses) families (Langor et al. 2014). The Noxious Weeds Regulation list plant species under The Noxious Weeds Act (Manitoba Government 2023b) in three Tiers, Tier 1 is most noxious. Noxious weeds may include species that are invasive or non-native.

Few invasive, non-native and noxious species were previously recorded in the vicinity of the R44H Transmission Project monitoring area (Szwaluk Environmental Consulting et al. 2011 through 2019). Species recorded in previous monitoring included bladder campion (*Silene vulgaris*), common dandelion (*Taraxacum officinale*), creeping bentgrass (*Agrostis stolonifera*), and pineappleweed (*Matricaria discoidea*). Of these species, only bladder campion (Tier 2) and common dandelion (Tier 3) are listed as noxious plants.

During 2022 and 2023 surveys, nine non-native species (SNA; MBCDC) were observed incidentally (Table 3-5.3), mainly along existing roadways and trails both on the developed and undeveloped RoW. A single occurrence of common dandelion was present in a sampling quadrat on the developed RoW (R44H-29 with 0.4% cover). (Field Activity IDs: BPM_EA_Terrestrial_Vegetation_EA_13 and 800). On average, the number of non-native species per site on the developed RoW (0.46 species/ site) was greater than in sites on the undeveloped RoW (0.20 species/ site). However, the number of observations, was only slightly higher in developed sites (0.54 observations/ site) than in undeveloped sites (0.47 observations/ site). Three non-native plants recorded are also listed as noxious (Manitoba Government 2023b), including oxeye daisy (*Leucanthemum vulgare*, Tier 2) and two Tier 3 plants. Oxeye daisy (Photograph 3-5d) was hand-pulled and removed where observed. Five species are considered invasive due to their tendency to outcompete native species and dominate habitats once introduced (Canadian Food Inspection Agency 2008; Invasive Species Council of Manitoba 2023). Of these invasive species, smooth catchfly was observed on the developed RoW, and subsequently hand-pulled and removed from the site (Photograph 3-5e). The development of the R44H RoW would likely show similar results for the occurrence of non-native species to the existing developed RoW monitored.

Table 3-5.3. Non-native, invasive and noxious species with status, recorded across sites in 2022 and 2023.

Species	Common Name	Sites	Status	Family
Crepis tectorum	Narrow-leaved Hawksbeard	R44H-21	SNA, Tier 3	Asteraceae
Leucanthemum vulgare	Oxeye Daisy	R44H-01	SNA, CFIA, ISCM, Tier 2	Asteraceae
Medicago sativa	Alfalfa	R44H-01	SNA, CFIA	Fabaceae
Melilotus albus	White Sweet Clover	R44H-01, 23, 25, 40, 41	SNA, CFIA	Fabaceae
Melilotus officinalis	Yellow Sweet Clover	R44H-23	SNA, CFIA	Fabaceae
Silene csereii	Smooth catchfly	R44H-44	SNA, CFIA	Caryophyllaceae
Taraxacum officinale	Common Dandelion	R44H-02, 23, 25, 29, 40, 41	SNA, Tier 3	Asteraceae
Trifolium hybridum	Alsike Clover	R44H-02, 41	SNA	Fabaceae
Trifolium repens	White Clover	R44H-01, 02, 23	SNA	Fabaceae

Note: SNA: status rank not applicable, MBCDC; CFIA Invasive status: Canadian Food Inspection Agency; ISCM: Invasive Species Council of Manitoba; Tier 2 and 3: Noxious Weeds Act.

Photograph 3-5d. Oxeye daisy observed near Site R44H-01, 2022.

Photograph 3-5e. Smooth catchfly observed along the developed RoW at R44H-44, 2023.

3.5.4 Species of Conservation Concern

The vegetation communities in the monitoring area support a wide range of species. According to the Manitoba Conservation Data Centre, there are 24 species of conservation concern that can be expected to range within the Hayes River Upland Ecoregion and 19 within the Hudson Bay Lowland Ecoregion (MBCDC Information Request August 8, 2023). There are currently no species at risk listed with either the *Endangered Species and Ecosystems Act* (ESEA), *Species at Risk Act* (SARA) or by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Six species of conservation concern were previously recorded on or in the vicinity of the RoW monitoring area (Manitoba Conservation Data Centre records and Szwaluk Environmental Consulting et al. 2011 through 2016). Two species are ranked Critically Imperilled (S1), the remaining four species are ranked Imperilled to Vulnerable (S2S3 to S3S4), Table 3-5.4. Species of conservation concern were observed from a diversity of habitats, including coniferous forested sites, wetlands, and exposed areas.

Table 3-5.4. Species of conservation concern recorded in the vicinity of the R44H Transmission Project monitoring area prior to 2022.

Scientific Name	Common Name	MBCDC Rank	Family
Critically Imperilled to Imperilled			
Askellia elegans	Elegant Hawksbeard	S1	Asteraceae
Poa arctica ssp. *caespitans**	High Arctic Bluegrass	S1?	Poaceae
*Arabidopsis arenicola**	Arctic Rockcress	S2S3	Brassicaceae
Salix arbusculoides	Shrubby Willow	S2S3	Salicaceae
Vulnerable			
Salix vestita	Rock Willow	S3	Salicaceae
Pinguicula villosa	Hairy Butterwort	S3S4	Lentibulariaceae

Note: * Manitoba Conservation Data Centre records prior to 2011.

Twelve species of conservation concern were observed during surveys in 2022 and 2023 along the monitoring area. Counts and frequency of species of conservation concern are slightly higher per site on the developed RoW (0.54 species and 0.69 observations per site) than on the undeveloped RoW (0.30 species and 0.57 observations per site), (Field Activity IDs: BPM_EA_Terrestrial_Vegetation_EA_13 and 800). The development of the R44H RoW may show similar results for the occurrence of species of conservation concern to the existing developed RoW monitored. Three species are ranked Imperilled, small-flowered lousewort (*Pedicularis parviflora*, S2S3) shrubby willow (*Salix arbusculoides*, S2S3) and floating marsh-marigold (*Caltha natans*, S2S4). The remaining nine species are ranked Vulnerable (S3 to S3S5), see Table 3-5.5. No species listed by ESEA, SARA or COSEWIC were observed during field studies.

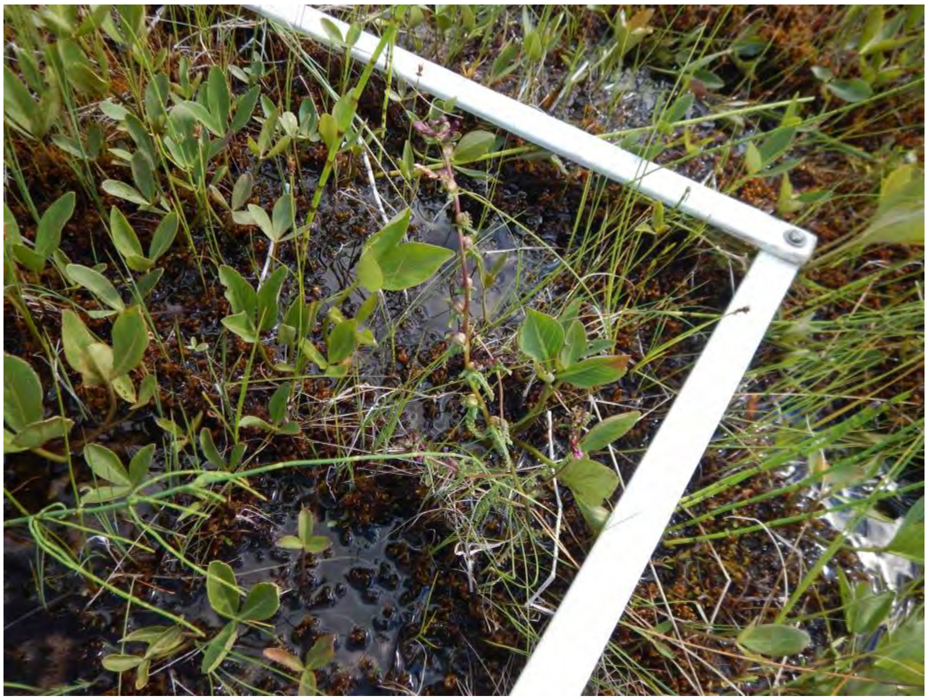
Table 3-5.5. Species of conservation concern recorded along the R44H Transmission Project monitoring area, observed in 2022 and 2023.			
Scientific Name	**Common Name**	**MBCDC Rank**	**Family**
	Imperilled		
Caltha natans	Floating Marsh-marigold	S2S4	Ranunculaceae
Pedicularis parviflora	Small-flowered Lousewort	S2S3	Orobanche
Salix arbusculoides	Shrubby Willow	S2S3	Salicaceae
	Vulnerable		
Antennaria microphylla	Little-leaved Pussytoes	S3S5	Asteraceae
Botrychium lunaria	Common Moonwort	S3S4	Ophioglossaceae
Drosera anglica	Oblong-leaved Sundew	S3S4	Droseraceae
Lonicera oblongifolia	Swamp-fly-honeysuckle	S3S5	Caprifoliaceae
Pedicularis labradorica	Labrador Lousewort	S3S4	Orobanche
Pinguicula villosa	Hairy Butterwort	S3S4	Lentibulariaceae
Rhododendron tomentosum	Dwarf Labrador-tea	S3S5	Ericaceae
Rhynchospora alba	White Beakrush	S3	Cyperaceae
Salix vestita	Rock Willow	S3	Salicaceae

Habitat and biological information for the species of conservation concern below was taken from the Flora of North America (1993+) and Johnson et al. (1995).

Caltha natans (Floating marsh-marigold, S2S4) was recorded at Boots Creek (R44H-37) on the developed RoW (Photograph 3-5f). This plant was observed floating in shallow water near the creek edge. Flowering occurs late spring to summer (June to August) and is usually found floating on lakes, slow-moving rivers and creeks, or on moist soil.

Photograph 3-5f. Floating marsh-marigold (centre) observed at Boots Creek, 2023.

Pedicularis parviflora (Small-flowered lousewort, S2S3) was observed in fen wetlands along the developed (R44H-26, 32) and undeveloped RoWs (R44H-12), see Photograph 3-5g. Where observed, the developed RoW was herb dominated while tamarack was recorded in the tall shrub and tree strata of the undeveloped RoW. Flowering occurs June through August. Habitat includes: muskegs, boggy flood plains, gravel stream bars, moist meadows, sedge meadows, fens, bogs, and black spruce-tamarack wetlands.



Photograph 3-5g. Small-flowered lousewort (purple flowers) observed along the developed RoW (R44H-32), 2023.

Salix arbusculoides (Shrubby willow, S2S3) was incidentally recorded on the developed RoW near site R44H-21. Shrubby willow flowers mid-May to early July, and is found along stream margins, lakeshores, openings in white spruce forests, treed bogs, sedge fens, edges of alpine and arctic tundra.

Antennaria microphylla (Little-leaved pussytoes, S3S5) was found along the undeveloped RoW at the edge of a mixedwood forest, near Radisson Converter Station (R44H-41). Little-leaved pussytoes flowers early to mid-summer, and prefers moist open areas, flood plains of streams, margins of alkaline depressions, subarctic habitats.

Botrychium lunaria (Common moonwort, S3S4) was observed along the undeveloped RoW at the edge of a black spruce stand, near Henday Converter Station (R44H-25), see

Photograph 3-5h. Leaves appear in spring, dying in the latter half of summer. Habitat of common moonwort included open fields, and occasionally forests.

Photograph 3-5h. Common moonwort observed near Henday Converter Station, 2023.

Drosera anglica (Oblong-leaved sundew, S3S4) was found in fen wetlands along the developed (R44H-32, 33) and undeveloped RoWs (R44H-12). The developed RoW was herb dominated while tamarack occurred in the upper canopies of the undeveloped RoW. Flowering occurs June to August, and the species is found along marly shores, fens, and drainage tracks in peat bogs (Photograph 3-5i).

Photograph 3-5i. Oblong-leaved sundew recorded at R44H-33, 2023.

Lonicera oblongifolia (Swamp-fly-honeysuckle, S3S5) was observed at R44H-07 in a fen wetland along the undeveloped RoW. Flowering is May to June for swamp-fly-honeysuckle and is found in wet woods and treed fens.

Pedicularis labradorica (Labrador lousewort, S3S4) was recorded at site R44H-23 on the previously cleared RoW. Labrador lousewort flowers June through August in open forests, tundras, heathlands, rocky slopes, and muskegs.

Pinguicula villosa (Hairy butterwort, S3S4) was found at six sites, along both the developed (R44H-13) and undeveloped (R44H-03, 17, 20, 30, 38) RoWs (Photograph 3-5j). Hairy butterwort is a small species (2 to 5 cm tall) and typically grows in bogs on sphagnum hummocks.

Photograph 3-5j. Hairy butterwort observed along the undeveloped RoW (R44H-30), 2023.

Rhododendron tomentosum (Dwarf Labrador-tea, S3S5) occurred in five plots along the developed (R44H-27) and undeveloped RoWs (R44H-19, 20, 30, 43), see Photograph 3-5k. Flowering occurs during the spring and summer. Habitat includes: bogs, muskeg, tundra, and raised beach ridges.

Photograph 3-5k. Dwarf Labrador-tea recorded at R44H-27, 2023.

Rhynchospora alba (White beakrush, S3) was observed in a fen wetland (R44H-12), along the undeveloped RoW. White beakrush fruits in the summer through fall, and can be found in sphagnum bogs, open sites, and poor fens.

Salix vestita (Rock willow, S3) was recorded along the undeveloped RoW at two sites, in a black spruce stand (R44H-15), and near Henday Converter Station (R44H-25) (Photograph 3-5l). Flowering occurs mid-June to late July. Rock willow occurs in moist to open forests, rocky streamsides, and subalpine zones.

Photograph 3-5l. Rock willow observed near Henday Converter Station, 2023.

4.0 RECOMMENDATIONS

Based on the botanical and vegetation monitoring in 2022 and 2023, the following are recommendations for future project activities:

1. Conduct clearing and construction activities during frozen ground conditions with snow cover to minimize surface disturbance, rutting and erosion. Areas of rutting should be returned to pre-existing conditions as soon as possible.
2. Tree removal should be confined within the limits of the RoW and trees should be felled into the RoW, to not damage adjacent vegetation.
3. Away from the equipment path, attempt to maintain low shrubs and other understory vegetation for berry picking and plant harvesting, on the RoW.
4. Retain vegetation at river and stream crossings with a 30 m buffer, from high water mark.
5. Where possible, consider buffering species of conservation concern (5 m buffer) and remove trees by low disturbance methods, to protect sensitive plants. While rare plants are an excellent measure of ecosystem sensitivity, future project activities should be confined to the RoW and activities should occur during frozen ground conditions to reduce the risk of damage to plant roots.
6. Use existing access roads and trails, and confine traffic to these locations to the extent possible, to access the RoW.
7. Care should be taken that equipment used during clearing and construction activities does not import any invasive plant materials into the RoW. Removal of visible plant material and mud from equipment prior to accessing the RoW can reduce the possibility of invasive species introduction.
8. Vegetation management for existing invasive plant species is recommended on the RoW (e.g., road and trail crossings), to reduce the spread of these species. Low disturbance manual or mechanical methods should be used for removal of invasive or noxious plants.
9. Chemical control of invasive species should be minimized, however if required, it is recommended that only spot treatments should only be used. All regulatory requirements and licence conditions should be followed.
10. Burning of slash should occur during the winter months. Areas of minimal debris should be left to decompose naturally. Debris may be habitat for small mammals, birds and pollinators.

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APPENDIX I. Definitions of selected technical terms, references from Cauboue et al. 1996, unless otherwise noted.

Abundance-Dominance – This term expresses the number of individuals of a plant species and their coverage in a phytosociological survey; it is based on the coverage of individuals for classes with a coverage higher than 5% and on the abundance for classes with a lower percentage.

Angiosperm – A seed borne in a vessel (carpel); thus one of a group of plants whose seeds are borne within a mature ovary or fruit (Raven et al. 1992).

Bog – Ombrotrophic peatlands generally unaffected by nutrient-rich groundwater that are acidic and often dominated by heath shrubs and Sphagnum mosses and that may include open-growing, stunted trees.

Boreal – Pertaining to the north; a climatic and ecological zone that occurs south of the subarctic, but north of the temperate hardwood forests of eastern North America, the parkland of the Great Plains region, and the montane forests of the Canadian cordillera.

Bryophyte – A plant of the group Bryophyta; a liverwort, moss or hornwort (Johnson et al. 1995).

Canopy – The more or less continuous cover of branches and foliage formed by the crowns of trees.

Canopy Closure – The degree of canopy cover relative to openings.

Classification – The systematic grouping and organization of objects, usually in a hierarchical manner.

Cluster Analysis – A multidimentional statistical technique used to group samples according to their degree of similarity.

Community-Type – A group of vegetation stands that share common characteristics, an abstract plant community.

Coniferous – A cone-bearing plant belonging to the taxonomic group Gymnospermae.

Cover – The area of ground covered with plants of one or more species, usually expressed as a percentage.

Deciduous – Refers to perennial plants from which the leaves abscise and fall off at the end of the growing season.

Dicotyledon – One of the two divisions of the Angiosperms; the embryo has two cotyledons, the leaves are usually net-veined, the stems have open bundles, and the flower parts are usually in fours or fives (Usher 1996).

Ecoregion – An area characterized by a distinctive regional climate as expressed by vegetation.

Endangered Species - A species that is facing imminent extirpation or extinction (Government of Canada 2022).

Ericaceous – Ericaceae family, heather-like (Usher 1996).

Extirpated Species - A species that no longer exists in the wild in Canada, but exists elsewhere in the wild (Government of Canada 2022).

Fen – Wetland with a peat substrate, nutrient-rich waters, and primarily vegetated by shrubs and graminoids.

Flora – A list of the plant species present in an area.

Forb – A broad-leaved, non-woody plant that dies back to the ground after each growing season (Johnson et al. 1995).

Forest – A relatively large assemblage of tree-dominated stands.

Graminoid – A narrow-leaved plant that is grass-like; the term refers to grasses and plants that look like grasses.

Gymnosperm – A seed plant with seeds not enclosed in the ovary; the conifers are the most familiar group (Raven et al. 1992).

Habitat – The place in which an animal or plant lives; the sum of environmental circumstances in the place inhabited by an organism, population or community.

Herb (Herbaceous) – A plant without woody above-ground parts, the stems dying back to the ground each year (Johnson et al. 1995).

Invasive – Invasive species are plants that are growing outside of their country or region of origin and are out-competing or even replacing native plants (Invasive Species Council of Manitoba 2023).

Mixedwood – Forest stands composed of conifers and angiosperms each representing between 25 and 75% of the cover.

Monocotyledon – A class of the Angiosperms; the seeds have a single cotyledon, the floral parts are in three or multiples of three, and the leaves have parallel veins (Usher 1996).

Non-vascular Plant – A plant without a vascular system (mosses and lichens).

Noxious Weed – A plant that is designated as a tier 1, tier 2 or tier 3 noxious weed in the regulations and includes the seed of a noxious weed, whether it is still attached to the noxious weed or is separate from it (Manitoba Government 2023b).

Plot – A vegetation sampling unit used to delineate a fixed amount of area for the purpose of estimating plant cover, biomass, or density.

Pteridophyte – A division of the plant kingdom including ferns and their allies (horsetails and clubmosses).

Rare Species – Any indigenous species of flora that, because of its biological characteristics, or because it occurs at the fringe of its range, or for some other reasons, exists in low numbers or in very restricted areas of Canada but is not a threatened species.

Riparian – Refers to terrain, vegetation or simply a position adjacent to or associated with a stream, flood plain, or standing body of water.

Shrub – A perennial plant usually with a woody stem, shorter than a tree, often with a multi-stemmed base.

Site – The place or category of places, considered from an environmental perspective, that determines the type and quality of plants that can grow there.

Species – A group of organisms having a common ancestry that are able to reproduce only among themselves; a general definition that does not account for hybridization.

Species of Special Concern – A species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats (Government of Canada 2022).

Stand – A collection of plants having a relatively uniform composition and structure, and age in the case of forests.

Stratum – A distinct layer within a plant community, a component of structure.

Terrestrial – Pertaining to land as opposed to water.

Threatened Species - A species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction (Government of Canada 2022).

Understory – Vegetation growing beneath taller plants such as trees or tall shrubs.

Vascular Plant – A plant having a vascular system (Usher 1996).

Vegetation – The general cover of plants growing on a landscape.

Vegetation Type – In phytosociology, the lowest possible level to be described.

Wetland – Land that is saturated with water long enough to promote hydric soils or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation, and various kinds of biological activity that are adapted to wet environments.

APPENDIX II. Report maps.

Manitoba Hydro

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, ProvMB, NRCan
Date Created: September 12, 2023

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Kilometres
1:120,000

N

Legend

- Field Study Area
- Converter Station
- Generating Station
- Electrical Station
- Transmission Line
- North/South Access Roads
- Major Road
- Railway

Field Study Area - 2023
Radisson to Henday (R44H) Transmission Project

Map 1-1

File Location: \\geodata\Tlea1\GIS\Orientis\PRJ_BPM\MXD\Maps\2023\BPM_Map1-1_FieldStudyArea2023_120K_BSize_MH.mxd

Manitoba Hydro

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, ProvMB, NRCan
Date Created: September 12, 2023

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Kilometres
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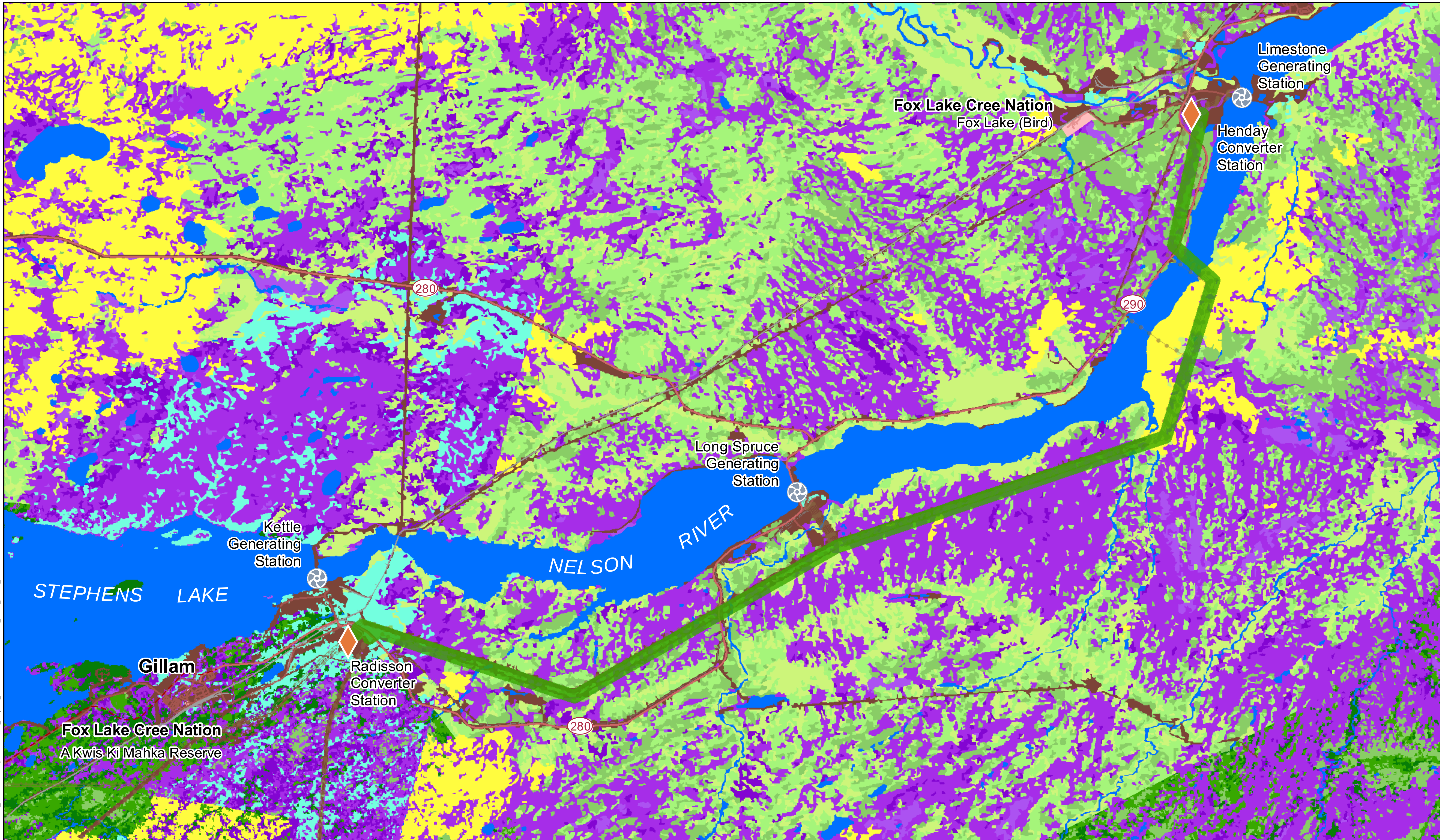
Legend

- Field Study Area
- Converter Station
- Generating Station
- Electrical Station
- Transmission Line
- North/South Access Roads
- Major Road
- Railway
- Hayes River Upland
- Hudson Bay Lowland
- Ecodistrict

Ecoregions and Ecodistricts of the Study Area
Radisson to Henday (R44H) Transmission Project

Map 3-1



Manitoba Hydro

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, ProvMB, NRCan
Date Created: September 12, 2023

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Kilometres
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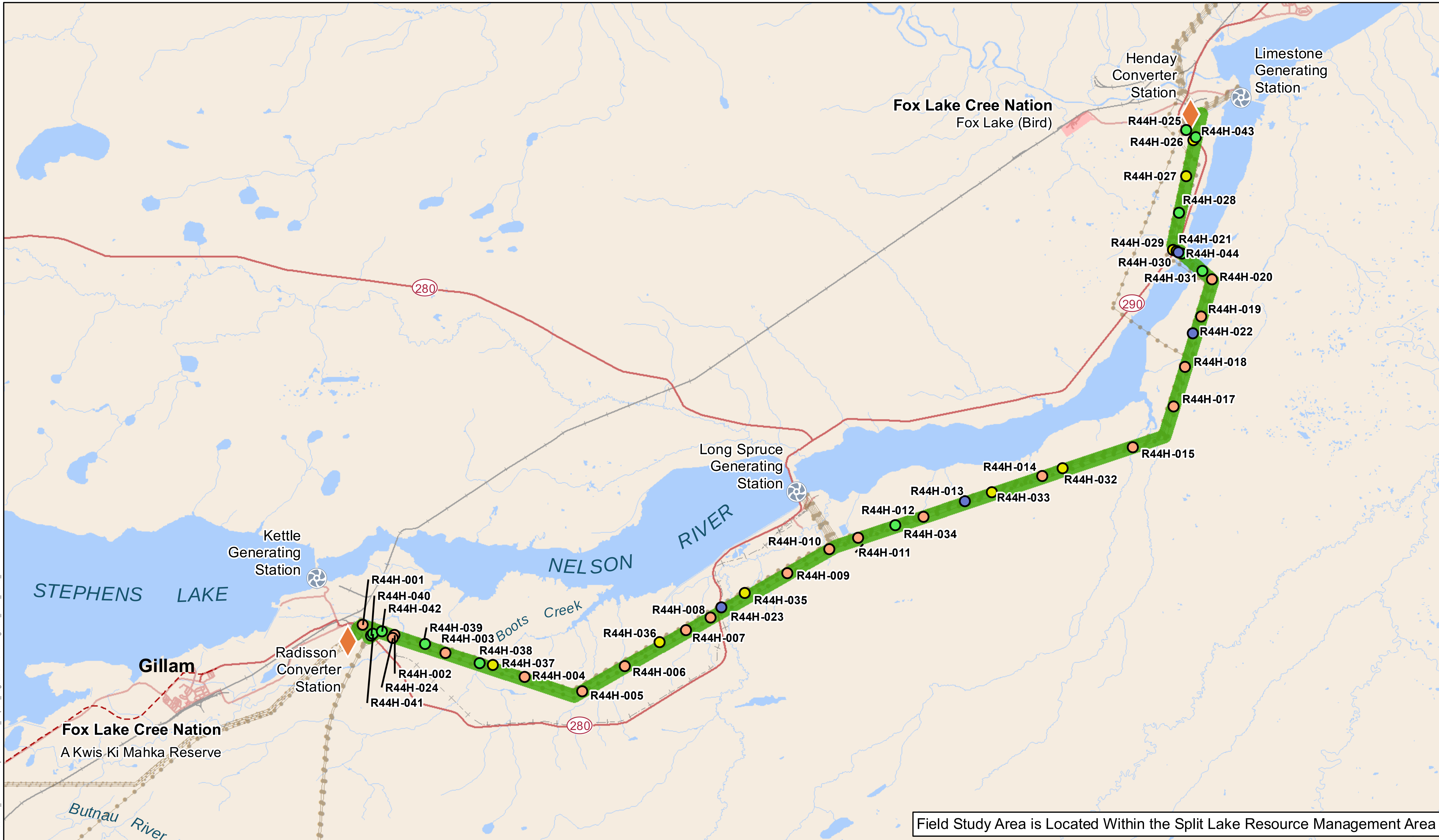
Legend

- Field Study Area
- Converter Station
- Generating Station
- Electrical Station
- Water
- Exposed Land
- Bryoids
- Shrub Tall
- Coniferous Dense
- Coniferous Open
- Coniferous Sparse
- Mixedwood Dense
- Wetland Treed
- Wetland Shrub
- Wetland Herb

Landcover Classification of the Study Area
Radisson to Henday (R44H) Transmission Project

Map 3-2

File Location: \\geodata\Tlea1\GIS\Orientis\PRJ_BPM\MXD\Maps\2023\BPM_Map3-2_LandCoverClassification_120K_BSize_MH.mxd



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Manitoba Hydro

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, ProvMB, NRCan
Date Created: September 12, 2023

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Kilometres
1:120,000

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Legend

- Developed ROW Site (2022)
- Undeveloped ROW Site (2022)
- Developed ROW Site (2023)
- Undeveloped ROW Site (2023)
- Field Study Area
- Converter Station
- Generating Station
- Electrical Station
- Transmission Line
- North/South Access Roads
- Major Road
- Railway

Distribution of Vegetation Monitoring Sites
Radisson to Henday (R44H) Transmission Project

Map 3-4

APPENDIX III. Location of vegetation sites visited in 2022 and 2023.

Site	UTM Zone	Easting	Northing	Survey Year
R44H-01	15 U	400479	6247990	2022
R44H-02	15 U	401522	6247560	2022
R44H-03	15 U	403172	6246806	2022
R44H-04	15 U	405782	6245758	2022
R44H-05	15 U	407678	6245108	2022
R44H-06	15 U	409197	6245824	2022
R44H-07	15 U	411361	6246856	2022
R44H-08	15 U	412224	6247209	2022
R44H-09	15 U	414946	6248492	2022
R44H-10	15 U	416424	6249176	2022
R44H-11	15 U	417441	6249468	2022
R44H-12	15 U	419696	6249991	2022
R44H-13	15 U	421142	6250392	2022
R44H-14	15 U	423825	6251015	2022
R44H-15	15 U	426973	6251724	2022
R44H-17	15 U	428465	6252979	2022
R44H-18	15 U	428965	6254275	2022
R44H-19	15 U	429660	6255929	2022
R44H-20	15 U	430131	6257144	2022
R44H-21	15 U	429066	6258154	2022
R44H-22	15 U	429323	6255385	2022
R44H-23	15 U	412625	6247526	2022
R44H-24	15 U	401434	6247467	2022
R44H-25	15 U	429692	6262266	2023
R44H-26	15 U	429914	6261898	2023
R44H-27	15 U	429557	6260689	2023
R44H-28	15 U	429208	6259496	2023
R44H-29	15 U	428893	6258257	2023
R44H-30	15 U	429197	6258100	2023
R44H-31	15 U	429833	6257457	2023
R44H-32	15 U	424544	6251214	2023
R44H-33	15 U	422074	6250623	2023
R44H-34	15 U	418732	6249777	2023
R44H-35	15 U	413447	6247937	2023
R44H-36	15 U	410422	6246537	2023
R44H-37	15 U	404744	6246257	2023
R44H-38	15 U	404311	6246355	2023
R44H-39	15 U	402514	6247167	2023
R44H-40	15 U	400722	6247605	2023
R44H-41	15 U	400798	6247672	2023
R44H-42	15 U	401096	6247729	2023
R44H-43	15 U	429997	6261988	2023
R44H-44	15 U	429014	6258206	2023

APPENDIX IV. Species of conservation concern recorded in 2022 and 2023.

Site	Species	MBCDC Rank	UTM Zone	Easting	Northing	Survey Year
R44H-12	*Pedicularis parviflora*	S2S3	15 U	419696	6249991	2022
R44H-21	*Salix arbusculoides*	S2S3	15 U	429019	6258207	2022
R44H-12	*Drosera anglica*	S3S4	15 U	419696	6249991	2022
R44H-07	*Lonicera oblongifolia*	S3S5	15 U	411361	6246856	2022
R44H-23	*Pedicularis labradorica*	S3S4	15 U	412625	6247526	2022
R44H-03	*Pinguicula villosa*	S3S4	15 U	403172	6246806	2022
R44H-13	*Pinguicula villosa*	S3S4	15 U	421142	6250392	2022
R44H-17	*Pinguicula villosa*	S3S4	15 U	428457	6252962	2022
R44H-20	*Pinguicula villosa*	S3S4	15 U	430134	6257146	2022
R44H-19	*Rhododendron tomentosum*	S3S5	15 U	429660	6255929	2022
R44H-20	*Rhododendron tomentosum*	S3S5	15 U	430131	6257144	2022
R44H-12	*Rhynchospora alba*	S3	15 U	419696	6249991	2022
R44H-15	*Salix vestita*	S3	15 U	426973	6251724	2022
R44H-37	*Caltha natans*	S2S4	15 U	404744	6246257	2023
R44H-26	*Pedicularis parviflora*	S2S3	15 U	429924	6261882	2023
R44H-32	*Pedicularis parviflora*	S2S3	15 U	424547	6251213	2023
R44H-41	*Antennaria microphylla*	S3S5	15 U	400798	6247672	2023
R44H-25	*Botrychium lunaria*	S3S4	15 U	429696	6262266	2023
R44H-32	*Drosera anglica*	S3S4	15 U	424544	6251214	2023
R44H-33	*Drosera anglica*	S3S4	15 U	422074	6250623	2023
R44H-30	*Pinguicula villosa*	S3S4	15 U	429206	6258090	2023
R44H-38	*Pinguicula villosa*	S3S4	15 U	404311	6246355	2023
R44H-43	*Rhododendron tomentosum*	S3S5	15 U	429997	6261988	2023
R44H-30	*Rhododendron tomentosum*	S3S5	15 U	429197	6258100	2023
R44H-27	*Rhododendron tomentosum*	S3S5	15 U	429557	6260689	2023
R44H-25	*Salix vestita*	S3	15 U	429688	6262257	2023

APPENDIX V. Flora recorded from sampling in 2022 and 2023.

Family/Species	Common Name	MB Rank
VASCULAR SPECIES		
Pteridophytes – Ferns and Allies		
EQUISETACEAE	HORSETAIL FAMILY	
Equisetum arvense	Field Horsetail	S5
Equisetum fluviatile	Swamp Horsetail	S5
Equisetum scirpoides	Dwarf Scouring-rush	S4S5
Equisetum sylvaticum	Woodland Horsetail	S5
LYCOPODIACEAE	CLUB-MOSS FAMILY	
Spinulum annotinum	Stiff Clubmoss	S5
OPHIOGLOSSACEAE	ADDERS-TONGUE FAMILY	
Botrychium lunaria	Common Moonwort	S3S4
Gymnosperms		
PINACEAE	PINE FAMILY	
Larix laricina	Tamarack	S5
Picea glauca	White Spruce	S5
Picea mariana	Black Spruce	S5
Pinus banksiana	Jack Pine	S5
Angiosperms - Monocotyledons		
ASPARAGACEAE	ASPARAGUS FAMILY	
Maianthemum trifolium	Three-leaved Solomon's-seal	S5
CYPERACEAE	SEDGE FAMILY	
Carex aquatilis	Water Sedge	S5
Carex aurea	Golden Sedge	S5
Carex buxbaumii	Buxbaum's Sedge	S4S5
Carex capillaris	Hair-like Sedge	S5
Carex chordorrhiza	Prostrate Sedge	S4S5
Carex concinna	Beautiful Sedge	S4S5
Carex diandra	Two-stamened Sedge	S4S5
Carex disperma	Two-seeded Sedge	S5
Carex gynocrates	Northern Bog Sedge	S5
Carex lasiocarpa	Hairy-fruited Sedge	S5
Carex limosa	Mud Sedge	S5
Carex magellanica	Boreal Bog Sedge	S5
Carex pellita	Woolly Sedge	S5

Carex tenuiflora	Sparse-flowered Sedge	S4S5
Carex trisperma	Three-seeded Sedge	S4S5
Carex utriculata	Northern Beaked Sedge	S5
Carex vaginata	Sheathed Sedge	S5
Carex spp.	A sedge	-
Eleocharis palustris	Creeping Spike-rush	S5
Eriophorum angustifolium	Tall Cotton-grass	S5
Rhynchospora alba	White Beakrush	S3
Scirpus sp.	A bulrush	-
Trichophorum alpinum	Alpine Clubrush	S5
JUNCACEAE	RUSH FAMILY	
Juncus sp.	A rush	-
JUNCAGINACEAE	ARROWGRASS FAMILY	
Triglochin maritima	Seaside Arrowgrass	S5
ORCHIDACEAE	ORCHID FAMILY	
Goodyera repens	Dwarf Rattlesnake-plantain	S4S5
Platanthera aquilonis	Tall Northern Green Orchid	S4S5
Spiranthes romanzoffiana	Hooded Ladies'-tresses	S5
POACEAE	GRASS FAMILY	
Agrostis scabra	Rough Bentgrass	S5
Calamagrostis canadensis	Marsh Reed Grass	S5
Deschampsia cespitosa	Tufted Hairgrass	S4S5
Elymus trachycaulus	Slender Wildrye	S5
Elymus trachycaulus ssp. *subsecundus*	One-sided Wildrye	SNR
Glyceria grandis	Tall Mannagrass	S5
Hordeum jubatum	Wild Barley	S5
Oryzopsis asperifolia	White-grained Mountain Rice Grass	S5
Poa glauca	Glaucous Bluegrass	S4S5
POTAMOGETONACEAE	PONDWEED FAMILY	
Potamogeton spp.	Pondweed	-
TOFIELDIACEAE	TOFIELDIA FAMILY	
Triantha glutinosa	Sticky False Asphodel	S4S5
Angiosperms – Dicotyledons		
APIACEAE	SUMAC FAMILY	
Cicuta maculata	Spotted Water-hemlock	S4S5
Sium suave	Water-parsnip	S5

ASTERACEAE	ASTER FAMILY	
Achillea millefolium	Yarrow	SNR
Antennaria microphylla	Little-leaved Pussytoes	S3S5
Crepis tectorum	Narrow-leaved Hawksbeard	SNA
Hieracium umbellatum	Umbellate Hawkweed	S5
Leucanthemum vulgare	Oxeye Daisy	SNA
Packera paupercula	Balsam Groundsel	S5
Petasites frigidus var. *palmatus*	Palmate-leaved Colt's-foot	S5
Petasites frigidus var. *sagittatus*	Arrow-leaved Colt's-foot	S5
Solidago canadensis	Canada Goldenrod	S5
Solidago hispida	Hairy Goldenrod	S5
Solidago nemoralis	Field Goldenrod	S5
Solidago sp.	A goldenrod	-
Symphyotrichum ciliolatum	Lindley's Aster	S5
Taraxacum officinale	Common Dandelion	SNA
BETULACEAE	BIRCH FAMILY	
Alnus incana	Speckled Alder	S5
Alnus alnobetula	Green Alder	S5
Betula papyrifera	Paper Birch	S5
Betula pumila	Bog Birch	S5
CAPRIFOLIACEAE	HONEYSUCKLE FAMILY	
Linnaea borealis	Twinflower	S5
Lonicera oblongifolia	Swamp-fly-honeysuckle	S3S5
Lonicera villosa	Mountain-fly-honeysuckle	S5
CARYOPHYLLACEAE	PINK FAMILY	
Silene csereii	Smooth Catchfly	SNA
CELASTRACEAE	BITTERSWEET FAMILY	
Parnassia palustris	Marsh Grass of Parnassus	S5
CORNACEAE	DOGWOOD FAMILY	
Cornus canadensis	Bunchberry	S5
Cornus sericea	Red Osier Dogwood	S5
DROSERACEAE	SUNDEW FAMILY	
Drosera anglica	Oblong-leaved Sundew	S3S4
Drosera rotundifolia	Round-leaved Sundew	S4S5
ELAEAGNACEAE	OLEASTER FAMILY	
Shepherdia canadensis	Soapberry	S5

EMPETRACEAE	CROWBERRY FAMILY	
Empetrum nigrum	Black Crowberry	S5
ERICACEAE	HEATH FAMILY	
Andromeda polifolia	Bog rosemary	S5
Arctostaphylos uva-ursi	Common Bearberry	S5
Arctous rubra	Alpine Bearberry	S4S5
Chamaedaphne calyculata	Leather-leaf	S5
Kalmia polifolia	Bog-laurel	S5
Orthilia secunda	One-sided Wintergreen	S5
Pyrola asarifolia	Pink Pyrola	S5
Rhododendron groenlandicum	Labrador-tea	S5
Rhododendron tomentosum	Dwarf Labrador-tea	S3S5
Vaccinium myrtilloides	Velvet-leaf Blueberry	S5
Vaccinium oxycoccos	Small Cranberry	S5
Vaccinium uliginosum	Bog Whortleberry	S5
Vaccinium vitis-idaea	Bog Cranberry	S5
FABACEAE	PEA FAMILY	
Medicago sativa	Alfalfa	SNA
Melilotus albus	White Sweet Clover	SNA
Melilotus officinalis	Yellow Sweet Clover	SNA
Trifolium hybridum	Alsike Clover	SNA
Trifolium repens	White Clover	SNA
Vicia americana	American Purple Vetch	S5
GROSSULARIACEAE	CURRENT FAMILY	
Ribes glandulosum	Skunk Currant	S5
Ribes lacustre	Bristly Black Currant	S4
Ribes triste	Wild Red Currant	S5
LAMIACEAE	MINT FAMILY	
Mentha canadensis	Common Mint	S5
Scutellaria galericulata	Hooded Skullcap	S5
LENTIBULARIACEAE	BLADDERWORT FAMILY	
Pinguicula villosa	Hairy Butterwort	S3S4
Utricularia intermedia	Flat-leaved Bladderwort	S4S5
MENYANTHACEAE	BUCKBEAN FAMILY	
Menyanthes trifoliata	Bogbean	S5
ONAGRACEAE	EVENING PRIMROSE FAMILY	

Chamaenerion angustifolium	Fireweed	S5
Epilobium ciliatum	Hairy Willow-herb	S5
Epilobium palustre	Marsh Willowherb	S5
OROBANCHE FAMILY	BROOMRAPE FAMILY	
Castilleja miniata	Great Red Paintbrush	S5
Pedicularis labradorica	Labrador Lousewort	S3S4
Pedicularis parviflora	Small-flowered Lousewort	S2S3
Rhinanthus minor	Little Yellow Rattle	S4
RANUNCULACEAE	CROWFOOT FAMILY	
Actaea rubra	Red Baneberry	S5
Anemone multifida	Cut-leaved Anemone	S5
Caltha natans	Floating Marsh-marigold	S2S4
Caltha palustris	Marsh Marigold	S5
Coptidium lapponicum	Lapland Buttercup	S4S5
Thalictrum venulosum	Veiny Meadow-rue	S5
ROSACEAE	ROSE FAMILY	
Comarum palustre	Marsh Cinquefoil	S5
Dasiphora fruticosa	Shrubby Cinquefoil	S5
Fragaria virginiana	Smooth Wild Strawberry	S5
Potentilla norvegica	Rough Cinquefoil	S5
Rosa acicularis	Prickly Rose	S5
Rubus arcticus	Stemless Raspberry	S5
Rubus chamaemorus	Cloudberry	S5
Rubus idaeus	Red Raspberry	S5
Rubus pubescens	Dewberry	S5
RUBIACEAE	MADDER FAMILY	
Galium boreale	Northern Bedstraw	S5
Galium trifidum	Small Bedstraw	S5
SALICACEAE	WILLOW FAMILY	
Populus balsamifera	Balsam Poplar	S5
Populus tremuloides	Trembling Aspen	S5
Salix arbusculoides	Shrubby Willow	S2S3
Salix bebbiana	Bebb's or Beaked Willow	S5
Salix candida	Hoary Willow	S5
Salix discolor	Pussy Willow	S5
Salix glauca	Smooth Willow	S4
Salix myrtillifolia	Myrtle-leaved Willow	S5
Salix pedicellaris	Bog Willow	S5

Salix planifolia	Tea-leaved Willow	S5
Salix vestita	Rock Willow	S3
Salix spp.	A willow	-
SANTALACEAE	SANDALWOOD FAMILY	
Geocaulon lividum	Northern Comandra	S5
SARRACENIACEAE	PITCHER PLANT FAMILY	
Sarracenia purpurea	Pitcher Plant	S4S5
SAXIFRAGACEAE	SAXIFRAGE FAMILY	
Mitella nuda	Mitrewort	S5
VIBURNACEAE	VIBURNUM FAMILY	
Viburnum edule	Mooseberry	S5
Viburnum opulus	Highbush-cranberry	S5
VIOLACEAE	VIOLET FAMILY	
Viola palustris	Marsh Violet	S4
Viola spp.	A violet	-
NON-VASCULAR SPECIES		
Bryophytes		
DICRANACEAE		
Dicranum spp.	A broom moss	-
HYLOCOMIACEAE		
Hylocomium splendens	Stairstep Moss	S4S5
Pleurozium schreberi	Red-stemmed Feather Moss	S4S5
HYPNACEAE		
Ptilium crista-castrensis	Knight's Plume Moss	S4S5
POLYTRICHACEAE		
Polytrichum sp.	Haircap Moss	-
SPHAGNACEAE		
Sphagnum spp.	A peat moss	-
Lichens		
CLADONIACEAE		
Cladonia arbuscula ssp. *mitis*	Green Reindeer Lichen	S4

Cladonia crispata	Organ-pipe Lichen	S4
Cladonia rangiferina	Gray Reindeer Lichen	S5
Cladonia stellaris	Star-tipped Reindeer Lichen	S5
Cladonia uncialis	Thorn Pixie Lichen	S5
Cladonia sp.	A reindeer lichen	-
ICMADOPHILACEAE		
Icmadophila ericetorum	Candy Lichen	S5
PARMELIACEAE		
Bryoria spp.	Horsehair Lichen	-
Evernia mesomorpha	Boreal Oakmoss Lichen	S5
Parmelia sulcata	Hammered Shield Lichen	S5
Usnea spp.	Beard Lichen	-
Vulpicida pinastri	Powdered Sunshine Lichen	S5
PELTIGERACEAE		
Peltigera apthosa	Common Freckle Pelt Lichen	S5
Peltigera spp.	A pelt lichen	-

Appendix C

Avian technical report

R44H RADISSON TO HENDAY 230 kV TRANSMISSION LINE PROJECT

AVIAN SURVEYS 2022-2023

R44H RADISSON TO HENDAY 230 kV TRANSMISSION LINE PROJECT

AVIAN SURVEYS 2022-2023

Prepared for

Transmission & Distribution Environment and Engagement, Manitoba Hydro

Winnipeg, Manitoba

By

Wildlife Resource Consulting Services MB Inc.

Winnipeg, Manitoba

September 2023

EXECUTIVE SUMMARY

Several studies were conducted in 2022/23 as part of bird community monitoring for the R44H Radisson to Henday 230 kV Transmission Line Project. Avian surveys were developed to provide a baseline understanding of the local and regional bird community near the connecting transmission lines. Surveys included monitoring bird species and populations during the breeding season, collecting baseline information on bird-wire collisions, and monitoring for the presence of large stick nests. The information collected during this study and data previously collected in the broader area was used to describe bird communities in the region.

During the breeding bird seasons of 2022 and 2023, automated recording units (ARUs) were placed along existing transmission line rights-of-way (ROWs) between the converter stations to record bird vocalizations. At each location, an ARU was placed in the middle of the widest ROW in open/shrubland habitat, in edge/open forest habitat in the forested buffer between the wide and narrow ROW, and in wetland/forest habitat in the undisturbed contiguous forest more than 400 m from the ROWs. The ARUs were programmed to record daily; a subset of recordings was reviewed by a qualified biologist who identified the bird species present. Species abundances were compared with those from previous surveys for hydroelectric developments in the region, with a focus on avian species of conservation concern listed under the federal Species at Risk Act and/or The Endangered Species and Ecosystems Act of Manitoba.

Seventy-six of the estimated 182 bird species that could reasonably be expected occur in the region were recorded in the study area in 2022/23. Sites on the ROW and along the edge of the ROW supported a greater number of species than those observed at forested sites, away from the ROW. Five species of conservation concern were identified in the study area, including common nighthawk, olive-sided flycatcher, rusty blackbird, evening grosbeak, and trumpeter swan.

A bird-wire collision study was also conducted in May 2023 to collect baseline data on potential bird mortalities and identify potential Environmentally Sensitive Sites. Observers searched for signs of bird collisions along the ROW at four different sites between the two converter stations. A relatively high number of bird collisions was found in comparison to other bird-wire collision surveys done in the province. Ptarmigan and grouse were the most common type of mortality observed. The presence of multiple transmission lines on the ROW likely attributed to the relatively high mortality rates observed by creating more obstacles for passing birds. However individual ROWs for each transmission line would likely also be problematic. It is recommended that any new transmission lines be fitted with bird diverters at the four sites examined in this study and in areas where the ROW intersects waterbodies.

Because some bird species frequently use transmission lines as habitat, an aerial survey to inventory large stick nests used by birds of prey, scavengers/predators, and colonial waterbirds was conducted in May 2022. Observers searched by helicopter for large nests on and near the ROW and identified the species using the nest where possible.

Five stick nests were observed during the aerial survey. Transmission towers were used as nesting habitat by at least two bird species, red-tailed hawk and common raven. The habitat adjacent to the ROWs did not appear to be used by larger birds for nesting and no nesting colonies were observed in the area.

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1.0 INTRODUCTION

In 2022 and 2023, as part of the R44H Radisson to Henday 230 kV Transmission Line Project, baseline information was collected on the breeding bird community in the area. Avian surveys were developed to provide Manitoba Hydro with a baseline understanding of the local and regional bird community near existing transmission lines, provide a baseline understanding of the rate of bird-wire collisions, and to help identify Environmentally Sensitive Sites (ESS) in the local study area. The information collected during this study and data previously collected in the broader area will be used to describe bird communities in the region and be compared to existing data from other transmission lines in the province.

The objectives of the avian monitoring surveys were to:

- Improve the baseline of breeding bird species along multiple parallel transmission line rights-of-way in the local study area;
- Develop a baseline understanding of potential bird-wire collisions at potential Environmentally Sensitive Sites (ESS) in the local study area; and,
- Compare and contrast the findings of the field study to existing regional data.

2.0 METHODS

2.1 Breeding Bird and Bird Species of Conservation of Concern Baseline Study

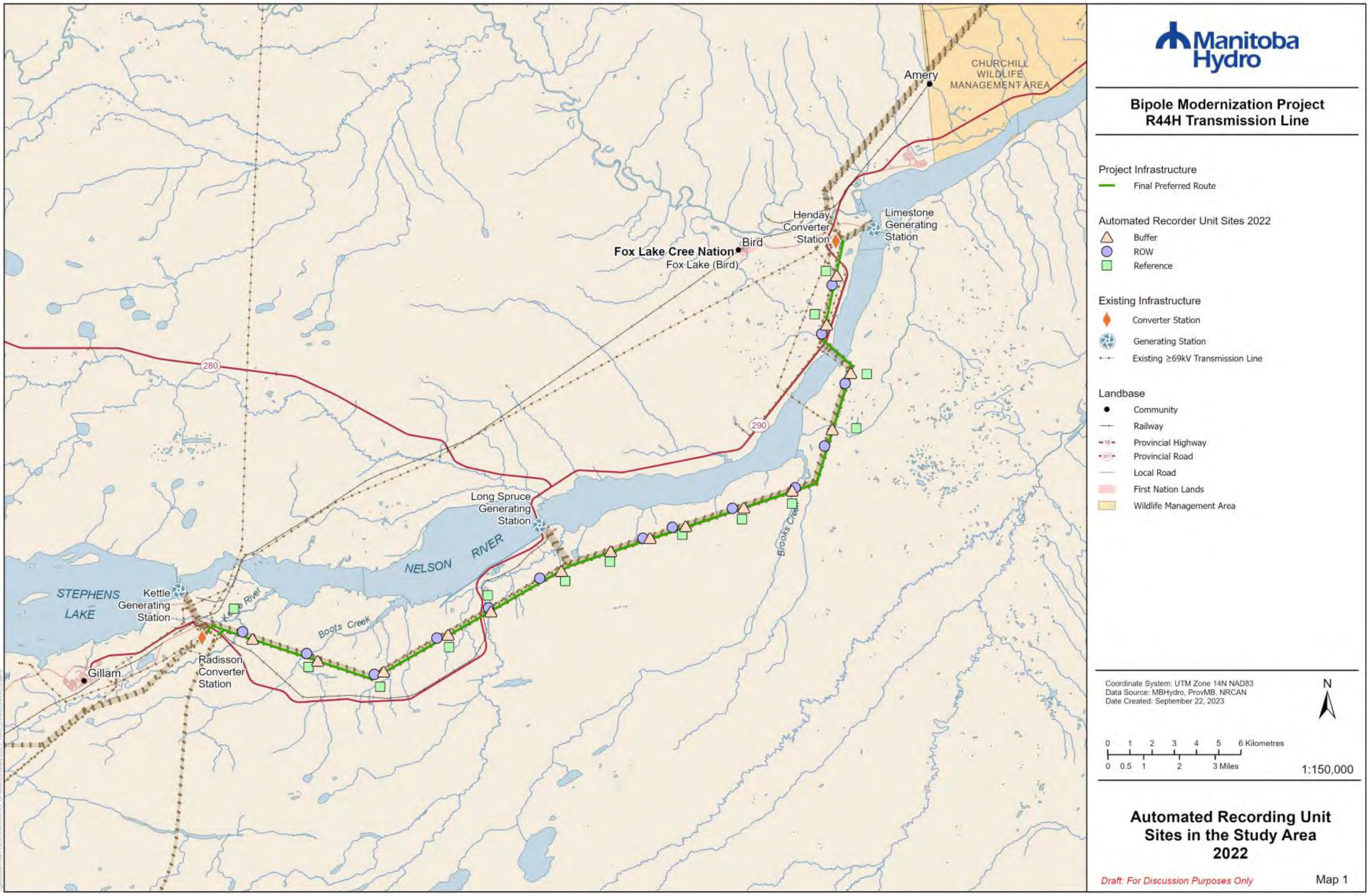
Automated recording units (ARUs) were used to survey breeding birds in 2022 and 2023 between the Radisson and Henday converter stations during the breeding bird season (Photo 1). In 2022, 45 ARUs were placed in clusters of three at 13 locations along the transmission line ROWs on May 25 and 26, 2022 (Map 1). In 2023, 21 ARUs were placed in clusters of three at seven locations along the transmission line ROWs on June 8-9, 2023 (Map 2).

At each location, an ARU was placed in the middle of the widest ROW in open/shrubland habitat (ROW sites), in edge/open forest habitat in the forested buffer between the wide and narrow ROW (buffer sties), and in wetland/forest habitat in the undisturbed contiguous forest more than 400 m from the ROWs for reference (reference sites). The ARUs were programmed to record daily for five minutes once per hour from a half-hour before sunrise to 9:00 a.m. and from a half-hour before sunset to 12:00 a.m., to capture breeding bird activity in the morning and at night. ARUs were removed in mid-July.

Photo 1: Automated-recording unit (ARU) deployed along the edge of the ROW, 2023

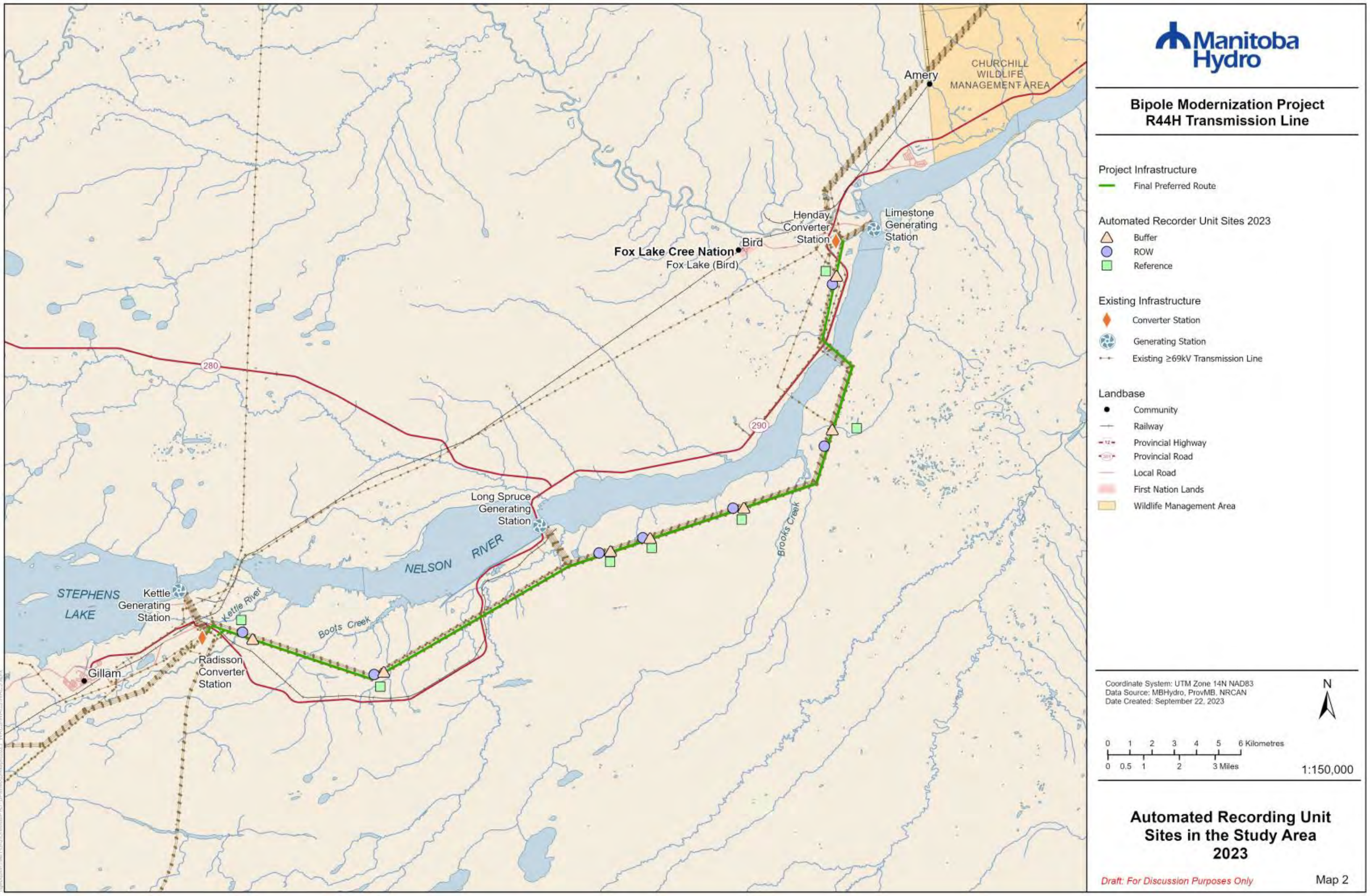
In 2022, a subset of recordings, made from May 27 to June 28, 2022, were reviewed by a qualified biologist. Five morning recordings made at approximately 6:00 a.m. and three nighttime recordings made at approximately 10:30 p.m. were reviewed for each site, and the bird species present were identified. In 2023, a subset of recordings, made from June 10-28, 2023, were reviewed by a qualified biologist. Two morning recordings made at approximately 6:00 am and 7:00 am, and one nighttime recording, made at approximately 10:30 pm were reviewed.

Bird species that could reasonably be expected to occur in the broader region were identified by reviewing Avibase (Lepage 2022) and The Atlas of the Breeding Birds of Manitoba (Artuso *et al.* 2018). The Guide to North American Birds (The National Audubon Society 2022) was consulted to identify which ranges of birds reported by Avibase overlap the study area. Manitoba Hydro breeding bird data that were previously collected in the region for the Bipole III Transmission Project ([WRCS 2011), the Keeyask Transmission Project (Stantec Consulting 2012), the Keeyask Generation Project (Stantec Consulting 2013), and the Avian Management Plan and Inventory 2021 (WRCS unpubl. data) were included for comparison. Single observations of species beyond their ranges in the region that were not observed or confirmed in the area by the Atlas of the Breeding Birds of Manitoba (Artuso *et al.* 2018) were not considered species that could reasonably be expected to occur in the region and were not included in the list.



NOTE: No recordings were made at one ROW site and one reference site

Map 1: **Automated recording unit sites in the study area, 2022**



NOTE: No recordings were made at one ROW site and one reference site

Map 2: Automated recording unit sites in the study area, 2023

2.2 Bird-wire Collision Baseline Study

On May 17-18 and May 24-25, 2023, six observers searched for signs of bird-wire collisions beneath the ROW between the Radisson and Henday converter stations at four different sites. Each site was visited twice, with seven days between visits. Personnel walked parallel lines spaced 5-10 m apart, for the entire length of the site, below the cleared ROW (CWSEC 2007). The spacing of personnel varied slightly depending on depending on the relative density of vegetation and terrain. Personnel visually inspected the search area for signs of bird collisions (*i.e.,* carcasses and clusters of feathers). Collisions were recorded when the remains found consisted of more than five feathers in a square meter (Barrientos *et al.* 2012). The location of the collision was recorded using a handheld global positioning system (GPS) and collision evidence was identified to species where possible and photographed.

The timing of the searches was chosen to coincide with the arrival of waterfowl, a group of birds that are susceptible to bird-wire collisions. The sites selected were located adjacent to waterbodies and/or watercourses, which are likely to be important movement areas for waterfowl (Map 3).

Sources of bias, including searcher efficiency bias and scavenger bias, was calculated for the study as they can influence the estimations of bird collisions. Searcher efficiency bias is important to include in mortality estimates as dead or injured birds may be overlooked during a survey, particularly when vegetation is present. Additionally, scavenger bias is important to include as both mammalian and avian scavengers may remove carcasses before they are located. By placing (planting) dead birds on the survey sites, these sources of biases can be considered, and a more accurate estimate of bird mortality can be produced.

Searcher efficiency bias was estimated by planting quail (*Coturnix sp.*) carcasses, sourced from a commercial supplier, within search areas in locations unknown to the searchers prior to searches commencing (California Energy Commission 2003; APLIC 2012). Two quail were planted at each site during the first visit. The proportion of the planted birds found is then used in the estimation of total collision mortality.

Searcher efficiency was calculated as:

$$\text{Seacher Efficiency} = \frac{\text{Number of planted birds found}}{\text{Number of birds planted}}$$

The quail used in the searcher efficiency trials were also used to estimate the scavenger removal bias. Search periods were separated by seven days to allow time for potential scavengers to locate the planted quail carcasses. Carcasses were considered scavenged if they were missing, or partially consumed. The proportion of planted birds remaining after the specified time period was used to determine the scavenger bias.

Scavenger bias was calculated as:

$$\text{Scavenger Bias} = \frac{\text{Number of planted birds remaining}}{\text{Number of birds planted}}$$

Habitat bias effects were also calculated to account for unsearchable portions of the formal search areas (*i.e.,* marshes, ponds, thick standing crops). Unsearchable areas were delineated in the field with a handheld GPS and its size was subtracted from the formal search area.

Habitat bias was calculated as:

$$\text{Habitat Bias} = \frac{\text{Actual area searched}}{\text{Formal search area}}$$

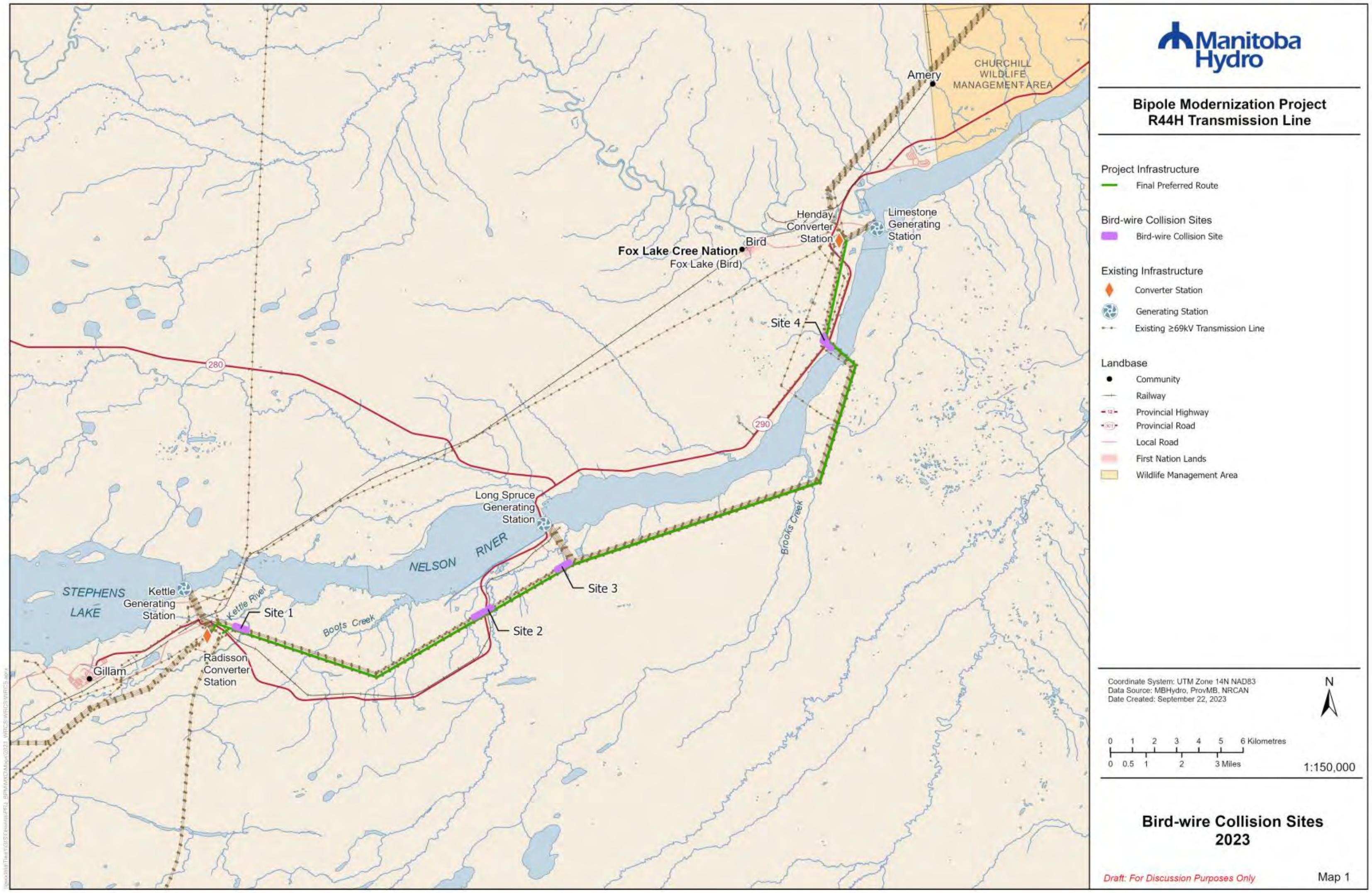
Estimated collision mortality (collisions/site/week) was calculated using searcher efficiency, scavenger, and habitat bias at all surveyed sites. The following assumptions were made during calculations:

- The observed level of mortality was consistent throughout the six-week spring migration period.
- Bird mortality is negligible outside the six-week migration period.
- The sites surveyed have representative levels of mortality in comparison to other areas of the transmission line.

Estimated weekly mortality was calculated as:

$$\text{Estimated Weekly Mortality} = \frac{\text{Number of bird carcasses found}}{\text{Searcher Efficiency} * \text{Scavenger Bias} * \text{Habitat Bias}}$$

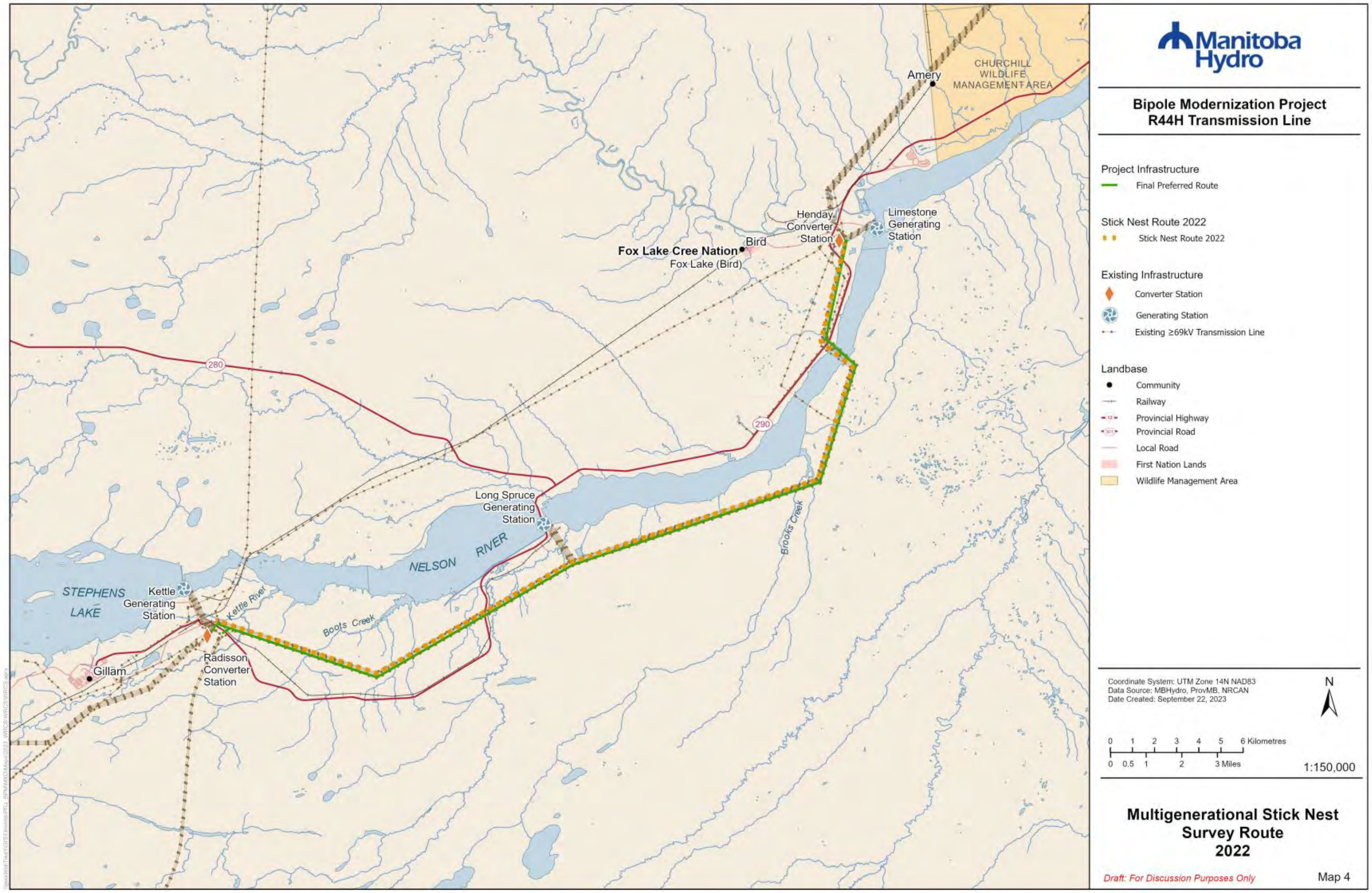
The estimated weekly mortality was then standardized per kilometer of transmission line searched to obtain the estimated weekly mortality/km. To estimate seasonal collision mortality (spring), weekly collision mortality estimates were multiplied by a factor of six weeks (42 days).



Map 3: Bird-wire collision sites, 2023

2.3 Large Stick Nest Survey

In 2022, an aerial survey was conducted to inventory large stick nests used by birds of prey, scavengers/predators (*e.g.,* common raven, *Corvus corax*), and colonial waterbirds (*e.g.,* great blue heron, *Ardea herodias*). On May 25, 2022, two observers searched by helicopter for large nests on and near the ROW between the Radisson and Henday converter stations and recorded their locations with a handheld GPS unit (Map 4). The species using the nest was identified where possible.



Map 4: **Large stick nest survey route, 2022**

3.0 RESULTS

3.1 Breeding Bird and Bird Species of Conservation of Concern Baseline Study

Recordings were made at 43 of the 45 sites where ARUs were placed in 2022 and 19 of 21 sites in 2023. No recordings were made at one ROW site and one reference site in both 2022 and 2023 (Appendix A, Table A-1). During the survey period, from 2022 to 2023, more bird species were detected at buffer sites (*i.e.,* edge habitat) (n = 65) compared to ROW sites (n = 61), and reference sites (n = 50). An average of 20 species were recorded per ROW site (range = 8–35), 22 species per buffer site (range = 11–31), and 19 species per reference site (range = 8–30).

Seventy-six bird species were identified in the study area (Appendix A, Table A-2). On ROW sites, white-throated sparrow (*Zonotrichia albicollis*), Lincoln's sparrow (*Melospiza lincolnii*), and American robin (*Turdus migratorious*) were the most abundant species observed. On buffer sites white-throated sparrow, ruby-crowned kinglet (*Regulus calendula*), and Lincoln's sparrow were the most common species observed. On reference sites, white-throated sparrow, American robin, and ruby-crowned kinglet were most common (Appendix A, Table A-2).

An estimated 182 bird species could reasonably be expected to occur in the region at various times of the year (Appendix A, Table A-3). One hundred and sixteen breed in the region in spring and migrate south in the fall, 23 are year-round residents, and five may winter in the area. Thirty-eight may be observed during migration but do not breed in the region. Most species are relatively common (n = 106). For several species, including the evening grosbeak (*Coccothraustes vespertinus*), American goldfinch (*Spinus tristis*), black-throated green warbler (*Setophaga virens*), and American white pelican (*Pelecanus erythrorhynchos*), the survey area is beyond their observed range. However, in 2022/23, these species were observed in the study area, and hundreds of American white pelicans have been observed in the region during recent surveys for the Keeyask Generation Project (WRCS 2022a).

Twenty-six species were common to the breeding bird surveys for the Keeyask Transmission Project from 2009 to 2011, the Bipole III Transmission Project in 2010, the Keeyask Generation Project in 2011, and the current study in 2022/23; all were observed during each (Appendix A, Table A-3). Seventy-eight species were only observed during bird and nest inventories conducted at the Kettle, Long Spruce, and Limestone generating stations (GSs) in 2021, including whimbrel (*Numenius phaeopus*), a migrant that was only detected at the Limestone GS. Sixty-seven species that could occur in the region were not detected during any of the surveys. Species such as raptors (*e.g.,* hawks and eagles), waterbirds (*e.g.,* gulls, ducks, geese, and pelicans), and upland game birds (*e.g.,* grouse and ptarmigan) do not typically sing to attract a mate and tend to be detected infrequently relative to songbirds during breeding bird surveys. Speciality surveys (*e.g.,* multiple aerial surveys) would be required to detect these species, which are likely to occur in the region. In all, 115 bird species were identified in the region during avian studies conducted between 2009 and 2023.

Five avian species of conservation concern listed under the federal *Species at Risk Act* and/or *The Endangered Species and Ecosystems Act* of Manitoba were identified in the study area (Table 1, Map 5, Map 6). Observations of species of conservation concern were relatively evenly distributed between the site types or in the survey area in 2022/23 (Table 1, Map 5, Map 6).

Table 1: Avian species of conservation concern identified in the study area in 2022 and 2023

Species	SARA[1] Status	ESEA[2] Status	No. Recorded	No. ROW Sites	No. Buffer Sites	No. Reference Sites	Total Sites
Rusty blackbird	Special concern	None	42	8	8	7	23
Olive-sided flycatcher	Threatened	Threatened	69	6	7	6	19
Common nighthawk	Threatened	Threatened	61	6	6	5	17
Evening Grosbeak	Special Concern	None	1	0	1	0	1
Trumpeter swan	None	Endangered	1	0	1	0	1

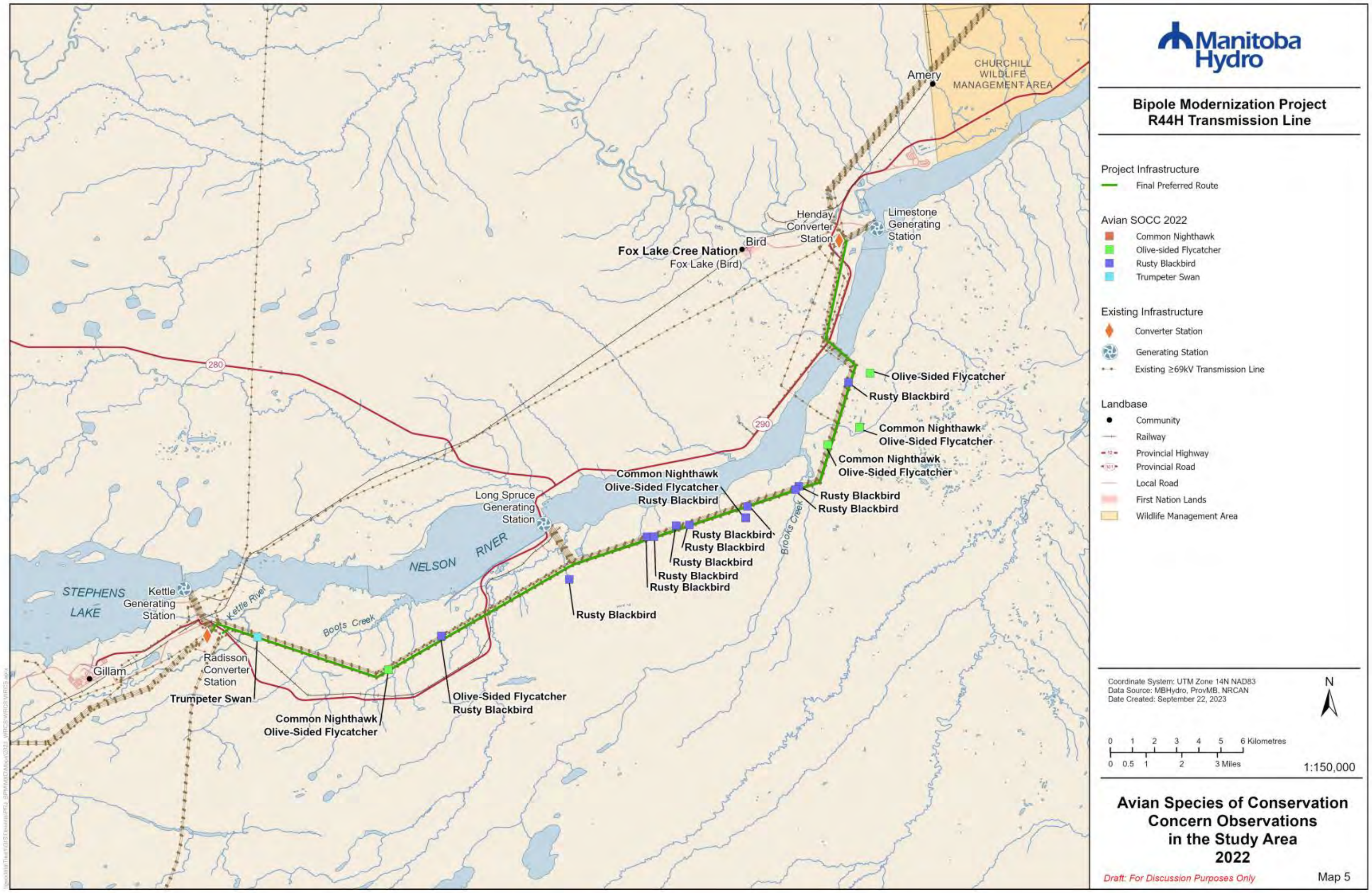
1. *Species at Risk Act*.
2. *The Endangered Species and Ecosystems Act*.

Six avian species of conservation concern that could be expected to occur in the region were not detected in 2022/23 (Table 2). Peregrine falcon (*Falco peregrinus*) and red knot (*Calidris canutus*), which may migrate through the area but do not breed within, were not included among them. Of the six, only bank swallow (*Riapria riparia*) and horned grebe (*Podiceps auratus*) were observed during previous bird surveys for hydroelectric projects in the region. Barn swallow (*Hirundo rustica*) nests were found at the Kettle and Long Spruce GSs during inventory surveys in 2021, but no birds were observed in this survey. Canada warbler (*Cardellina canadensis*) were detected during studies of the Bipole III Transmission Project but are outside of their known range in the local study area. Short-eared owl (*Asio flammeus*) and yellow rail (*Coturnicops noveboracensis*) were not found during any of the surveys conducted in the region. All six of the species of conservation concern not detected in 2022/23 require specialized surveys and would not be expected to be observed during breeding bird surveys. Trumpeter swan (*Cygnus buccinator*) was not detected during any of the previous surveys in the region and was recorded at one buffer site in 2022.

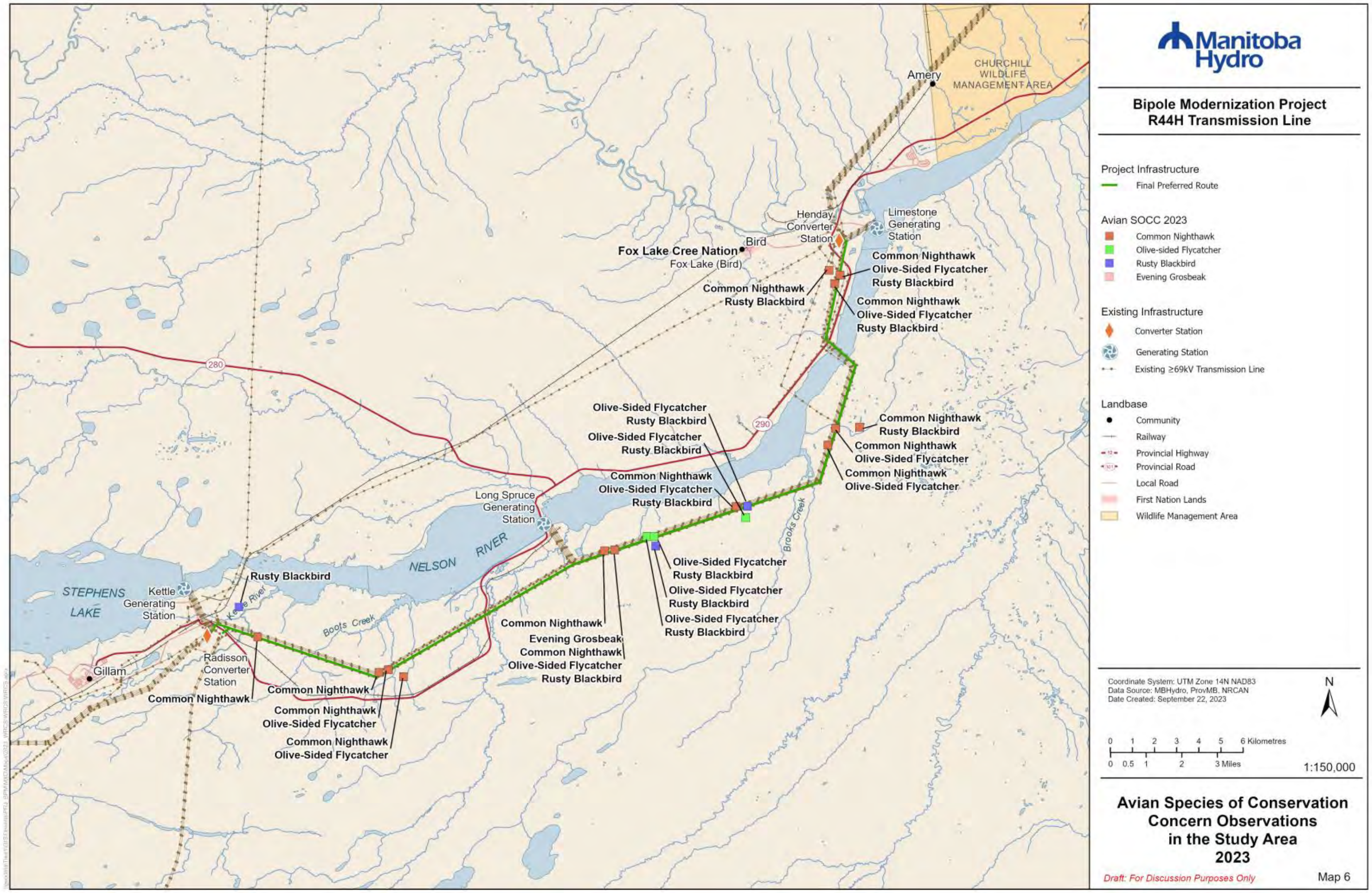
Table 2: Avian species of conservation concern identified during bird surveys for hydroelectric projects in the region, 2009 to 2011, 2021 to 2023

Species	SARA[1] Status	ESEA[2] Status	KTP[3] 2009–2011	BPIII[4] 2010	KGP[5] 2011	Inventory 2021[6]	R44H[7] 2022/23
Bank swallow	Threatened	None	✓			✓	
Barn swallow	Threatened	None				✓	
Canada Warbler	Threatened	Threatened		✓			
Common nighthawk	Threatened	Threatened	✓	✓			✓
Evening Grosbeak	Special Concern	None		✓		✓	✓
Horned grebe	Special Concern	None			✓	✓	
Olive-sided flycatcher	Threatened	Threatened	✓	✓	✓		✓
Rusty blackbird	Special Concern	None	✓	✓	✓		✓
Short-eared owl	Special Concern	Threatened					
Trumpeter swan	None	Endangered					✓
Yellow rail	Special Concern	None					

1. *Species at Risk Act.*
2. *The Endangered Species and Ecosystems Act.*
3. Keeyask Transmission Project (Stantec Consulting 2012).
4. Bipole III Transmission Project, Hayes River Upland Ecoregion (WRCS 2011).
5. Keeyask Generation Project (Stantec Consulting 2013).
6. Avian Management Plan and Inventory 2021 (WRCS unpublished data). A pair of Horned grebes were observed incidentally in a pond near Gillam, 2023.
7. R44H Radisson to Henday 230 kV Transmission Line Project.



Map 5: **Avian species of conservation concern observations in the study area, 2022**



Map 6: **Avian species of conservation concern observations in the study area, 2023**

3.2 Bird-wire Collision Baseline Study

Signs of 19 bird-wire collisions were recorded during the first visit from May 17-18, 2023, and evidence of 15 collisions were recorded during the second visit from May 24-25, 2023.

The most common evidence of bird-collisions found came from ptarmigan species, either willow ptarmigan (*Lagopus lagopus*) or rock ptarmigan (*Lagopus muta*). During the first and second visit, collision evidence of 12 and eight ptarmigan was observed, respectively. Additionally, evidence of three sharp-tailed grouse (*Tympanuchus phasianellus*) collisions, three waterfowl (ducks, including mallard), one dark-eyed junco (*Junco hyemalis*), and five unknown species were observed (Table 3). Collision mortalities of bird species-at-risk and Canada geese were not detected during the spring survey.

Table 3: Bird-wire collision evidence observed at each site in 2023

Site	Date	Visit	Species	UTM
Site 1	18-May-23	1	Mallard	15 V 401455 6247716
	18-May-23	1	Ptarmigan spp.	15 V 401690 6247566
	18-May-23	1	Ptarmigan spp.	15 V 401356 6247801
	18-May-23	1	Sharp-tailed Grouse	15 V 401709 6247551
	18-May-23	1	Sharp-tailed Grouse	15 V 401646 6247587
	18-May-23	1	Unknown	15 V 401580 6247634
	18-May-23	1	Unknown	15 V 401673 6247609
	18-May-23	1	Unknown	15 V 401211 6247842
	25-May-23	2	Sharp-tailed Grouse	15 V 401576 6247701
	25-May-23	2	Unknown	15 V 401450 6247744
Site 2	17-May-23	1	Dark-eyed Junco	15 V 412236 6247416
	17-May-23	1	Ptarmigan spp.	15 V 412828 6247638
	17-May-23	1	Ptarmigan spp.	15 V 412244 6247354
	17-May-23	1	Ptarmigan spp.	15 V 411989 6247276
	17-May-23	1	Ptarmigan spp.	15 V 412254 6247442
	17-May-23	1	Ptarmigan spp.	15 V 412146 6247416
	17-May-23	1	Ptarmigan spp.	15 V 412101 6247367
	24-May-23	2	Ptarmigan spp.	15 V 412775 6247696
	24-May-23	2	Ptarmigan spp.	15 V 412740 6247580
Site 3	18-May-23	1	Ptarmigan spp.	15 V 416015 6249154
	18-May-23	1	Ptarmigan spp.	15 V 416144 6249159
	18-May-23	1	Ptarmigan spp.	15 V 416070 6249137
	18-May-23	1	Ptarmigan spp.	15 V 416333 6249351
	25-May-23	2	Ptarmigan spp.	15 V 416025 6249144
	25-May-23	2	Ptarmigan spp.	15 V 415935 6249082
Site 4	24-May-23	2	Duck spp.	15 V 428814 6258372
	24-May-23	2	Duck spp.	15 V 428861 6258306
	24-May-23	2	Mallard	15 V 428801 6258429
	24-May-23	2	Ptarmigan spp.	15 V 429068 6258066
	24-May-23	2	Ptarmigan spp.	15 V 428722 6258322
	24-May-23	2	Ptarmigan spp.	15 V 428837 6258278
	24-May-23	2	Ptarmigan spp.	15 V 428827 6258437
	24-May-23	2	Unknown	15 V 429011 6258104
	24-May-23	2	Unknown	15 V 428789 6258364

The estimated searcher efficiency was 0.63 (63%) and the scavenger bias was 0.25 (75%) (Table 4), indicating that a large proportion of carcasses were likely scavenged prior to being found. The estimated seasonal mortality for a six-week period in the spring ranged from 218-620 mortalities/km and was estimated to be 443 mortalities/km for all sites combined (Table 4).

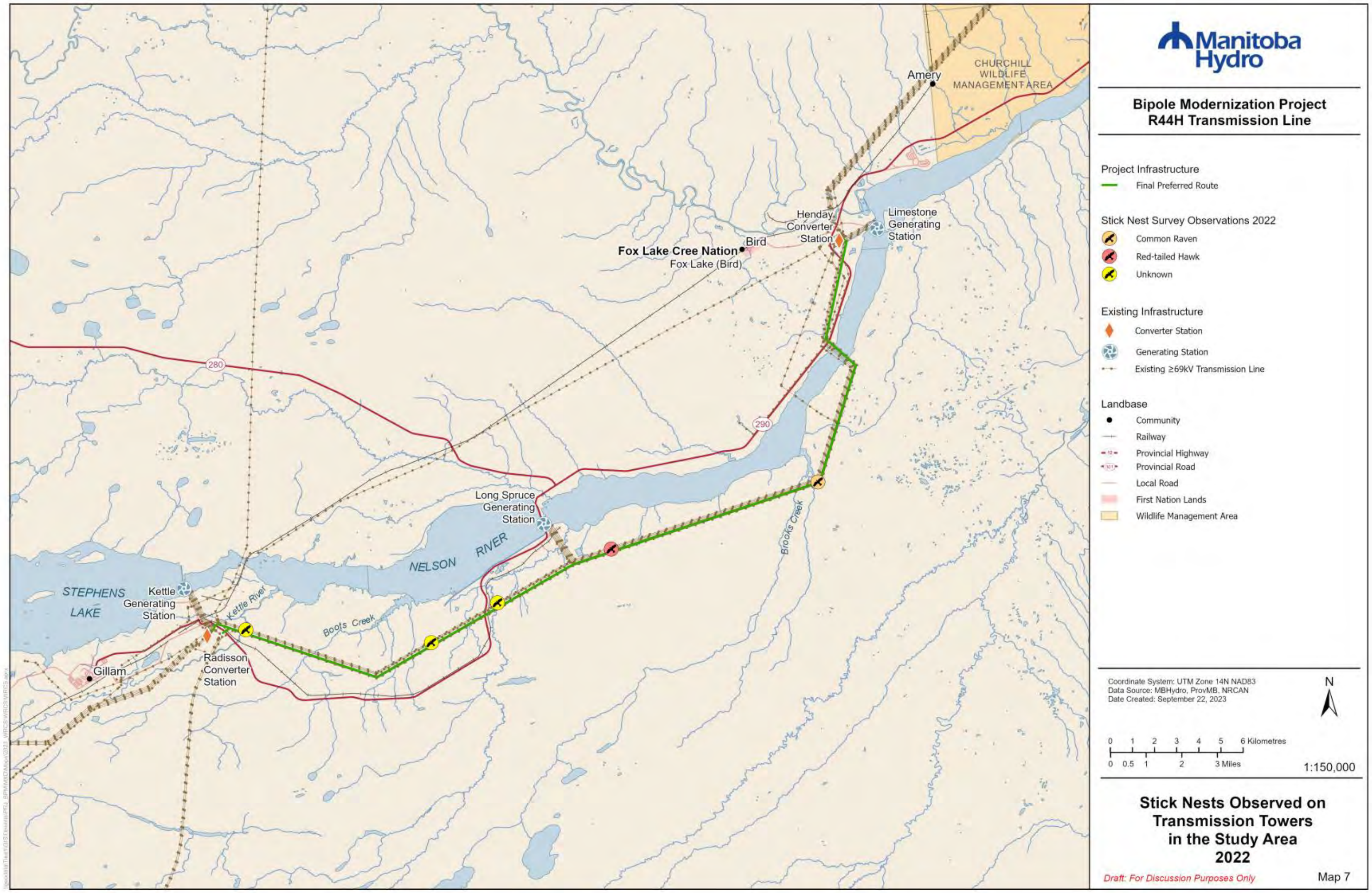
Table 4: Bird-wire collision mortality estimates, 2023

Site	Total Collisions	Searcher Efficiency	Scavenger Bias	Est. Weekly Mortality	Site Length (m)	Est. Weekly Mortality/km	Est. Seasonal Mortality (6 weeks)
Site 1	10	0.63	0.25	64	619	103	620
Site 2	9			58	766	75	451
Site 3	4			26	705	36	218
Site 4	9			58	685	84	505
Total	32			205	2,775	74	443

3.3 Large Stick Nest Survey

Five stick nests were observed on transmission towers between the Radisson and Henday converter stations (Map 7), including one used by a red-tailed hawk (*Buteo jamaicensis*) and a second used by common raven (Photo 2). No large nests or colonial waterbird colonies were observed in the habitat within approximately 100 m of the ROWs.

Photo 2: Common raven in a nest on a transmission tower, 2022



Map 7: **Stick nests observed on transmission towers in the study area, 2022**

4.0 DISCUSSION

Seventy-six of the estimated 182 bird species that could reasonably be expected occur in the region were recorded in the study area in 2022/23. Based on site occupancy and abundance, the most common species observed on or near the ROW included white-throated sparrow (*Zonotrichia albicollis*), Lincoln's sparrow (*Melospiza lincolnii*), American robin (*Turdus migratorius*), ruby-crowned kinglet (*Regulus calendula*), fox sparrow (*Passerella iliaca*), Wilson's snipe (*Gallinago delicata*), swamp sparrow (*Melospiza georgiana*), hermit thrush (*Catharus guttatus*), dark-eyed junco (*Junco hyemalis*), and alder flycatcher (*Empidonax alnorum*). A few species, including American goldfinch (*Spinus tristis*), black-throated green warbler (*Setophaga virens*), and evening grosbeak (*Coccothraustes vespertinus*) were observed in 2022/23, that are beyond their known ranges.

The edge/open forest habitat at ROW sites and buffer sites supported the greatest number of avian species. Vegetation surveys indicated that habitat on the wide ROW was previously coniferous forest, and the buffer consists mainly of black spruce (*Picea mariana*) forest and fen wetlands with stunted tamarack (*Larix laricinia*) (Szwaluk Environmental Consulting 2022). Deciduous trees occur only where soil conditions are suitable (Szwaluk Environmental Consulting 2022). The fewest bird species were found in the undisturbed contiguous forest beyond the transmission line ROWs. As edge habitats tend to support higher bird abundances and more species diversity (*e.g.,* Yahner 1988; Terraube *et al.* 2016), the results were as expected. Species abundance and diversity are anticipated to remain similar to those observed in 2022/23 following the development of the R44H transmission line. Clearing of forest habitat will create shrub and edge habitat that are preferred by some species in the region. For the most common species observed in the study area, the additional clearing of forest habitat may result in a greater abundance of American robins and a decrease in ruby-crowned kinglets, while species such as the white-throated sparrow and Lincoln's sparrow would remain stable. The relatively even distribution of species of conservation of concern during the study suggests that abundance will not change with the development of the R44H transmission line. However, some shifts may occur in these species due to their habitat preferences. Species such as the olive-sided flycatcher, which prefers edges, and common nighthawk, which prefers open areas, will likely continue to use habitat around the ROW.

Five species of conservation concern were recorded in the study area in 2022/23. Bank swallow, common nighthawk (*Chordeiles minor*), olive-sided flycatcher (*Contopus cooperi*), and rusty blackbird (*Euphagus carolinus*) are more numerous in the region than suggested by their conservation status. Studies specific to these species have been conducted in the region for Keeyask Generation Project construction monitoring. Aerial and boat-based surveys of shoreline bank swallow habitat (WRCS 2022b), nighttime ARU surveys in common nighthawk habitat (WRCS 2020a), and ARU surveys in olive-sided flycatcher and rusty blackbird habitat (WRCS 2020b) have shown that while these species are not abundant in the region, they are not as sparse as indicated by general surveys for breeding birds in broad habitat types. While the likelihood of observing trumpeter swans in northern Manitoba is low, the species was recorded at one site in the study area in 2022. A pair with cygnets was observed in the region in 2020 during studies for the Keeyask Generation Project (WRCS 2022c) and possible breeding evidence was recorded during the Atlas of the Breeding Birds of Manitoba (Koes 2018). Based on the modernized *Migratory Birds Regulations*, 2022 (SOR/2022-105), a noteworthy species detected in the buffer area was pileated woodpecker (*Dryocopus pileatus*), whose nests are protected year-round (Government of Canada 2022).

The estimated collision mortality rates observed in this study are relatively high in comparison to the rates observed from other transmission lines in the province (Table 5). The overall seasonal mortality rate of 443 mortalities/km/six-weeks is comparable to those observed in the spring at the Manitoba-Minnesota Transmission Project in southern Manitoba (478 mortalities/km/six-weeks), where bird diversity is generally higher, and to the Keeyask Transmission Project in 2017 (469.09 mortalities/km/six-weeks), which experienced high scavenging rates.

The presence of multiple transmission lines on the study ROW may have contributed to the relatively high number of collisions observed in comparison to other areas. These estimated collision mortality rates combine three or four individual transmission lines in the ROW. Collision rates per transmission line would be lower if they were not combined. Numerous transmission lines in a single ROW create a broad collision hazard for birds that pass through the area. However separate ROWs for each transmission line could also create elevated risks. Additionally, the high scavenging rates observed in the study area amplified the estimated collision mortality estimates.

The consistent finding of collision evidence from ptarmigan and sharp-tailed grouse suggests that resident grouse species present in the study area are more susceptible to collision in comparison to migratory species. Ptarmigan and grouse may be more susceptible to wire collisions as they have high wing loading (large body mass relative to body size), making them less maneuverable (Bevanger 1998).

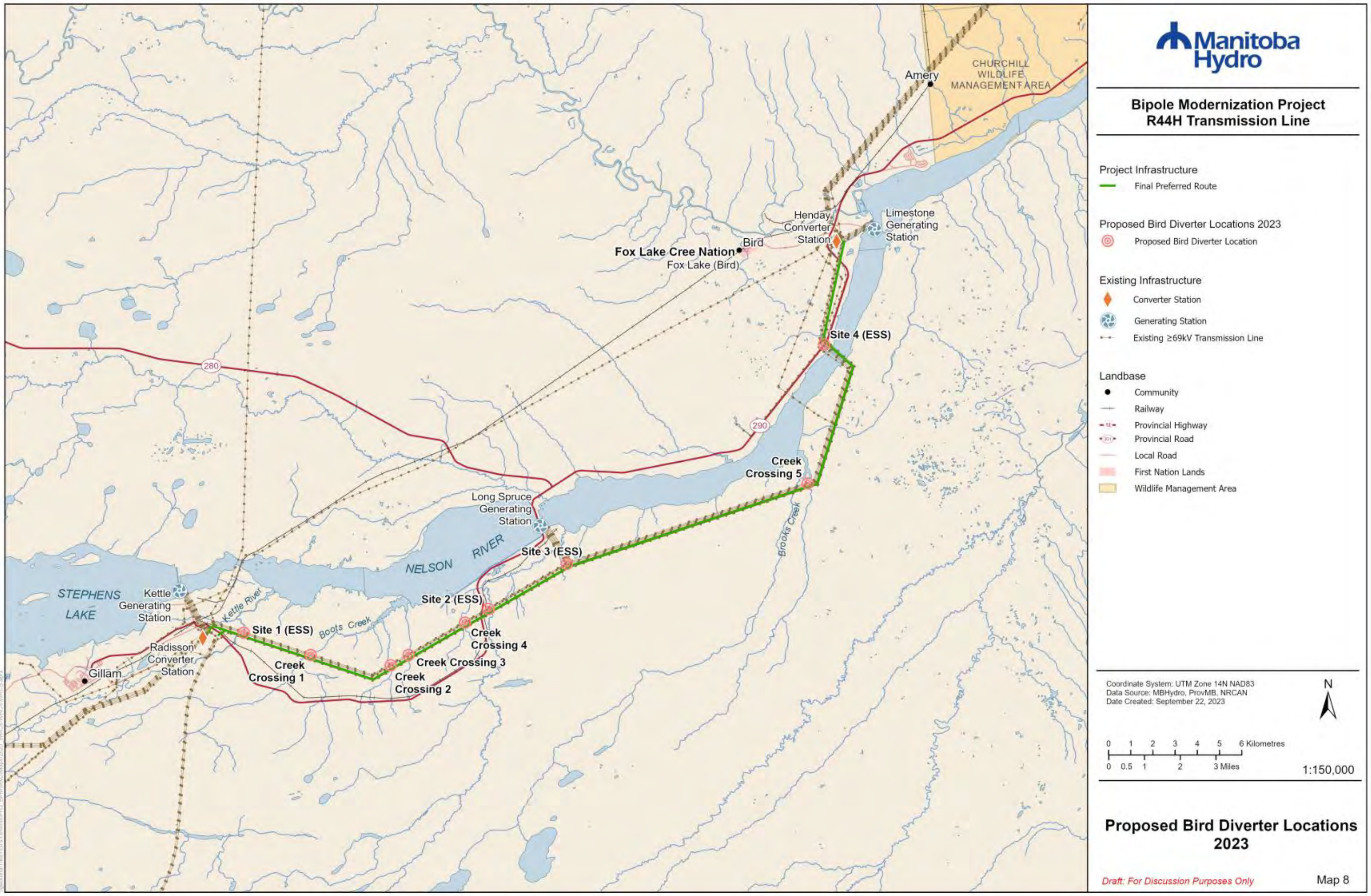
To reduce the potential number of bird-wire collisions, the installation of bird diverters at the ESS's identified in this study, as well as at locations where the ROW intersects watercourses that may be used as travel corridors by waterfowl, is recommended (Map 8, Appendix A, Table A-4). Bird diverters should be installed for a minimum length of one span in either direction from the intersecting creek. Increasing the visibility of transmission lines using commercially available products has been shown to reduce the number of bird-wire strikes (Barrientos *et al.* 2012; Brown and Drewien 1995; Morkill and Anderson 1991). Outfitting parallel transmission lines with bird diverters would also be helpful and recommended.

The transmission towers were used as nesting habitat by at least two bird species, red-tailed hawk and common raven; no bald eagle nests were observed. The habitat adjacent the ROWs did not appear to be used by larger birds for nesting. No nesting colonies like those used by great blue heron were observed in the area. Nesting habitat for large stick nests does not appear to be limited in the study area, and nesting on the transmission towers likely occur opportunistically.

Table 5: Estimated seasonal collision mortality (mortalities/km/six-weeks) from other studies conducted in Manitoba (WRCS 2017; WRCS 2018a; WRCS 2018b; WRCS 2018c; WRCS 2021; WRCS 2022d)

Study and Year(s)	Estimated Collision Mortality (mortalities/km/six-weeks)					
	Spring Migration Diverters Present	Spring Migration Diverters Absent	Breeding Bird Diverters Present	Breeding Bird Diverters Absent	Fall Migration Diverters Present	Fall Migration Diverters Absent
Keeyask Transmission Project 2016	NA	NA	10.8	0	10.32	0
Keeyask Transmission Project 2017	469.09*	1130.88*	0	54.91	14.54	27.49
Lake Winnipeg East 2018	NA	NA	NA	NA	5.98	NA
Wuskwatim Outlet Transmission Line 2014, 2016-2018	NA	NA	NA	27.34	NA	27.34
Bipole III Transmission Line 2018-2020	35.10	29.64	NA	NA	19.68	19.38
Manitoba-Minnesota Transmission Project 2020-2022	478.6	209.1	NA	NA	67.0	67.1

* The estimated collision mortality was inflated due to efficient scavengers.



Map 8: **Proposed locations for the installation of bird diverters**

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APPENDIX A
Tables

Table A-1: Number of bird species recorded at 45 ARU sites in 2022 and 21 sites in 2023

Location	Site	Site Type	UTM Location	Number of Species 2022	Number of Species 2023
BR10	BR10C	ROW	15 V 424194 6251225	15	30
BR10	BR10O	Buffer	15 V 424709 6251200	15	24
BR10	BR10Co	Reference	15 V 424586 6250698	18	25
BR11	BR11C	ROW	15 V 427100 6251906	16	
BR11	BR11O	Buffer	15 V 426942 6251770	11	
BR11	BR11Co	Reference	15 V 426891 6251202	8	
BR12	BR12C	ROW	15 V 428569 6253652	21	28
BR12	BR12O	Buffer	15 V 428981 6254362	15	21
BR12	BR12Co	Reference	15 V 430064 6254325	19	24
BR13	BR13C	ROW	15 V 429744 6256382	15	
BR13	BR13O	Buffer	15 V 430033 6256813	16	
BR13	BR13Co	Reference	15 V 430747 6256716	17	
BR14	BR14C	ROW	15 V 428885 6258697	12	
BR14	BR14O	Buffer	15 V 429145 6259077	14	
BR14	BR14Co	Reference	15 V 428649 6259607	11	
BR15	BR15C	ROW	15 V 429545 6260837	10	24
BR15	BR15O	Buffer	15 V 429786 6261241	14	22
BR15	BR15Co	Reference	15 V 429316 6261497	12	25
BR1	BR1C	ROW	15 V 401755 6247602	14	
BR1	BR1O	Buffer	15 V 402170 6247245	17	23
BR1	BR1Co	Reference	15 V 401457 6248680	16	19
BR2	BR2C	ROW	15 V 404538 6246378	14	
BR2	BR2O	Buffer	15 V 405005 6246003	22	
BR2	BR2Co	Reference	15 V 404570 6245769	14	
BR3	BR3C	ROW	15 V 407489 6245189	11	24
BR3	BR3O	Buffer	15 V 407922 6245263	25	22
BR3	BR3Co	Reference	15 V 407706 6244605	14	24
BR4	BR4C	ROW	15 V 410444 6246573	22	
BR4	BR4O	Buffer	15 V 410958 6246662	21	
BR4	BR4Co	Reference	15 V 410954 6246114	13	
BR5	BR5C	ROW	15 V 412868 6247715	8	
BR5	BR5O	Buffer	15 V 412967 6247534	12	
BR5	BR5Co	Reference	15 V 412889 6248287	13	
BR6	BR6C	ROW	15 V 415283 6248840	19	
BR6	BR6O	Buffer	15 V 416282 6249074	18	
BR6	BR6Co	Reference	15 V 416416 6248620	11	
BR7	BR7C	ROW	15 V 418065 6249776	–	28
BR7	BR7O	Buffer	15 V 418571 6249766	16	24
BR7	BR7Co	Reference	15 V 418500 6249312	13	

Location	Site	Site Type	UTM Location	Number of Species	
				2022	2023
BR8	BR8C	ROW	15 V 420071 6250235	14	25
BR8	BR8O	Buffer	15 V 420388 6250203	18	24
BR8	BR8Co	Reference	15 V 420429 6249769	–	25
BR9	BR9C	ROW	15 V 421435 6250613	17	
BR9	BR9O	Buffer	15 V 422031 6250596	14	
BR9	BR9Co	Reference	15 V 421849 6250241	13	
	Total species			60	59

Table A-2: Bird species detected at three ARU site types, 2022 and 2023

Species	Scientific Name	ROW		Buffer		Reference		Total	
		No. Observed	Percent of Sites	No. Observed	Percent of Sites	No. Observed	Percent of Sites	No. Observed	Percent of Sites
White-throated Sparrow	Zonotrichia albicollis	155	100	161	100	100	90	416	97
Lincoln's Sparrow	Melospiza lincolnii	117	90	103	95	83	71	303	85
American Robin	Turdus migratorius	99	95	96	90	96	81	291	89
Ruby-crowned Kinglet	Regulus calendula	72	90	105	100	84	86	261	92
Fox Sparrow	Passerella iliaca	87	95	85	95	82	76	254	89
Wilson's Snipe	Gallinago delicata	65	90	79	81	58	71	202	81
Swamp Sparrow	Melospiza georgiana	76	80	66	81	55	76	197	79
Hermit Thrush	Catharus guttatus	57	65	58	67	43	52	158	61
Dark-eyed Junco	Junco hyemalis	38	65	65	86	54	76	157	76
Alder Flycatcher	Empidonax alnorum	56	30	47	33	21	10	124	24
Common Raven	Corvus corax	48	65	39	81	31	57	118	68
Northern Waterthrush	Parkesia noveboracensis	30	60	51	81	31	57	112	66
Greater Yellowlegs	Tringa melanoleuca	18	35	33	57	21	29	72	40
Olive-sided Flycatcher	Contopus cooperi	21	30	24	33	24	29	69	31
Savannah Sparrow	Passerculus sandwichensis	39	45	27	33	3	10	69	29
Chipping Sparrow	Spizella passerina	21	35	23	48	23	29	67	37
Wilson's Warbler	Cardellina pusilla	17	40	15	38	31	48	63	42
Common Nighthawk	Chordeiles minor	20	35	30	29	11	24	61	29
Least Flycatcher	Empidonax minimus	11	25	22	29	21	24	54	26
Sandhill Crane	Antigone canadensis	15	55	19	52	18	52	52	53
Canada Goose	Branta canadensis	10	35	18	52	23	57	51	48
Tennessee Warbler	Oreothlypis peregrina	17	20	14	19	18	24	49	21
Lesser Yellowlegs	Tringa flavipes	18	30	12	29	18	24	48	27
Nashville Warbler	Oreothlypis ruficapilla	11	25	21	43	13	29	45	32
Swainson's Thrush	Catharus ustulatus	9	20	17	33	19	38	45	31
Rusty Blackbird	Euphagus carolinus	15	40	16	38	11	33	42	37

Species	Scientific Name	ROW		Buffer		Reference		Total	
		No. Observed	Percent of Sites	No. Observed	Percent of Sites	No. Observed	Percent of Sites	No. Observed	Percent of Sites
Orange-crowned Warbler	Oreothlypis celata	12	40	18	24	11	33	41	32
Palm Warbler	Setophaga palmarum	10	25	9	29	21	29	40	27
White-crowned Sparrow	Zonotrichia leucophrys	20	50	16	24	4	10	40	27
Solitary Sandpiper	Tringa solitaria	8	20	11	33	12	29	31	27
Common Loon	Gavia immer	12	40	5	19	10	33	27	31
Clay-colored Sparrow	Spizella pallida	20	15	4	5	0	0	24	6
Canada Jay	Perisoreus canadensis	4	15	3	10	14	52	21	26
Winter Wren	Troglodytes hiemalis	4	20	2	5	14	24	20	16
Spruce Grouse	Falcipennis canadensis	3	10	12	14	4	14	19	13
Common Redpoll	Acanthis flammea	3	15	13	29	1	5	17	16
White-winged Crossbill	Loxia leucoptera	6	15	5	24	6	19	17	19
LeConte's Sparrow	Ammospiza leconteii	5	10	7	10	2	5	14	8
Spotted Sandpiper	Actitis macularius	3	15	8	10	3	14	14	13
Sora	Porzana carolina	5	5	8	10	0	0	13	5
Ring-billed Gull	Larus delawarensis	1	5	5	19	3	10	9	11
Yellow Warbler	Setophaga petechia	5	15	2	10	0	0	7	8
American Bittern	Botaurus lentiginosus	1	5	1	5	4	10	6	6
Connecticut Warbler	Oporornis agilis	3	10	0	0	3	10	6	6
Song Sparrow	Melospiza melodia	1	5	5	5	0	0	6	3
Killdeer	Charadrius vociferus	2	10	3	14	0	0	5	8
Northern Flicker	Colaptes auratus	1	5	4	19	0	0	5	8
Pileated Woodpecker	Dryocopus pileatus	0	0	3	14	1	5	4	6
American Goldfinch	Spinus tristis	2	10	1	5	0	0	3	5
American Three-toed Woodpecker	Picoides dorsalis	0	0	1	5	2	10	3	5
Black-capped Chickadee	Poecile atricapillus	2	10	0	0	1	5	3	5
Boreal Chickadee	Poecile hudsonica	0	0	2	10	1	5	3	5
Cedar Waxwing	Bombycilla cedrorum	0	0	1	5	2	5	3	3

Species	Scientific Name	ROW		Buffer		Reference		Total	
		No. Observed	Percent of Sites	No. Observed	Percent of Sites	No. Observed	Percent of Sites	No. Observed	Percent of Sites
Common Yellowthroat	Geothlypis trichas	1	5	1	5	1	5	3	5
Great Horned Owl	Bubo virginianus	1	5	2	5	0	0	3	3
Pine Siskin	Spinus pinus	2	10	1	5	0	0	3	5
Red-winged Blackbird	Agelaius phoeniceus	3	10	0	0	0	0	3	3
Magnolia Warbler	Setophaga magnolia	2	5	0	0	0	0	2	2
Red-breasted Nuthatch	Sitta canadensis	2	10	0	0	0	0	2	3
Tree Swallow	Tachycineta bicolor	0	0	1	5	1	5	2	3
Veery	Catharus fuscescens	1	5	1	5	0	0	2	3
Yellow-rumped Warbler	Setophaga coronata	1	5	1	5	0	0	2	3
American Redstart	Setophaga ruticilla	0	0	1	5	0	0	1	2
Belted Kingfisher	Ceryle alcyon	0	0	1	5	0	0	1	2
Black-backed Woodpecker	Picoides arcticus	1	5	0	0	0	0	1	2
Black-throated Green Warbler	Setophaga virens	0	0	1	5	0	0	1	2
Downy Woodpecker	Picoides pubescens	0	0	1	5	0	0	1	2
Eastern Phoebe	Sayornis phoebe	1	5	0	0	0	0	1	2
Evening Grosbeak	Coccothraustes vespertinus	0	0	1	5	0	0	1	2
Golden-crowned Kinglet	Regulus satrapa	1	5	0	0	0	0	1	2
Pine Grosbeak	Pinicola enucleator	0	0	0	0	1	5	1	2
Red-eyed Vireo	Vireo olivaceus	0	0	1	5	0	0	1	2
Ruffed Grouse	Bonasa umbellus	0	0	1	5	0	0	1	2
Sedge Wren	Cistothorus platensis	1	5	0	0	0	0	1	2
Sharp-tailed Grouse	Tympanuchus phasianellus	0	0	0	0	1	5	1	2
Trumpeter Swan	Cygnus buccinator	0	0	1	5	0	0	1	2

Table A-3: Relative abundance (rank number, 1 = most abundant) or presence (✓) of bird species reasonably expected to occur in the region, 2009–2011, 2021-2023

Common Name	Scientific Name	Nature of Occurrence	Expected Occurrence	SARA Status[1]	ESEA Status[2]	Rank R44H[3] 2022/23	Rank KGP[4] 2011	Rank BPIII[5] 2010	Rank KTP[6] 2009–2011	Kettle GS 2021[7]	Long Spruce GS 2021[7]	Limestone GS 2021[7]
Alder flycatcher	*Empidonax alnorum*	Breeding	Common			10	11	19	13			✓
American bittern	*Botaurus lentiginosus*	Breeding	Common			43						
American black duck	*Anas rubripes*	Breeding	Uncommon									
American coot	*Fulica americana*	Breeding	Uncommon									
American crow	*Corvus brachyrhynchos*	Breeding	Common					67	40	✓	✓	✓
American golden-plover	*Pluvialis dominica*	Migration	Common									
American goldfinch	*Spinus tristis*	Breeding	Uncommon/beyond range			49						
American kestrel	*Falco sparverius*	Breeding	Common					68				
American pipit	*Anthus rubescens*	Migration	Common									
American redstart	*Setophaga ruticilla*	Breeding	Uncommon			63		47				
American robin	*Turdus migratorius*	Breeding	Common			3	13	26	18	✓	✓	✓
American three-toed woodpecker	*Picoides dorsalis*	Resident	Uncommon			49		82				
American tree sparrow	*Spizelloides arborea*	Migration	Uncommon									
American white pelican	*Pelecanus erythrorhynchos*	Migration	Uncommon to common								✓	✓
American wigeon	*Mareca americana*	Breeding	Common						59			
Arctic tern	*Sterna paradisaea*	Migration	Uncommon									
Baird's sandpiper	*Calidris bairdii*	Migration	Common									
Bald eagle	*Haliaeetus leucocephalus*	Breeding	Common				35		52	✓	✓	✓
Bank swallow	*Riparia riparia*	Breeding	Common	Threatened	None				33		✓	✓
Barn swallow	*Hirundo rustica*	Breeding	Uncommon to common	Threatened	None					✓	✓	
Bay-breasted warbler	*Setophaga castanea*	Breeding	Common					18	36			
Belted kingfisher	*Megaceryle alcyon*	Breeding	Common			63	36		49		✓	
Black scoter	*Melanitta nigra*	Migration	Uncommon									
Black-and-white warbler	*Mniotilta varia*	Breeding	Common					56				
Black-backed woodpecker	*Picoides arcticus*	Resident	Common			67		43	62			
Black-bellied plover	*Pluvialis squatarola*	Migration	Common									
Blackburnian warbler	*Setophaga fusca*	Breeding	Uncommon					69				

Common Name	Scientific Name	Nature of Occurrence	Expected Occurrence	SARA Status[1]	ESEA Status[2]	Rank R44H[3] 2022/23	Rank KGP[4] 2011	Rank BPIII[5] 2010	Rank KTP[6] 2009–2011	Kettle GS 2021[7]	Long Spruce GS 2021[7]	Limestone GS 2021[7]
Black-capped chickadee	*Poecile atricapillus*	Resident	Common			49		51				
Blackpoll warbler	*Setophaga striata*	Breeding	Common				14	52	1			
Black-throated Green Warbler	*Setophaga virens*	Breeding	Uncommon/beyond range			63						
Blue-headed vireo	*Vireo solitarius*	Breeding	Common					54	44			
Blue-winged teal	*Spatula discors*	Breeding	Uncommon									
Bohemian waxwing	*Bombycilla garrulus*	Breeding	Uncommon									
Bonaparte's gull	*Chroicocephalus philadelphia*	Breeding	Common				16	53	47	✓	✓	✓
Boreal chickadee	*Poecile hudsonicus*	Resident	Common			49	31	38	28			
Boreal owl	*Aegolius funereus*	Resident	Uncommon									
Broad-winged hawk	*Buteo platypterus*	Breeding	Uncommon									
Brown creeper	*Certhia americana*	Breeding	Common					29	30			
Bufflehead	*Bucephala albeola*	Breeding	Uncommon									✓
Cackling goose	*Branta hutchinsii*	Migration	Common									
Canada goose	*Branta canadensis*	Breeding	Common			21		62	60	✓	✓	✓
Canada jay	*Perisoreus canadensis*	Resident	Common			33	22	8	12			✓
Cape May warbler	*Setophaga tigrina*	Breeding	Common					23				
Cedar waxwing	*Bombycilla cedrorum*	Breeding	Common			49	23	31				
Chipping sparrow	*Spizella passerina*	Breeding	Common			16	37	11	20			
Clay-colored sparrow	*Spizella pallida*	Breeding	Uncommon			32			41			✓
Cliff swallow	*Petrochelidon pyrrhonota*	Breeding	Uncommon							✓	✓	
Common goldeneye	*Bucephala clangula*	Breeding	Common					76		✓	✓	✓
Common grackle	*Quiscalus quiscula*	Breeding	Uncommon				27					
Common loon	*Gavia immer*	Breeding	Common			31	32	37	50	✓	✓	✓
Common merganser	*Mergus merganser*	Breeding	Common							✓	✓	✓
Common nighthawk	*Chordeiles minor*	Breeding	Uncommon	Threatened	Threatened	18			51			
Common raven	*Corvus corax*	Resident	Common			11		39	27	✓	✓	✓
Common redpoll	*Acanthis flammea*	Resident	Common			36		70	34			
Common tern	*Sterna hirundo*	Breeding	Common							✓	✓	✓
Common yellowthroat	*Geothlypis trichas*	Breeding	Uncommon			49		49				
Connecticut warbler	*Oporornis agilis*	Breeding	Uncommon			43		63				
Dark-eyed junco	*Junco hyemalis*	Breeding	Common			9	4	6	7			

Common Name	Scientific Name	Nature of Occurrence	Expected Occurrence	SARA Status[1]	ESEA Status[2]	Rank R44H[3] 2022/23	Rank KGP[4] 2011	Rank BPIII[5] 2010	Rank KTP[6] 2009–2011	Kettle GS 2021[7]	Long Spruce GS 2021[7]	Limestone GS 2021[7]
Downy woodpecker	*Picoides pubescens*	Resident	Common			63						
Dunlin	*Calidris alpina*	Migration	Common									
Eastern kingbird	*Tyrannus tyrannus*	Breeding	Uncommon									
Eastern phoebe	*Sayornis phoebe*	Breeding	Uncommon			63						
European starling	*Sturnus vulgaris*	Breeding	Uncommon									
Evening grosbeak	*Coccothraustes vespertinus*	Resident	Uncommon/beyond range	Special Concern		63						
Fox sparrow	*Passerella iliaca*	Breeding	Common			5	12	17	4			
Gadwall	*Anas strepera*	Breeding	Uncommon									
Golden eagle	*Aquila chrysaetos*	Breeding	Uncommon									
Golden-crowned kinglet	*Regulus satrapa*	Breeding	Common			63		32				
Gray catbird	*Dumetella carolinensis*	Breeding	Uncommon					85				
Gray-cheeked thrush	*Catharus minimus*	Migration	Common							✓		
Great blue heron	*Ardea herodias*	Breeding	Uncommon									
Great gray owl	*Strix nebulosa*	Resident	Uncommon									
Great horned owl	*Bubo virginianus*	Resident	Common			49						
Greater scaup	*Aythya marila*	Migration	Uncommon									
Greater white-fronted goose	*Anser albifrons*	Migration	Common									
Greater yellowlegs	*Tringa melanoleuca*	Breeding	Common			13		22	55		✓	
Green-winged teal	*Anas crecca*	Breeding	Common					75				
Gyrfalcon	*Falco rusticolus*	Wintering	Uncommon									
Hairy woodpecker	*Picoides villosus*	Resident	Common				38	45	63			
Harris's sparrow	*Zonotrichia querula*	Migration	Common									
Hermit thrush	*Catharus guttatus*	Breeding	Common			8	15	10	11			
Herring gull	*Larus argentatus*	Breeding	Common				39	71		✓	✓	✓
Hoary redpoll	*Carduelis hornemanni*	Wintering	Common									
Hooded merganser	*Lophodytes cucullatus*	Breeding	Uncommon									
Horned grebe	*Podiceps auritus*	Breeding	Common	Special Concern	None		40					
Horned lark	*Eremophila alpestris*	Migration	Uncommon									
House sparrow	*Passer domesticus*	Breeding	Uncommon									
Hudsonian godwit	*Limosa haemastica*	Migration	Common									
Killdeer	*Charadrius vociferus*	Breeding	Uncommon			46					✓	
Lapland longspur	*Calcarius lapponicus*	Migration	Common									

Common Name	**Scientific Name**	**Nature of Occurrence**	**Expected Occurrence**	**SARA Status[1]**	**ESEA Status[2]**	**Rank R44H[3] 2022/23**	**Rank KGP[4] 2011**	**Rank BPIII[5] 2010**	**Rank KTP[6] 2009–2011**	**Kettle GS 2021[7]**	**Long Spruce GS 2021[7]**	**Limestone GS 2021[7]**
Least flycatcher	*Empidonax minimus*	Breeding	Uncommon			19		15	29	✓	✓	✓
Least sandpiper	*Calidris minutilla*	Migration	Common									
LeConte's sparrow	*Ammospiza leconteii*	Breeding	Common			38		61				
Lesser scaup	*Anthya affinis*	Breeding	Common								✓	
Lesser yellowlegs	*Tringa flavipes*	Breeding	Common			23	17	46	56			✓
Lincoln's sparrow	*Melospiza lincolnii*	Breeding	Common			2	5	34	14		✓	
Long-eared owl	*Asio otus*	Breeding	Uncommon									
Magnolia warbler	*Setophaga magnolia*	Breeding	Common			58	28	12	21	✓		
Mallard	*Anas platyrhynchos*	Breeding	Common					50	61			
Merlin	*Falco columbarius*	Breeding	Uncommon						53			
Nashville warbler	*Oreothlypis ruficapilla*	Breeding	Uncommon			24		40	32			
Northern flicker	*Colaptes auratus*	Resident	Common			46		27	64	✓		
Northern goshawk	*Accipiter gentilis*	Resident	Uncommon									
Northern harrier	*Circus hudsonius*	Breeding	Common					77				
Northern hawk owl	*Surnia ulula*	Resident	Uncommon									
Northern pintail	*Anas acuta*	Breeding	Common									
Northern shoveler	*Anas clypeata*	Breeding	Uncommon									
Northern shrike	*Lanius excubitor*	Migration	Uncommon									
Northern waterthrush	*Parkesia noveboracensis*	Breeding	Common			12	3	28	3	✓	✓	✓
Olive-sided flycatcher	*Contopus cooperi*	Breeding	Common	Threatened	Threatened	14	41	30	23			
Orange-crowned warbler	*Oreothlypis celata*	Breeding	Common			27	24	35	16	✓		
Osprey	*Pandion haliaetus*	Breeding	Uncommon									
Ovenbird	*Seiurus aurocapilla*	Breeding	Uncommon					4				
Pacific loon	*Gavia pacifica*	Migration	Uncommon									
Palm warbler	*Setophaga palmarum*	Breeding	Common			28	8	20	10	✓		
Pectoral sandpiper	*Calidris melanotos*	Migration	Common									
Peregrine falcon	*Falco peregrinus*	Migration	Uncommon	Special Concern	Endangered							
Philadelphia vireo	*Vireo philadelphicus*	Breeding	Uncommon					57				
Pied-billed grebe	*Podilymbus podiceps*	Breeding	Common					78				
Pileated woodpecker	*Dryocopus pileatus*	Resident	Uncommon			48		55				
Pine grosbeak	*Pinicola enucleator*	Resident	Uncommon			63	42	72	38			
Pine siskin	*Spinus pinus*	Breeding	Uncommon			49	29	73				
Red crossbill	*Loxia curvirostra*	Resident	Uncommon					21	39			
Red knot	*Calidris canutus*	Migration	Uncommon	Endangered	Endangered							

Common Name	Scientific Name	Nature of Occurrence	Expected Occurrence	SARA Status[1]	ESEA Status[2]	Rank R44H[3] 2022/23	Rank KGP[4] 2011	Rank BPIII[5] 2010	Rank KTP[6] 2009–2011	Kettle GS 2021[7]	Long Spruce GS 2021[7]	Limestone GS 2021[7]
Red-breasted merganser	*Mergus serrator*	Breeding	Common							✓	✓	✓
Red-breasted nuthatch	*Sitta canadensis*	Resident	Uncommon			58		41	42			
Red-eyed vireo	*Vireo olivaceus*	Breeding	Common			63		7				
Red-necked grebe	*Podiceps grisegena*	Breeding	Uncommon					79				
Red-necked phalarope	*Phalaropus lobatus*	Migration	Uncommon									
Red-tailed hawk	*Buteo jamaicensis*	Breeding	Common					64				
Red-winged blackbird	*Agelaius phoeniceus*	Breeding	Common			49		65	31			
Ring-billed gull	*Larus delawarensis*	Breeding	Uncommon			41	43	66	48			✓
Ring-necked duck	*Aythya collaris*	Breeding	Common									
Rock ptarmigan	*Lagopus muta*	Wintering	Uncommon									
Rose-breasted grosbeak	*Pheucticus ludovicianus*	Breeding	Uncommon									
Ross's goose	*Chen rossii*	Migration	Common									
Rough-legged hawk	*Buteo lagopus*	Migration	Uncommon									
Ruby-crowned kinglet	*Regulus calendula*	Breeding	Common			4	10	5	2	✓	✓	
Ruddy turnstone	*Arenaria interpres*	Migration	Uncommon									
Ruffed grouse	*Bonasa umbellus*	Resident	Common			63		58	57	✓	✓	
Rusty blackbird	*Euphagus carolinus*	Breeding	Uncommon	Special Concern	None	26	18	59	24			
Sanderling	*Calidris alba*	Migration	Common									
Sandhill crane	*Antigone canadensis*	Breeding	Common			20		60	45			
Savannah sparrow	*Passerculus sandwichensis*	Breeding	Common			14			37			✓
Sedge wren	*Cistothorus platensis*	Breeding	Uncommon			63						
Semipalmated plover	*Charadrius semipalmatus*	Migration	Common									
Semipalmated sandpiper	*Calidris pusilla*	Migration	Common									
Sharp-shinned hawk	*Accipiter striatus*	Breeding	Uncommon					80				
Sharp-tailed grouse	*Tympanuchus phasianellus*	Resident	Uncommon			63						
Short-billed dowitcher	*Limnodromus griseus*	Breeding	Uncommon									
Short-eared owl	*Asio flammeus*	Breeding	Uncommon	Special Concern	Threatened							
Smith's longspur	*Calcarius pictus*	Migration	Uncommon									
Snow bunting	*Plectrophenax nivalis*	Migration	Common									
Snow goose	*Chen caerulescens*	Migration	Common									
Snowy owl	*Bubo scandiacus*	Wintering	Uncommon									

Common Name	Scientific Name	Nature of Occurrence	Expected Occurrence	SARA Status[1]	ESEA Status[2]	Rank R44H[3] 2022/23	Rank KGP[4] 2011	Rank BPIII[5] 2010	Rank KTP[6] 2009–2011	Kettle GS 2021[7]	Long Spruce GS 2021[7]	Limestone GS 2021[7]
Solitary sandpiper	*Tringa solitaria*	Breeding	Common			30	19	48				
Song sparrow	*Melospiza melodia*	Breeding	Common			43			35	✓	✓	✓
Sora	*Porzana carolina*	Breeding	Common			40			46			
Spotted sandpiper	*Actitis macularius*	Breeding	Common			38	33					✓
Spruce grouse	*Falcipennis canadensis*	Resident	Common			35		81	58			
Stilt sandpiper	*Calidris himantopus*	Migration	Common									
Surf scoter	*Melanitta perspicillata*	Migration	Uncommon							✓		✓
Swainson's thrush	*Catharus ustulatus*	Breeding	Common			24	25	3	15	✓	✓	✓
Swamp sparrow	*Melospiza georgiana*	Breeding	Common			7	1	42	22		✓	✓
Tennessee warbler	*Oreothlypis peregrina*	Breeding	Common			22	6	1	9			
Tree swallow	*Tachycineta bicolor*	Breeding	Common			58	26	74		✓	✓	✓
Trumpeter swan	*Cygnus buccinator*	Breeding	Uncommon	None	Endangered	63						
Tundra swan	*Cygnus colombianus*	Migration	Common									
Veery	*Catharus fuscescens*	Breeding	Uncommon			58						
Whimbrel	*Numenius phaeopus*	Migration	Uncommon									✓
White-crowned sparrow	*Zonotrichia leucophrys*	Breeding	Common			28	34		26	✓	✓	✓
White-rumped sandpiper	*Calidris fuscicollis*	Migration	Common									
White-throated sparrow	*Zonotrichia albicollis*	Breeding	Common			1	2	2	6	✓	✓	✓
White-winged crossbill	*Loxia leucoptera*	Resident	Common			36	44	16	43		✓	
White-winged scoter	*Melanitta fusca*	Breeding	Common									
Willow ptarmigan	*Lagopus lagopus*	Wintering	Uncommon									
Wilson's snipe	*Gallinago delicata*	Breeding	Common			6	20	24	54			
Wilson's warbler	*Cardellina pusilla*	Breeding	Common			17	9	36	17			✓
Winter wren	*Troglodytes hiemalis*	Breeding	Common			34		9	19			
Yellow rail	*Coturnicops noveboracensis*	Breeding	Uncommon	Special Concern	None							
Yellow warbler	*Setophaga petechia*	Breeding	Common			42	21	14	25	✓	✓	✓
Yellow-bellied flycatcher	*Empidonax flaviventris*	Breeding	Common				30	25	5			
Yellow-bellied sapsucker	*Sphyrapicus varius*	Breeding	Common					33				
Yellow-rumped warbler	*Setophaga coronata*	Breeding	Common			58	7	13	8			✓

1. *Species at Risk Act.*
2. *The Endangered Species and Ecosystems Act.*
3. R44H Radisson to Henday 230 kV Transmission Line Project.

4. Keeyask Generation Project (Stantec Consulting 2013).
5. Bipole III Transmission Project, Hayes River Upland ecoregion (WRCS 2011).
6. Keeyask Transmission Project (Stantec Consulting 2012).
7. Avian Management Plan and Inventory 2021 (WRCS unpublished data).

Table A-4: Proposed locations for the installation of bird diverters at Environmentally Sensitive Sites (ESS) and watercourse crossings

Site	Zone	Easting	Northing
Site 1 (ESS)	15N	401771	6247579
Site 2 (ESS)	15N	412833	6247680
Site 3 (ESS)	15N	416528	6249398
Site 4 (ESS)	15N	428911	6258226
Creek Crossing 1	15N	404686	6246315
Creek Crossing 2	15N	408228	6245544
Creek Crossing 3	15N	409068	6245933
Creek Crossing 4	15N	411725	6247166
Creek Crossing 5	15N	427636	6252060

Appendix D

Greenhouse gas report

RADISSON TO HENDAY (R44H) TRANSMISSION PROJECT – GREENHOUSE GAS MITIGATION ASSESSMENT REPORT

Energy Resource Planning Department
Integrated Resource Planning

PROVINCE OF MANITOBA
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DATE: DECEMBER 2023

REPORT: **IRPD 23_17**

Final Version

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The following people provided meaningful contributions to this report:

- **K Michael Shaw** (Senior GHG Analysis Engineer, Energy Resource Planning Dept, AP&D) co-led the R44H GHG Assessment and was the main author.
- **Jordan Cruise** (GHG Analysis Engineer, Energy Resource Planning Dept, AP&D) co-led the R44H GHG Assessment and was the primary reviewer.
- **Jodine MacDuff** (Coordination and Regulatory Section Head, T&D Environment and Engagement Dept, AP&D) managed the data collection process and reviewed all sections.
- **Emerson Adajar** (Senior Transmission Line Engineer, Transmission Overhead & Civil Engineering Dept, AP&D) contributed to the assessment of construction-related emissions and reviewed relevant sections.
- **Amy Wtorek** (Civil Design Section Head, Transmission Overhead & Civil Engineering Dept, AP&D) contributed to the assessment of construction-related emissions.
- **Evan Rodgers** (Technical Assistant with Geospatial Data Services, Engineering Standards & Support Services Dept, AP&D) contributed to the assessment of land land-use change emissions and reviewed relevant sections.
- **Sam Kovnats** (HVDC Assets Lead, Asset Lifecycle Management Dept, AP&D) contributed to the assessment of generation effects and reviewed relevant sections.
- **Ioni Fernando** (HVDC Planning Section Head, Grid Infrastructure Planning Dept, AP&D) contributed to the assessment of generation effects and reviewed relevant sections.
- **Dallas MacDonald** (Technical Assistant within Generation System Studies, Energy Resource Planning Dept, AP&D) contributed to the assessment of generation effects and reviewed relevant sections.
- **Ariel Brawerman** (Generation System Studies Engineer, Energy Resource Planning Dept, AP&D) contributed to the assessment of generation effects and reviewed relevant sections.
- **Aimee Intac-Leung** (HVDC Modernization Project Manager, Transmission & Distribution Projects Dept, AP&D) reviewed relevant sections.
- **Kristina Koenig** (Energy Resource Planning Department Manager, AP&D) provided managerial review.
- **Lindsay Melvin** (Director Integrated Resource Planning, AP&D) provided managerial review.

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1 PURPOSE OF THIS REPORT

This report summarizes the estimate of greenhouse gas emission (“emission”) implications (“GHG effects”)[1] related to the Radisson to Henday (R44H) Transmission Project (“R44H Project”). The R44H Project consists of the construction of a new 230-kV transmission line between the existing Radisson and Henday converter stations (“Radisson” & “Henday”), terminations at those stations, and associated station upgrades. The Project Description, included within the Environmental Assessment (“EA”) of the R44H Project, provides more details on, and need for, the R44H Project.

The purpose of this report is to function as a point of reference for the EA of the R44H Project, documenting the applied GHG effect estimation methodologies and assumptions. The greenhouse gas (“GHG”) mitigation assessment of the R44H Project (“R44H GHG Assessment”) incorporates estimates of all relevant GHG effects (both emissions and emission reductions), primary and secondary, of the R44H Project. The R44H GHG Assessment considered all significant impacts of the project: This includes both life cycle emissions, related to the construction of new infrastructure, as well as generation effects due to both the system improvements and outage mitigations resulting from the R44H Project. Life cycle emissions include construction related emissions (including supply-chain emissions), permanent land-use change emissions along the right-of-way (“ROW”), and ongoing maintenance emissions. When considering all relevant GHG effects, the R44H Project is expected to reduce global emissions.

[1] Note: “GHG effect” means “changes in GHG emissions, removals, or storage caused by a project activity. There are two types of GHG effects: primary effects and secondary effects.” [WRI & WBCSD, 2005]

2 SUMMARY OF R44H PROJECT GHG EFFECTS

Table 1 provides a high-level approximation of R44H Project's GHG effects, indicating the order of magnitude of potential emission impacts. GHG effects presented in Table 1 are absolute values, not net values, as the project scenario and baseline scenario are assumed to be identical (refer to Section 3 for details on this topic). While aggregated GHG effects are presented to the nearest kilotonne ("kt") of CO_2e in Table 1, this is only done for comparison purposes; it is not intended to imply that this level of accuracy was achieved during the estimate of GHG effects. The R44H Project is expected to very likely reduce global emissions by at least 400 kt of CO_2e. Net reductions could be higher, but there is a wide range of uncertainty related to the generation effects resulting from the R44H Project's outage mitigation benefits.

Table 1 Summary of Absolute R44H Project GHG Effects

R44H Project GHG Effect	kt CO_2e
Life Cycle Construction Related Emissions	+24
Generation Effects due to Improved System Efficiency	-400
Incremental Generation Effects due to One Long-Term outage	-660 to +5
Combined GHG Effects: Very likely at least 400 kt CO_2e in global reductions	

It is expected that global emission reductions resulting from the R44H Project's generation effects will outweigh construction related emissions by at least one order of magnitude, potentially up to three orders of magnitude. The R44H Project has the potential to significantly increase the amount of regional load served by non-emitting generation (i.e., hydroelectricity) for several decades following project completion. It is typical[2] for Manitoba Hydro transmission projects to result in net reductions in global emissions.

While the GHG effects resulting from construction related emissions are relatively small, they are detailed in Table 2 as the purpose of this report is to function as a point of reference for the EA. While aggregated GHG effects are presented to the nearest tenth of a kilotonne ("kt") of CO_2e in Table 2, this is only done for comparison purposes; it is not intended to imply that this level of accuracy was achieved during the estimate of life cycle emissions. The two most significant categories of construction related emissions are the supply-chain emissions embedded in the materials of R44H Project components (45% of emissions) and permanent land-use change due permanent land use change along the ROW (29% of emissions). As with other[3] Manitoba Hydro

[2] Note: This result is consistent with assessment of the MMTP [Jeyakumar & Kilpatrick, 2015], PW75 [Manitoba Hydro, 2021a], and PACE [Manitoba Hydro, 2021c].

[3] Note: This result is consistent with assessment of the MMTP [Jeyakumar & Kilpatrick, 2015], PW75 [Manitoba Hydro, 2021a], and PACE [Manitoba Hydro, 2021c].

transmission projects, emissions related to on-site energy consumption during construction are estimated to be relatively small (10% of emissions).

Table 2 Summary of R44H Project Life Cycle Construction Related Emissions

R44H Project Construction Related Activity	kt CO_2e	% of total
Construction: Material Supply-Chain	10.7	45%
Construction: On-Site Energy & Labour Transport	2.3	10%
Maintenance and Refurbishment	3.8	16%
Permanent Land Use Change	6.9	29%
All R44H Project Construction Related Emissions	**23.7**	

3 GHG ASSESSMENT METHODOLOGY

The R44H GHG Assessment follows the same methodological approaches applied for the GHG mitigation assessments of the Pointe du Bois Renewable Energy Project[4] ("PREP") and the Portage Area Capacity Expansion Project[5] ("PACE"). Additional details related to "generation effects" resulting from Manitoba Hydro projects and applied GHG Project Accounting methods can be found in those comprehensive reports.

For the purposes of the R44H GHG Assessment, the project scenario and baseline scenario are assumed to be identical[6]. The R44H Project Description states that "*the risk of equipment failure continues to increase as the infrastructure ages, therefore the option of doing nothing is not acceptable*". Both the R44H Project and a Remedial Action Scheme[7] will be pursued as separate projects; these projects were determined to both be required and not mutually exclusive. It is therefore assumed that the R44H Project (or a similar project which increases the transfer capacity available between Bipole I ("BPI") and BPII/BPIII) must be completed to ensure adequate reliability of the MB Electrical System and a "do-nothing" scenario would not be a realistic baseline scenario; however, emission estimates presented herein are absolute R44H Project emissions (i.e., emissions are compared against a "do-nothing" scenario where the R44H Project is not built).

The R44H GHG Assessment relied on readily available construction information for the route, LCA emission factors ("EFs"), and system impact information. This approach was deemed reasonable because, although a more comprehensive analysis might provide greater accuracy, a greater level of accuracy was not considered necessary for a project with no net emission effects, where absolute generation effects substantially outweigh construction related emissions, and where absolute construction related emissions are relatively small. Where detailed construction and system information was readily available it has been incorporated.

[4] [Manitoba Hydro, 2021a]

[5] [Manitoba Hydro, 2021c]

[6] Note: This was not the case for the GHG mitigation assessments of the PREP and PACE.

[7] Note: Described in the EA of the R44H Project.

4 LIFE CYCLE EMISSIONS – METHODOLOGY & ASSUMPTIONS

The R44H GHG Assessment's estimate of life cycle emissions strives to follow LCA principles and draws on methodologies from previous GHG life cycle assessments ("LCAs") and GHG Mitigation Assessments of Manitoba Hydro projects. This includes assessments of Keeyask[8], the Manitoba-Minnesota Transmission Project[9] ("MMTP"), PREP[10], and PACE.[11]

Design and construction assumptions related to the transmission line are based on preliminary project design scopes and, when necessary, similar MH projects (e.g., PW75 and D83W)[12]; the final design may change from what is assumed herein. Construction assumptions presented in this report are intended for emissions estimation purposes only. Conservative estimates are adopted at some decision points such that the total life cycle emission estimates provided herein are considered to likely be higher than what will occur.

The Climate Lens directs that "*Mitigation assessments will assess each project across the construction (excluding supply-chain) and operations and maintenance (O&M) phases. The assessment should not seek to estimate construction emissions associated with the asset's future major rehabilitative maintenance or decommissioning. Assessments should include estimates of a project's cumulative construction and O&M emissions over the useful lifespan of the infrastructure, i.e., annual emissions for each year from the start year of the project to the end of its useful life*" [Infrastructure Canada, 2019][13].

Due to Climate Lens direction, substantial uncertainty related to the future decommissioning of the R44H Project, and the presumed relatively small GHG effects related to the decommissioning of the R44H Project, decommissioning related GHG effects have been excluded for the R44H GHG Assessment; however, experience with the GHG assessment of other[14] Manitoba Hydro projects has shown that for projects that require significant portions of pre-manufactured materials, embedded emissions in 'Building Materials' substantially outweigh the emissions directly attributable (Scope 1) to their installation; therefore, these emissions have been included.

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8 [Switzer, 2012]

9 [Jeyakumar & Kilpatrick, 2015]

10 [Manitoba Hydro, 2021a]

11 [Manitoba Hydro, 2021c]

12 Note: PW75 is a component of PREP; D83W is a component of PACE.

13 Climate Lens – Section 2.4 (*Timescale / Forecast Window*)

14 Note: This result occurred in the assessment of the MMTP [Jeyakumar & Kilpatrick, 2015], PW75 [Manitoba Hydro, 2021a], and PACE [Manitoba Hydro, 2021c].

4.1 Construction Activities

Construction activities for the R44H Project are broken down into three major activities:

1. Manufacture of construction components/materials (supply-chain)
2. Transportation of construction components/materials (supply-chain)
3. Transmission line construction (on-site energy and worker transportation)

Fuel use related to station upgrades is assumed to be negligible, compared with the construction of the transmission line, and no corresponding emission estimate has been included in the R44H GHG Assessment; however, high level emission estimates related to the manufacture and transportation of station upgrade materials have been included.

The sequence to construct D83W, as presented in the high-level construction activity map of PACE in Manitoba Hydro (2021c)[15], is identical to the one for the R44H transmission line.

4.1.1 Manufacture of the R44H Transmission Line's Components/Materials

Material estimates for R44H Project components (Table 7) are based on current designs for the route, as described in the R44H Project EA. Key assumed design elements of relevance to the R44H GHG Assessment are as follows:

- R44H transmission line is a ≈42 kilometer-long, 3-phase AC transmission line in a double bundle conductor per phase, horizontal configuration and supported by steel lattice structures.

- Most of the R44H transmission line will utilize 795 MCM 26/7 Strands ACSR (Aluminum Conductors, Steel Reinforced) "DRAKE" with an outside diameter of 28.11 mm for its phase conductors, while 795 MCM 30/19 Strands ACSR "MALLARD" with an outside diameter of 28.96 mm will be used on the section of the line crossing the Nelson River (≈1.8 km). Total ACSR wire lengths for the Nelson River crossing portion and the rest of the line are calculated to be 10.9 km and 248 km respectively.

- For its lightning protection, two (2) shield wires of 7#7 Alumoweld[16] wire (i.e., 7 strands, 11 mm total diameter) are attached and strung at the top of structures. Conversely, the Nelson River crossing portion of the line will be using 19#8 Alumoweld wires (i.e., 19

[15] PACE Project GHG Mitigation Assessment – Section 4.7.2 (*Methodology – Construction Emissions – High Level Construction Activity Map*), Figure 15 (*PACE Project High Level Construction Activity Map*), p.96

strands, 16.3 mm total diameter). Total Alumoweld wire lengths for the Nelson River crossing and the rest of the line are calculated to be 3.7 km and 82.7 km respectively.

- The R44H transmission line comprises two common tower types: guyed suspension towers ("A Structures") and dead-end (i.e., heavy-angle) self-supporting towers ("D Structures", "F Structures", and "X Structures"). All towers are assumed to be composed of galvanized stainless steel. 94 total towers are assumed with an average span between towers of 475 metres. Tower quantities are broken down as follows:
    - 82 A Structures with an average weight of 4.94 tonnes per tower.
    - "*Heavy angle and dead-end structures will be required at specific locations to accommodate line redirection and to terminate the transmission line into the stations"* [Manitoba Hydro, 2014a][16].
        - 4 D Structures with an average weight of 16.94 tonnes per tower.
        - 6 F Structures with an average weight of 19.82 tonnes per tower.
        - 2 X Structures with an average weight of 38.59 tonnes per tower. These special towers are specifically for the Nelson Crossing portion.

- All A Structures will require 4 guy wires per structure. Guy wires are assumed to be 3/4" GR220 19 strand 17 N/m. Guy wires will range in length from 33 to 46 meters, depending on structure design, with an average weight per A structure of 282 kg.

- All tower foundations are assumed to be piled (no mat foundations), based on terrain, tower design, and recent construction experience. All heavy-angle towers will use steel piles (both helical and micropile) for their foundations. 74 of the A structures will use steel piles for the footings and anchors and 8 will use precast concrete piles for the footings and anchors (based on terrain).
    - **Steel helical footings (3-pile configurations) for 19 A structures:**
        - 324 mm diameter x 12.7 mm thick piles with two 558 mm diameter x 19 mm thick helices per pile
        - Average pile depths of 19 meters
        - Total of 6.12 tonnes of steel (average) per 3-pile structure
    - **Steel Micropile footings (3-pile configurations) for 55 A Structures:**
        - 219 mm diameter by 12.7 mm thick steel pipe pile
        - Average pile depths of 19 meters
        - Total of 4.49 tonnes of steel (average) per 3-pile structure

[16] PdB Transmission Project EAR – Chapter 2.2.1.1 (*Project Description – Project Components - Pointe du Bois to Whiteshell Stations 115 kV Transmission Line (PW75) - Structures*), p.2

        - 4.02 tonnes of grout per structure design (average)
    - **Steel helical guy anchors (1-pile configurations) for 74 A structures:**
        - 324 mm diameter piles with two 558 diameter x 19 mm thick helices per pile
        - 4 anchors per A Structure
        - Average pile depths of 13 meters
        - 5.36 tonnes of steel per 1-pile structure (average)
    - **Precast concrete footings for 8 A Structures:**
        - 4.20 tonnes of concrete per structure
        - One 12.75 meter x 0.375 meter steel mast per structure at 0.45 tonnes of steel per mast
    - **Precast concrete guy anchors for 8 A Structures:**
        - 1.80 tonnes of concrete per anchor
        - 4 anchors per A Structure
        - One steel anchor takeoff plate per anchor at 0.03 tonnes per anchor
    - **Steel helical self-supporting foundations (4-pile configurations) for six D, F, and X Structures:**
        - 324 mm diameter x 12.7 mm thick piles with two 558 mm diameter x 19 mm thick helices per pile
        - Average pile depths of 12 meters
        - 4 legs per structure
        - 21.58 tonnes of steel per 4-pile structure (average)
    - **Steel Micropile self-supporting foundations (6-pile configurations) six D, F, and X Structures:**
        - 219 mm diameter x 12.7 mm thick steel pipe pile
        - Average pile depths of 19 m
        - 4 legs per structure
        - 32.60 tonnes of steel (average) per 6-pile structure
        - 8.04 tonnes of grout per structure (average)
- Insulators are assumed to be glass, with combined average insulator weights for each tower type as follows:
    - A Structures: 144 kg per structure.
    - D & F Structures: 1,186 kg per structure.
    - X Structures: 1,469 kg per structure.

- R44H Project components/materials (e.g., towers, conductors, shield wires, and insulators) may be manufactured in Canada or internationally. Products being sourced from Asia are not unusual. For the R44H GHG Assessment, Turkey[17] was selected as the presumed source location: Turkey has been identified as the likely source of tower steel for all the A structures (82 of 92 towers). The choice of Turkey for all components/material is conservative because application of that assumption results in higher emissions than a more local source; however, the actual source location of all the components/materials is unknown at this time.

- The original source for cement is assumed to be Edmonton, based on recent projects and Canadian availability. The R44H Project requires a small amount of concrete compared with other transmission projects where higher percentages of concrete foundations were used. As the concrete is assumed to be prefabricated, it is conservatively assumed that concrete will be mixed near Winnipeg and transported to site.

- Borrow materials required for construction will be purchased from local suppliers. Locations and sites will be determined based on availability and quality of product. It is expected that the use of local borrow materials will minimize the introduction of non-native and/or invasive plant species. Borrow materials can sometimes be re-used for other projects when they are not incorporated into permanent project infrastructure. Due to low materiality (low GHG emissions contributions) and minimal data availability emission effects related to the manufacture of these borrow materials were not quantified for the R44H GHG Assessment.

The manufacture of R44H Project components will require multiple processes (e.g., steel making and rolling, forging, extrusion, etc.). As an approximation of the entire process, LCA EFs for both the production of galvanized steel sheets and the forging of steel bars were applied to the entire weight of steel (Table 4). Similarly, LCA EFs for the production of aluminum conductors were applied to the entire weight of aluminum (Table 4). EFs for other materials (e.g., insulator materials) are based on the overall average of the main materials. 15% of the total concrete weight is assumed to be cement, with a cement production LCA EF listed in Table 4 as well. This same approach for estimating supply-chain emissions was applied to the “Manufacture of Radisson/Henday Station Upgrade Components/Materials (Supply-Chain)”.

[17] Note: Previous assessments have assumed India. The assumption of Turkey reduces supply-chain emissions by less than 1%.

4.1.2 Manufacture of Radisson/Henday Upgrade Components/Materials

The R44H Project will require new equipment to be installed at both Radisson and Henday to accommodate the terminations of the R44H transmission line. This equipment will be located within existing station footprints and, compared with the R44H transmission line, will require a relatively small amount of material and direct construction emissions. Major new equipment includes:

- **Radisson:** One 333MVA 230-138kV power transformer, one 230kV disconnect switch; one 138kV disconnect switch, and other associated components.
- **Henday:** One 230-kV breaker, various 230-kV switches, and other associated components.

High-level material estimates for required station equipment (Table 3) are based on the major equipment listed above as well as design specifications for the De Salaberry East Transmission Station[18] and the Wash'ake Mayzoon Transmission Station[19]. For simplicity, some minor station components (e.g., the "other associated components") were left out of the scope of the overall material estimate. The overall weight of new material installed as the result of the station upgrades is expected to be less than 10% of the overall weight of new material installed for the entire R44H Project (Table 7).

Table 3 Approximation of Station Upgrade Construction Material – Mass Summary (tonnes)

Construction Material	R44H Station Upgrades
Aluminum	2
Steel	36
Copper	90
Insulating Oil	43
Other	2
Material Total (Excluding Concrete/Grout/CF_4/SF_6)	**173**
Breaker CF_4	0.033
Breaker SF_6	0.055

[18] Note: A project description is provided in Manitoba Hydro (2017).

[19] Note: Provided in Manitoba Hydro (2021b).

4.1.3 Transportation of Construction Components/Materials (Supply-Chain)

As noted in Section 4.1.1, for conservativeness, Turkey was the assumed manufacture location for estimating transportation emissions for steel, aluminum, and copper materials. Metal-based materials and equipment were assumed to be transported by ocean to Montreal, then by rail to Winnipeg (via Toronto), and then by road to Radisson, Henday, and other project sites between those locations. Transportation emissions for diesel (and insulating oil) were embedded in the "Produce and Deliver Diesel" EF (Table 4).

Cement is assumed to be transported by rail from Edmonton to Winnipeg, mixed and prefabricated, and then transported by road to site. A conservative average source distance of 100 km was assumed for estimating the transportation emissions of grout and other borrow materials as no specific supplier is currently identified.[20]

Alternative source locations (other than Turkey) for steel, aluminum, and copper would likely result in lower transportation emissions; however, Table 5 shows that transportation emissions contribute ≈6% of overall life cycle emissions for these materials, even with this conservative assumption.

4.1.4 Transmission Line Construction

Estimated workforce requirements were assumed to be proportional based on project scope to those presented in the PdB Transmission Project EAR:

- 756 person-months (842 person-months[21] * 42 km/46.5[22] km) for the construction of the transmission line, including the mobilizing phase, clearing, construction, and demobilization.

"*It is expected that…existing local accommodations will be used for the most part for housing the transmission construction workforce*" [Manitoba Hydro, 2014a][23]. The assumed typical housing location for the workforce is the Kettle Camp due to its relative proximity to Radisson and Henday, with the average one-way daily commute distance conservatively[24] assumed to be 25 km.

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[20] Note: For every 50 km of distance between the supplier and site, total emissions increase by approximately one tonne.

[21] [Manitoba Hydro, 2014a]

[22] Note: PW75 is assumed to be 46.5 km in length.

[23] PdB Transmission Project EAR – Chapter 2.2.3.1 (*Project Description – Project Components – Project Construction – PW75 115 kV Transmission Line*), p.17 [Manitoba Hydro, 2014b]

[24] Note: There is the possibility of mobile construction camps. The camps will be placed along the right-of-way or in pre-disturbed locations. The camp will use a diesel generator for electrical power. In terms of emissions related to worker commutes the choice of the Kettle work camp is conservative as it is further away from site than any mobile construction camps.

Construction equipment could include feller-bunchers, helicopters[25], skidders, bulldozers, drill rigs, backhoes, excavators, loaders, cranes (e.g., 20 tonne, 50 tonne), semi-trailers, tracked vehicles, pick-up trucks, drill rigs, bucket trucks, telehandlers, tensioners, pullers, person lifts, mulchers, chippers, all-terrain and support vehicles as well as generators, compressors and other small construction equipment. For simplicity, and due to data availability, the R44H GHG Assessment assumes that the typical construction vehicle would be an aerial device vehicle (e.g., a bucket truck) and that the vehicles would be left on-site while workers commuted from the Kettle Camp daily. It is assumed that there will be one major construction vehicle for every three workers. It is assumed that workers will arrive on site using one light duty truck[26] for every three workers. Construction vehicles are assumed to consume, on average, twice the 3.4 L/hour rate of fuel required to continually idle without load over the course of 10 hours a day. The doubling incorporates a high-level estimate of average vehicle loading under various seasons and work requirements.

An exception to the above is that, in addition to the assumed 6.8 L/hour average consumption rate (per vehicle) throughout construction, additional fuel is assumed to be consumed for the two most energy intense construction activities:

- Based on assumptions from similar projects, 900 L of diesel fuel is consumed for every hectare ("ha") of area cleared on the ROW.[27]
- While crane erection of the towers is typically presumed, for conservativeness it has been assumed that all towers are erected via heavy duty helicopter at a rate of 750 L of aviation fuel per tower.[28]

[25] Note: Pending the contractors preferences, helicopters could potentially be used in many aspects of construction. Helicopters may be used to transport staff, tools and materials from structure to structure or to assist with the installation of the conductor. Manitoba Hydro analysis undertaken for the EA of the MMTP indicated that the use of helicopters, versus land-based equipment, produces a comparable amount of overall greenhouse gas emissions. While their hourly burn rates are high, they are much more efficient at undertaking certain construction activities (refer to the note on tower erection).

[26] Note: This is a simplification for the purposes of the R44H GHG Assessment. Due to terrain, off road vehicles (e.g., snowmobiles, ATVs, tracked vehicles) will likely be necessary in many situations.

[27] Note: Clearing methods can include machine clearing by mulching, selective clearing by feller-bunchers and hand clearing, particularly in environmentally sensitive areas. Trees will be cut close to ground level. Ground vegetation will not be grubbed except at structure sites where foundations are required, where access of equipment necessitates it, or for worker safety reasons.

[28] Note: Assumed helicopter burn rate of 500 gallons of fuel per hour and erection rate of 25 towers per 10-hour day.

4.1.5 Key Assumptions and Inputs

Table 4 lists the EFs applied for the assessment of construction emissions. These EFs were selected for the LCA of the Manitoba–Minnesota Transmission Project (“MMTP”)[29] and reapplied[30] for the life cycle emission estimate of the R44H Project.

Table 4 Life Cycle Activity EFs

Activity	CO_2e	Unit	Source
Ocean Transport	15.84	g/tonne-km	NREL
Rail Transport	18.97	g/tonne-km	NREL
Road Transport	79.91	g/tonne-km	NREL
Mine Iron Ore	43.04	g/kg of ore	StatsCan
Produce Galvanized Steel Sheet	2,706.09	g/kg steel	NREL
Forge Steel into Bars/Wire/Other	354.61	g/kg steel	Chalmers University
Mine Bauxite	9,627.19	g/kg aluminum	NREL
Produce Aluminum Ingot			
Produce Aluminum Conductor	860.00	g/kg aluminum	CPM LCA Database
Mine Copper	1,424.62	g/kg copper	ICE and StatsCan
Process Copper	1,625.44	g/kg copper	ICE and StatsCan
Produce Copper Wire	3,192.00	g/kg copper	LCA of Copper Products
Produce Cement	928.39	g/kg of cement	LCI of Portland Cement
Combust Aviation Fuel (Full Life Cycle)	3,181.78	g/L of fuel	ECCC LCA Fuel Model
Combust Diesel (Full Life Cycle)	3,537.89	g/L of diesel	ECCC LCA Fuel Model

To provide a more complete understanding of the impact of specific input assumptions, Table 5 presents EFs for aggregated activities closely aligned with the three main activities laid out in Section 4.1. “g/kg material” for the R44H transmission line exclude emissions related to concrete, grout, and insulating gases as these emissions are calculated separately.

[29] [Jeyakumar & Kilpatrick, 2015]

[30] Note: EFs for the combustion of fuel have been updated to match values in the government of Canada’s Fuel Life Cycle Assessment Model.

Table 5 Life Cycle EFs for Aggregated Activities

Activity	CO_2e	Unit
Transport from Turkey to R44H t-line	269.7	g/kg material
Transport from Edmonton to R44H t-line	105.3	g/kg material
Transport from Winnipeg to R44H t-line	82.6	g/kg material
Full LC - Station Upgrade Material	4,518	g/kg material
Full LC - Transmission Line Material	4,295	g/kg material
Full LC - Diesel Combustion (all locations average)	3,538	g/L of diesel
Full LC - Prefabricated Concrete	238	g/kg concrete
Full LC - Aggregate, Grout (all locations)	8	g/kg material
Worker Transport to R44H	26,534	g/vehicle-day
Construction Vehicle Emissions	240,576	g/vehicle-day

Table 6 lists the key assumptions used in the estimate of construction emissions. Rationale for the selection of these values is provided in Section 4.1. Table 7 summarizes the mass of construction materials required for the R44H Project, based on inputs provided in Sections 4.1.1 and 4.1.2.

Table 6 Construction Emissions – Key Input Assumptions

Assumption	Value	Unit	Source
Transmission Line Length	42	km	Manitoba Hydro
Total # of Transmission Towers	94	towers	Manitoba Hydro
Average Transmission Tower Mass	7.12	tonnes	Manitoba Hydro
Conductor Mass - Steel (Non-Nelson Crossing)	0.51	tonnes/km	[Midal Cable, 2010]
Conductor Mass - Aluminum (Non-Nelson Crossing)	1.12	tonnes/km	[Midal Cable, 2010]
Shield Wire Mass - Steel (Non-Nelson Crossing)	0.58	tonnes/km	[AFL, 2003]
Conductor Mass - Steel (Nelson Crossing)	0.72	tonnes/km	[Midal Cable, 2010]
Conductor Mass - Aluminum (Nelson Crossing)	1.12	tonnes/km	[Midal Cable, 2010]
Shield Wire Mass -Steel (Nelson Crossing)	1.25	tonnes/km	[AFL, 2003]
Light Duty Truck Mileage	0.15	L/km	Manitoba Hydro
"Aerial Device" Mileage	0.50	L/km	Manitoba Hydro
"Aerial Device" vehicle idling (no load)	3.4	L/hour	Oak Ridge National Lab
ROW Clearing - Additional Energy	900	L/ha	Manitoba Hydro
Tower Erection - Additional Energy	750	L/tower	Manitoba Hydro
Turkey to Montreal by Ocean	9,634	km	sea-distances.org
Montreal to Winnipeg by Rail	1,821	km	rome2rio.com
Edmonton to Winnipeg by Rail	1,197	km	rome2rio.com
Winnipeg to Henday	1,052	km	Google Maps
Winnipeg to Radisson	1,015	km	Google Maps
Kettle Camp to Radisson	3	km	Google Maps
Kettle Camp to Henday	47	km	Google Maps
Hours per Construction Day	10	hours	Manitoba Hydro
Construction Days Per Month	22	days	Manitoba Hydro
Vehicle Ratio (Labour & Construction)	3	persons/vehicle	Manitoba Hydro
Construction Labour: R44H Project	16,632	person-days	[Manitoba Hydro, 2014a]

Table 7 Permanent Construction Material – Mass Summary (tonnes)

Construction Material	R44H Project
Aluminum	291
Steel	2,005
Copper	90
Insulating Oil	43
Other	29
Material Total (Excluding Concrete/Grout/CF_4/SF_6)	**2,457**
Concrete	91
Grout	269
Breaker CF_4	0.0330
Breaker SF_6	0.0550

4.2 LAND USE CHANGE EMISSIONS – METHODOLOGY & RESULTS

The R44H Project will require permanent clearing due to the ROW and the permanent installation of tower foundations. It is assumed that there will be negligible land use change impacts due to the station upgrades as they occur within existing station footprints.

The R44H Project will also require temporary land disturbances (e.g., temporary access roads, marshalling yards). Manitoba Hydro's preference is to use existing roads and trails to the extent possible prior to development of any new access routes. The use of existing access routes may result in vegetation removal. Where access is not required for operations, Manitoba Hydro will decommission the access route and rehabilitate vegetation, as required. These temporary disturbances are assumed to return to their original state, from a carbon content perspective, and resulting net land use change emissions are assumed to be zero.

For estimating land use change impacts, the assessment followed similar methods to those used for the LCA of the MMTP[31] and PACE[32]. From a carbon content perspective, only treed areas within the project ROW footprint, as well as land permanently converted for tower foundations, are permanently[33] disturbed. It is assumed treed areas will be converted to "Non-Treed" land (Table 8). While this land could convert to a variety of low-lying vegetation land-types the "Non-Treed" carbon content of 15.33 tonne C/ha (Table 8) was deemed a reasonable approximation of the final mix. "*Other areas of low-lying vegetation such as wetlands, peatland, agricultural, riparian and shrub lands along the ROW are assumed to be minimally disturbed and, when disturbed for construction, are assumed to return to their natural state within the project life"* [Jeyakumar & Kilpatrick, 2015].

Along the ROW, the R44H GHG Assessment assumes only above ground carbon content is permanently disturbed due to clearing: "*Carbon content of soils is assumed to be unchanged after clearing*" [Jeyakumar & Kilpatrick, 2015]. Both above and below ground biomass are assumed to be permanently removed from the land converted for tower foundations/footings.

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31 [Jeyakumar & Kilpatrick, 2015]

32 [Manitoba Hydro, 2021c]

33 Note: The assumption of permanence assumes a 75-year project life; however, ROW impacts can be expected to persist beyond 2100 as well.

Table 8 Manitoba Specific Forest Above Ground Biomass (tonne C/ha) [Shaw et al., 2005][34]

Dominant Stand Species	Stands in Sample	Total Live Tree Carbon
Non-Treed	**3**	**15.33**
Jack Pine	16	23.13
Black Spruce	19	32.37
White Spruce	2	88.50
Mixed Coniferous (i.e., Needle)	**37**	**31.41**
Balsam Popular	2	95.00
White Birch	3	50.67
Trembling Aspen	11	49.00
Mixed Deciduous (i.e., Broadleaf)	**16**	**55.06**
Mixed Deciduous/Coniferous	**8**	**69.00**

Manitoba Hydro utilized Earth Observation for Sustainable Development of Forests (EOSD)[35] data to produce an estimate of treed areas along the ROW (Table 9). A standard 60 m ROW was assumed. Total treed area is 93.41 ha; however, clearing activities are estimated to occur along 180.86 ha (87.45 ha of the ROW is assumed to have similar average[36] above ground biomass before and after establishment of the ROW and is not assumed to be permanently impacted).

[34] Note: Based on data from 64 tree stand samples provided on pages 89-90 and 108-109 of Shaw et al. (2005). Above ground biomass includes stem wood, stem bark, branch, and foliage carbon. Shaw et al. (2005) listed both a dominant and co-dominant species for each tree stand. “Mixed” stands were stands where a coniferous species was dominant and a deciduous species was co-dominant, or vice versa.

[35] Note: From 1999 to 2001 the EOSD produced a coarse (25-meter) product using Landsat-7 imagery. Forest Resource Inventory datasets, which were used for the PACE Assessment, are not available for the R44H transmission line ROW.

[36] Note: Above ground biomass varies temporally. Carbon content immediately before and after clearing is not indicative of the average content over time.

Table 9 EOSD Data for the R44H Transmission Line ROW

EOSD Class	Area (ha)
Coniferous Dense	**13.62**
Coniferous Open	**26.28**
Coniferous Sparse	**41.38**
Exposed Land	14.29
Mixedwood Dense	**9.40**
Shrub Tall	25.62
Water	7.24
Wetland Herb	2.29
Wetland Shrub	109.33
Wetland Treed	**2.73**
Total Treed Area	**93.41**
Total Area	**252.18**

The R44H GHG Assessment follows IPCC (2003) direction on calculation methodology while using MB specific carbon contents, for different forestland types, from Shaw et al. (2005). Biomass assumptions in Table 8 are MB specific, not ROW footprint specific. Land use change emissions were estimated using Equation A. Equation A assumes all carbon is released as CO_2 as all biomass is combusted (or productively harvested for use elsewhere) or aerobically decomposed[37]. These assumptions are consistent with mitigation measures outlined in Manitoba Hydro (2014b).

Equation A: CO_2e emissions (tonnes CO_2e) = Area Effected (ha) * [Original Carbon State (tonne C/ha) - Modified Carbon State (tonne C/ha)] * 44/12[38]

Land use change emissions resulting from the R44H Project are estimated to be 6.9 kt of CO_2e; Table 10 summarizes the key inputs assumed for that estimate.

[37] Note: The disposal of trees and other vegetation will conform to the recommendations outlined in the environmental protection program (Section 8.0 of the EA of the R44H Project), as per applicable Provincial Acts and regulations. Where practical, Manitoba Hydro may set aside a limited quantity of timber for use and/or auction but it is not anticipated there will be any merchantable timber within the R44H transmission line ROW. The remaining debris/timber will be chipped or mulched.

[38] Note: 44/12 is the approximate ratio of the molecular weight of CO_2 (44) to that of carbon (12).

Table 10 R44H Project – Land Use Change Summary

Land Use Change Component	ROW Clearing	Tower Foundations	Unit
Permanently Impacted Area	93.41	0.11	ha
Above Ground Carbon Content - Original State	38.92	15.33	tonne C/ha
Above Ground Carbon Content - Modified State	15.33	0.00	tonne C/ha
Permanent Above Ground Carbon Change	19.85	52.13	tonne C/ha
Below Ground Carbon Content - Original State	N/A	176.08[39]	tonne C/ha
Below Ground Carbon Content - Modified State	N/A	0.00	tonne C/ha
Permanent Below Ground Carbon Change	0.00	176.08	tonne C/ha
Total GHG Released	72.80	836.77	t CO_2e/ha
Total GHG Released	**6,800**	**94**	**t CO_2e**

[39] Note: Only a small amount of land (0.11 ha) is required for tower foundations. Total soil carbon (both mineral and organic) is assumed to average of the 37 mixed coniferous stands from Shaw et al. (2005); however, foundations could be installed in areas with different existing land types. For comparison, the non-treed value is 79.33 tonne C/ha.

4.3 OPERATION AND MAINTENANCE EMISSIONS – METHODOLOGY

Maintaining the R44H transmission line in a safe and reliable operating condition will require regular inspection and maintenance. The inspections of the transmission line will include air patrols, ground patrols and non-scheduled maintenance by air or ground if unexpected repairs are required. Ground travel can include snowmobiles, flex-track, or road vehicles. Regular inspections will typically occur once per year by ground and can occur up to three times per year by air. Vegetation management within the ROW is required for public and employee safety, as well as the reliable operation of the line. The ROW will be maintained on an ongoing basis throughout the life cycle of operation. An integrated vegetation management approach will be undertaken to address non desirable and non-compatible vegetation issues within the ROW. To achieve this, a variety of possible vegetation management methods are available, including mechanical, chemical, and biological techniques within reasonable costs and to minimize environmental impacts.

Based on emissions from MH's entire vehicle fleet (23 kt CO_2e)[40] and the size of MH's existing transmission (11,045 km) and distribution (75,320 km) infrastructure[41], at a high level, additional O&M emissions due to the R44H Project are expected to be in the range of 20 to 35 t CO_2e per year range (including air patrols). But, as technology (e.g., electric vehicles) improves, these emissions are expected to approach zero over the very long term (i.e., over 75 years).

Incremental fossil-fuel combustion related O&M emissions (e.g., due to the use of construction vehicles) at Radisson and Henday are expected to be negligible as these are existing stations and the upgrades related to the R44H Project are minimal compared to the stations as a whole; however, it is probable that some carbon tetrafluoride ("CF_4") and sulphur hexafluoride ("SF_6") will be added to the MH Transmission System, within circuit breakers, as a result of the R44H Project. These are potent GHGs with global warming potentials[42] of 6,630 t CO_2e/tonne of CF_4 and of 23,500 t CO_2e/tonne of SF_6. No design value are available yet; however, based on circuit breaker design for Wash'ake Mayzoon Transmission Station[43] there is a total potential of 1.5 kt CO_2e related to these installed gases. New breakers are expected to have an average release rate of <1%/year, which translates to be 0 to 15 tonnes of CO_2e per year.

An assessment of supply-side emissions related to O&M materials was excluded from this assessment and presumed to be negligible. The quantity of material required to construct the

[40] [Manitoba Hydro, 2023a]
[41] [Manitoba Hydro, 2023b]
[42] [ECCC, 2023]
[43] Note: provided in Manitoba Hydro (2021b).

R44H transmission line will be substantially higher than any material required for repairs. Any large-scale replacements of R44H Project equipment (e.g., full line replacement) are placed outside the scope of this assessment.

At a high level, additional O&M emissions are expected to be less than 0.05 kt CO_2e per year on average, over an assumed 75-year period[44]. An upper limit of 3.75 kt (i.e., 75 years * 0.05 kt/year) will be assumed.

[44] Note: (from an environmental assessment perspective), a 75-year period has been identified as the temporal boundary for O&M activities

5 GENERATION EFFECTS – METHODOLOGY

The MH HVDC Transmission System needs to be modernized: BPI contains thyristors that were replaced in 1992 and 2004 and some controls dating back to 1971. BPII, which was placed into service in 1978, has had no significant rehabilitation work done to it, making it among the oldest active large HVDC lines (≥ 1,000MW) in the world. Manitoba Hydro is planning a HVDC Modernization Project; however, it is not expected to be completed until the mid-2030s[45] and there is a heightened risk that longer-term outages will occur along the MH HVDC Transmission System prior to the HVDC Modernization Project's completion.

The MH Northern Collector System offers the flexibility in routing the flow of power from the lower Nelson River generating stations via BPI, BPII, and BPIII in the event of outages. Currently, the Alternative Current transfer capacity available between BPI and BPII/BPIII is approximately 500 MW. Based on the ageing infrastructure and the risk of equipment failure with components of BPI, this is not adequate, and Manitoba Hydro has identified a need to increase the transfer capacity. The R44H Project will improve transmission reliability by adding up to a minimum of 346 MW transfer capacity and reduce the risk of not being able to move electricity on to Manitoba Hydro's customers. This line will also be needed for future work modernizing the Manitoba Hydro HVDC system. By increasing the transfer capacity, the R44H Project will mitigate part of the impact of nearly all outage scenarios related to the MH HVDC Transmission System (both prior to and after the completion of the HVDC Modernization Project), resulting in net global emission reductions (compared to a Baseline Scenario where the transfer capacity is not increases).

The Electricity Project Guidelines state that "*the primary effect for grid-connected project activities will be reducing combustion emissions from grid-connected power plants*" [WRI, 2007][46]. Furthermore, the Project Protocol states that "*A primary effect is the intended change caused by a project activity…*" [WRI & WBCSD, 2005][47] The R44H Project is intended to, typically[48], increase the quantity of northern hydroelectric generation that is transmitted to southern Manitoba. This is due to the:

- Incremental improvement in overall MH Transmission System efficiency.
- Mitigation of adverse impacts during typical forced, differed, and planned outage conditions of MH Transmission System components.

[45] Note: Current proposed schedule is to complete BPII related upgrades by 2030 and BPI related upgrades by 2035.

[46] Electricity Project Guidelines – Chapter 4.2 (*Identifying Primary Effects*), p.27

[47] Project Protocol – Chapter 2.4 (*GHG Effects*), p.11

[48] Note: Under a couple atypical long-term outage scenarios (e.g., BPIII is permanently offline) the R44H Project provides no incremental system benefits as both BPI and BPII would already be fully utilized; however, there is no scenario where the R44H Project reduces the overall performance of the MH Transmission System.

- Mitigation of adverse impacts (decreases in hydroelectric generation[49] and MH Transmission System efficiency) during long-term atypical unplanned outages of critical MH HVDC Transmission System components.

In support of the HVDC Modernization Project, Manitoba Hydro undertook analysis to examine the net impact of enhancing the Northern Collector System via the R44H Project. This analysis included projections of the net electricity exported to (either due to increases in exports or decreases in imports) neighbouring regions (i.e., Ontario, Saskatchewan, and MISO). These projections are based on modeling using the GSPRO-NCP generation dispatch model coupled with pre and post processing tools developed by Manitoba Hydro which incorporate generation and transmission systems, domestic load, firm contracts, and the opportunity electric energy market.

There is substantial uncertainty related to the quantification of the incremental benefits of the R44H Project, in terms of increases in net electricity exports, due to several variables. Key variables include the following:

- Future outage conditions (i.e., which components of the MH Transmission System are experiences outages), including the timing[50] and length[51] of the outage conditions.
- The future commissioning of new, and decommissioning of old, generation and transmission assets in the MB Electricity System.

The assessment of generation effects uses a "System Intact" condition as the reference point. The "System Intact" scenario assumes no atypical outages occur on the MH HVDC Transmission System; however, under the "System Intact" scenario the MH HVDC Transmission System will undergo typical forced, differed, and planned outage conditions with typical outage probabilities. Benefits are mostly due to the incremental improvement in overall MH Transmission System efficiency due to the R44H Project. Table 11 presents a summary of the generation effects of R44H. Over the life of the R44H Project it is estimated that the R44H will very likely contribute to global emission reductions of at least 400 kt of CO_2e due to its beneficial generation effects.

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[49] Note: The MH HVDC Transmission System plays a critical role in the transmission of electricity within Manitoba, specifically the transmission of the electricity generated on the Lower Nelson River in the northern Manitoba. BPI, BPII and BPIII that makeup the MH HVDC Transmission System transmit approximately 72% of the electrical energy generated in Manitoba. When there is insufficient transmission available along the MH HVDC Transmission System, water that could otherwise have been used to produce power in hydroelectric generating units must often pass through hydroelectric station spillways instead.

[50] Note: In System Intact conditions, the benefit of the R44H Project decreases over time as both the MH HVDC Transmission System improves and the generation effects related to increases in net exports decrease; however, the benefit of the R44H Project can actually increase over time, under certain outage conditions (e.g., a BPII valve group outage).

[51] Note: Some outage conditions could require lengthy repair timelines due to the advanced age of various system components.

Table 11 R44H Project – Reference Generation Effects (Expected Increase in Net Exports of Electricity)

HVDC System Scenario	Net Annual Energy Benefits (GWh/year)	Net Global Emission Reductions (tonnes CO_2e)
System Intact (2025-2049)[52]	21	400,000 Total
System Intact (pre-2030)	38	31,000 per Year
System Intact (post-2029)	17	12,000 per Year

The estimate that the benefits of R44H will be "at least 400 kt" is because the MH Transmission System could experience atypical long-term outages. And, as mentioned above, there is a heightened risk that longer-term outages will occur along the MH HVDC Transmission System prior to the HVDC Modernization Project's completion. It is very likely that R44H's net generation effects will be higher than the values presented in Table 11, due to R44H's typical[53] GHG benefits during outages.

Table 12 presents examples of the generation effects of longer-term outages; these effects are incremental (i.e., additional) to the benefits of R44H under System Intact conditions. The impact of outages both pre-2030 and post-2030 are presented on Table 12 to illustrate the impact of the "timing" of outages on the magnitude of generation effects. Table 12 presents the impact of 3-month long outages; the actual lengths of future outages (both planned and unplanned) are unknown. Longer outages would have proportionally larger effects on net global emission reductions. The HVDC System Scenarios presented in Table 12 are as follows:

- "BPI Valve Group Out" and "BPII Valve Group Out" represent the outage of a valve group on either bipole. These outage conditions could either modestly increase (up to 12.4 kt over a 3-month period) or decrease (up to 5 kt over a 3-month period) the net global emission reductions resulting from R44H.
- "BPI Outage" represent the outage condition where BPI experiences a full outage and BPII and BPIII are intact. This outage condition would result in the R44H Project providing the most incremental benefits, from a global GHG perspective. Outage conditions where BPI either experiences a full outage, or loses one pole, are where the R44H Project has the greatest mitigation impact. For clarity, these outage conditions would have substantial

[52] Note: R44H will provide net energy benefits both before and after the completion of the HVDC Modernization Project. For the purposes of the R44H Generation Assessment, generation effects are assumed to end after 2050.

[53] Note: Under a couple atypical long-term outage scenarios (e.g., BPIII is permanently offline) the R44H Project provides no incremental system benefits as both BPI and BPII would already be fully utilized; however, there is no scenario where the R44H Project reduces the overall performance of the MH Transmission System.

adverse effects on the MB Electricity System. **Overall, a BPI outage (or a BPII or BPIII outage) increases global emissions: the R44H Project mitigates that increase.**[54]

A 3-month "BPI Outage" Scenario would result in net global emissions reductions (500 to 660 kt), due to the R44H Project's mitigation effects, that exceed the reference emission reductions resulting from 25 years of "System Intact" R44H transmission line operation (400 kt). The generation effect impact of "BPI Outage" is considered the upper bookend of potential generation effects resulting from the R44H Project.

Table 12 R44H Project – Generation Effects: 3-Month Outage Examples[55]

HVDC System Scenario	Energy Benefits (GWh)	Net Global Emission Reductions (tonnes CO_2e)
Pre-2030: 3-Month Outage Examples:		
BP1 Valve Group Outage	9	7,300
BP2 Valve Group Outage	-6	-5,000
BP1 Outage	807	660,000
Post-2030: 3-Month Outage Examples:		
BP1 Valve Group Outage	18	12,400
BP2 Valve Group Outage	3	2,000
BP1 Outage	713	500,000

The assessment of generation effects follows the same methodological approaches applied for the GHG mitigation assessments of the Pointe du Bois Renewable Energy Project[56] ("PREP") and the Portage Area Capacity Expansion Project[57] ("PACE"). Additional details related to the quantification of "generation effects" can be found in those comprehensive reports. The substantial majority of generation effects are assumed to occur in the U.S. (e.g., MISO), not Canada. Table 11 and Table 12 don't include reductions in emissions from fossil fuel generating units located in Manitoba (e.g., the Brandon generating station). Net global reductions would be higher if these were also quantified, which is another justification for the conclusion that emission reductions will likely be "at least" 400 kt.

[54] Note: The R44H GHG Assessment is assessing the R44H Project, not the HVDC Modernization Project. Accelerating the timelines of the HVDC Modernization Project reduces global emissions.

[55] Note: The results presented in this table are only a few examples of the large list of potential outages; no probabilities to their likelihood of occurrence have been assigned.

[56] [Manitoba Hydro, 2021a]

[57] [Manitoba Hydro, 2021c]

6 NOMENCLATURE

BP means bipole; Manitoba Hydro has three operational HVDC bipoles: BPI, BPII, and BPIII.

CF_4 means carbon tetrafluoride.

CO_2e means carbon dioxide equivalent. The universal unit of measurement used to indicate the global warming potential of GHGs. CO_2e is used to evaluate the impacts of releasing (or avoiding the release of) different GHGs.

D83W means the new 230 kV line being constructed between the Dorsey Convertor Station the and Wash'ake Mayzoon Transmission Station.

ECCC means Environment and Climate Change Canada.

EF means emission factor, typically in tonnes of CO_2e per unit.

emissions means GHG emissions.

EA means Environmental Assessment.

EOSD means Earth Observation for Sustainable Development of Forests.

generation effect means the R44H Project's "GHG effects" on generation emissions within the interconnected region, over the life of the R44H Project. "Generation effect" is used for clarity in this report as impacts on combustion emissions (including all life cycle emissions related to combustion) from grid-connected power plants would be considered "upstream" or "downstream" of R44H Project infrastructure. The term "generation effect" was adopted from Madrigal & Spalding-Fecher [2010]. Generation effects potentially include both build margin and operating margin effects and they occur during the O&M phase.

GHG means greenhouse gas (and **GHGs** means greenhouse gases).

GHG effect means "*changes in GHG emissions, removals, or storage caused by a project activity. There are two types of GHG effects: primary effects and secondary effects"* [WRI & WBCSD, 2005][58]. "Generation effects" are a sub-category of GHG effects.

Henday means the Henday Converter Station, located in northern Manitoba near the Limestone Generating Station.

kt means kilotonnes. When used in this report they refer specifically to units of CO_2e emitted.

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[58] Project Protocol – Chapter 2.4 (*GHG Effects)*, p.11

LCA means life cycle assessment.

MB Electrical System means all electrical facilities owned and operated by Manitoba Hydro, including the MH Distribution System, MH Transmission System, MH Northern Collector System, and the MH HVDC Transmission System. It also includes all MB Generation Facilities, even if they are not owned and/or operated by Manitoba Hydro. It can also include the four remote, off-grid, diesel generating systems, though they are not relevant to this assessment.

MB Generation Facility means a facility, in Manitoba, that generates and delivers power to the MH Transmission System (including delivery via the MH HVDC Transmission System and MH Northern Collector System).

MH means Manitoba Hydro.

MH Distribution System means A/C transmission facilities, below 100 kV, owned and operated by MH used to serve MB load.

MH HVDC Transmission System means MH's HVDC transmission lines including all converter stations, and associated equipment.[59]

MH Northern Collector System means isolated 138 kV and 230 kV transmission systems in Northern Manitoba owned by MH that interconnect the Keeyask, Kettle, Long Spruce, and Limestone generating stations to the MH HVDC Transmission System.[60]

MH Transmission System means transmission facilities, 100 kV and above, owned and operated by Manitoba Hydro; excluding the MH Northern Collector System and the MH HVDC Transmission System.[61]

MISO means the Midcontinent Independent System Operator region, regional transmission system, Organized Power Market, and/or organization; the terms are often interchangeable. Manitoba Hydro is a coordinating member of MISO.

MMTP means the Manitoba-Minnesota Transmission Project, a 500 kV transmission line incorporated into the MH Transmission System in 2020. It connects across the U.S. border with the Great Northern Transmission Line.

PACE means the Portage Area Capacity Enhancement Project.

[59] [Manitoba Hydro, 2016]
[60] [Manitoba Hydro, 2016]
[61] [Manitoba Hydro, 2016]

PREP means the Pointe du Bois Renewable Energy Project, formerly known as the Pointe du Bois Unit Replacement Project. PW75 was a component of PREP.

PW75 means the proposed 46.5km 115 kV transmission line from PdB to Whiteshell.

ROW means a transmission line right-of-way, typically the R44H transmission line ROW.

R44H transmission line means the proposed 230 kV transmission line between Radisson and Henday.

R44H GHG Assessment means the GHG Mitigation Assessment of the R44H Project.

R44H Project means the Radisson to Henday (R44H) Transmission Project.

Radisson means the Radisson Converter Station, located in northern Manitoba near the Kettle Generating Station.

SF_6 means sulphur hexafluoride.

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APPENDIX E

Construction Environmental Protection Plan

Radisson to Henday (R44H)

230 kV Transmission Project

Construction Environmental Protection Plan

Prepared by Manitoba Hydro

Project Management Division

Transmission & Distribution Environment

and Engagement Department

December 2023

Preface

Manitoba Hydro's environmental commitment

Manitoba Hydro is committed to protect and preserve natural environments and heritage resources affected by its projects and facilities. This commitment and a commitment to continually improve environmental performance is demonstrated through the company's Environmental Management System.

Environmental protection can only be achieved with the engagement of Manitoba Hydro employees, consultants, local communities, and contractors at all stages of projects from planning and design through construction and operational phases.

As stated in the corporate Environmental Management Policy:

"Manitoba Hydro is committed to protecting the environment by:

- ensuring that work performed by its employees and contractors meets environmental, regulatory, contractual, and voluntary commitments
- recognizing the needs and views of its interested parties and ensuring that relevant information is communicated
- continuously assessing its environmental risks to ensure they are managed effectively
- reviewing its environmental objectives regularly, seeking opportunities to improve its environmental performance
- considering the life cycle impacts of its products and services
- ensuring that its employees and contractors receive relevant environmental training, and
- fostering an environment of continual improvement

Manitoba Hydro's Environmental Management Policy has been used to guide the development of the Environmental Protection Program for the proposed project. Implementation of the program is practical application of the policy and will demonstrate Manitoba Hydro's dedication to environmental stewardship.

Adaptive management is being implemented within the Environmental Protection Program to be responsive and adaptive to changes to the project and on the landscape, stakeholder, and indigenous concerns, as well as inputs from our inspection and monitoring programs.

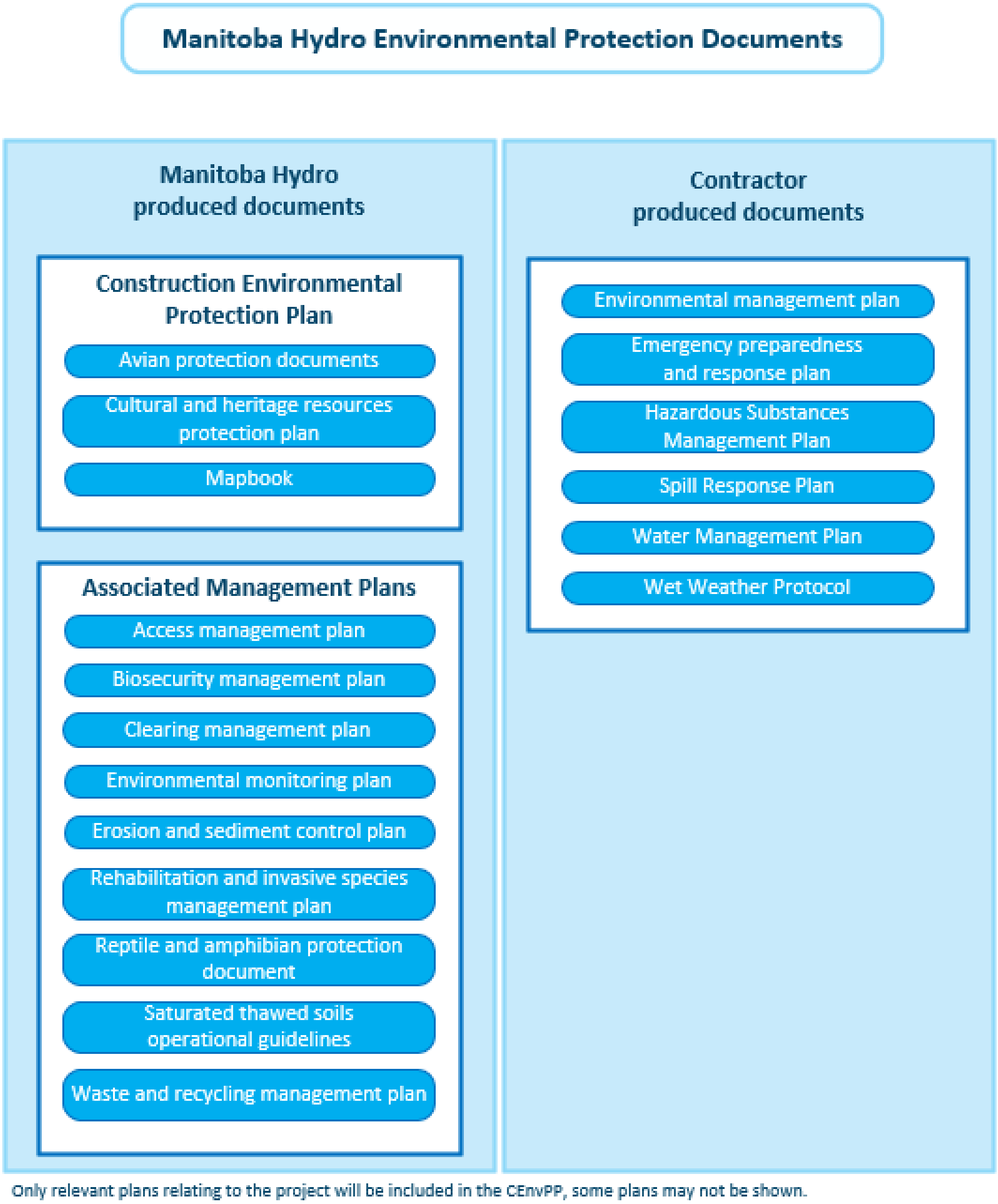

Figure 1: Diagram of environmental protection documents

Document Owner
Transmission & Distribution Environment and Engagement Department
Project Management Division
Manitoba Hydro

Version – Final 1.0

List of revisions

Number	Nature of Revision	Section(s)	Revised By	Date

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1.0 Introduction

The purpose of this construction environmental protection plan (CEnvPP) is to provide information that will guide contractors and field personnel while constructing the Radisson to Henday (R44H) 230 kV Transmission Project (the 'project') in a manner that meets environmental legislation requirements and protects the environment. The activities and areas associated with the project are as described in this CEnvPP, the associated management plans and the environmental assessment report. This includes rights of ways, transmission lines, stations, access routes, marshalling yards, and any other ancillary works and temporary workspaces developed for the sole purpose of constructing the project. The CEnvPP outlines the commitments and efforts that will be taken by Manitoba Hydro (MH) and contractors to protect the environment and mitigate potential environmental effects that may occur during construction of the project. The use of environmental protection plans is a practical and direct implementation of Manitoba Hydro's commitment to responsible environmental stewardship.

This CEnvPP provides guidance for the implementation of environmental protection measures for the project. The direction and guidance provided in this CEnvPP document applies to all lands related to the project both private land and crown land. The project includes the construction of a 45 km long transmission line from Radisson Converter Station to Henday Converter Station (Map 1), with work at both stations to terminate the new line.

This document provides general and specific mitigation measures to reduce the potential for environmental effects that may occur during the project's construction phase. It is designed to be a resourceful, user-friendly tool to guide onsite implementation of environmental protection measures. This document provides contractors and field personnel guidance on the implementation of environmental protection measures. Where contractors have experience using other federally or provincially accepted methods of environmental protection, they are encouraged to discuss with the MH environmental officer/inspector.

1.1 Document amendment process

To communicate the recent versions of environmental protection documents an amendment process has been established. This amendment process applies to both text (Part 1) and mapping (Part 2) documents. Throughout construction there will be changes and revisions to documents, these revisions are a result of errors and omissions or due to the ongoing adaptive management process to improve environmental protection measures.

In addition, Manitoba Hydro's Transmission & Distribution Environment and Engagement Department must approve all field decisions and/or changes to a procedure outlined in the CEnvPP. Figure 2 illustrates the document amendment process.

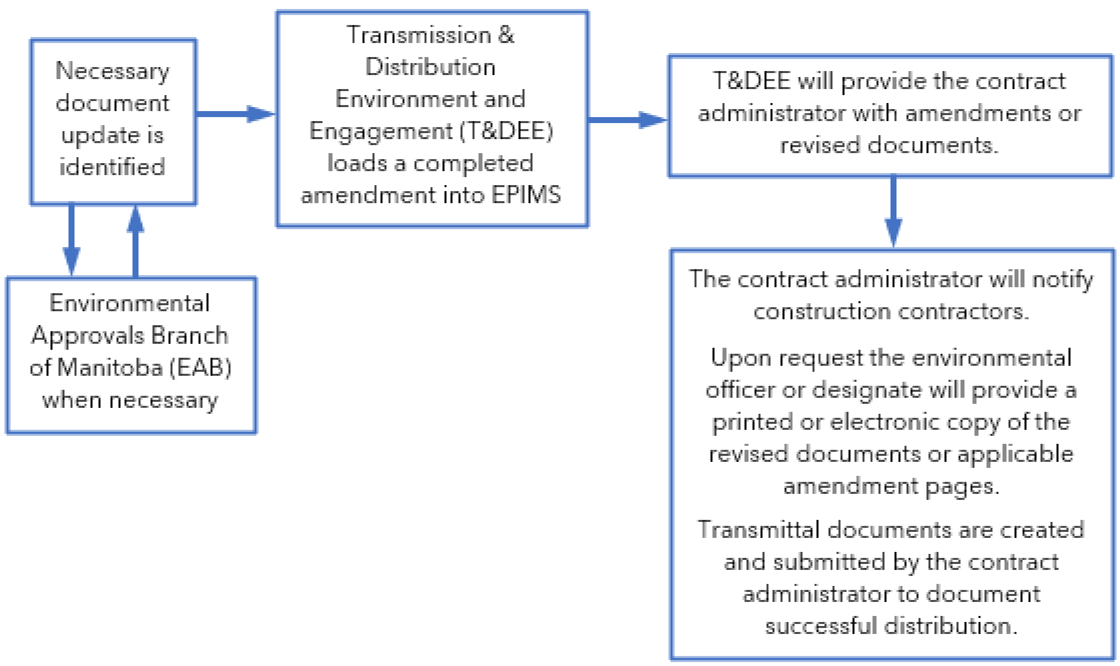


Figure 2: Document amendment process

1.2 Overview of the environmental protection plan

Part of Manitoba Hydro's commitment to environmental protection includes a comprehensive environmental protection program. This program includes the development of a CEnvPP specific to the project. The CEnvPP provides general and specific environmental protection information for project components and is intended for use by construction contractors and environmental staff.

Several environmentally sensitive sites (ESS) have been identified for the project. ESS are locations, features, areas, activities, or facilities that were identified in the project environmental impact statement to be ecologically, socially, economically, culturally, or spiritually important or sensitive to disturbance and require protection during construction of the project. The determination of ESS has included the consideration of First Nations and Red River Métis traditional knowledge. Manitoba Hydro will continue to engage with First Nations, Red River Métis and interested parties in efforts to continually update this plan with sensitive sites and current knowledge as it is shared.

Map sheets have been developed for the project to present the location and spatial extent of ESS. Each map has corresponding tabular summary information including ESS feature information and relevant mitigation measures to address the potential environmental effects at each ESS.

1.3 Roles, responsibilities, and reporting

This section outlines the major roles and responsibilities of those involved in the implementation of the CEnvPP for the transmission components of the project. A summary of roles and key responsibilities is found in Table 1. Communication and reporting on environmental issues, monitoring and compliance will be as outlined in Figure 3. A contact list for key staff involved in supporting this CEnvPP is found in Appendix A.

Table 1: Environmental roles and responsibilities

Role	Key responsibilities
MH environmental officer (T&DEE) / business partner (T&DEE) / inspector	• The environmental officer reports to the line construction business partner / environmental specialist and provides advice and guidance to the contract administrator / field engineer • Provides support and guidance in developing solutions for environmental issues on-site with the contract administrator and the contractor and where applicable with the input from the line construction business partner / environmental specialist • Provides support and guidance to the contractor regarding CEnvPP • Participates in contractor environmental representative pre-job meeting and in contractor environmental pre-job orientation • Assists the contractor's environmental representative in ensuring that all necessary information is covered in the contractor's pre-job employee orientation and record is kept • Provides advice and guidance to the Contract administrator for non-compliance situations, environmental incidents, and emergencies • Conducts site inspections regularly and ensures that reports containing information on activities conducted as well as effectiveness of actions and outstanding issues • Prescribes follow-up mitigation measures and ensures proper implementation • Confirms that all ESS are correctly identified, delineated, and flagged/marked by the construction contractor in the field • Monitors the project for compliance of the CEnvPP, environmental license and other environmental regulatory requirements • Responsible for ongoing compliance monitoring of project activities to ensure consistent implementation of the CEnvPP and accurate reporting. • Manages MH and contractor spill response, clean-up, testing, follow-up, and reporting

Role	Key responsibilities
MH Engineer (LC) / Contract Administrator (LC) / MH contract administrator(s) (LC)	• Monitor, track and prepare report on construction progress • Issue Work Instructions, Variations and Non-Conformance Reports as required • Assist in chairing progress meetings • Review and provide comments on Contractors reports, plans, schedules etc. • Ensure compliance of all contractual requirements • Responds to Environmental Non-Compliance Advisements with plan of action to correct non-compliances • Supervise construction inspectors • Arrange safety orientations with the Contractor for MH/Consultant staff/visitors. • Responsible for implementation of all construction related landowner commitments • Responsible for rectifying construction related Customer Complaints • Conduct regular site visits to identify any issues related to construction, safety, and environment • Facilitates construction contractor's implementation of remedial actions or responses to non-conformance situations or incidents are implemented as required • Works with the Line Construction Business Partner / Environmental Specialist and Environmental Officer/Inspector to ensure implementation of environmental protection measures.

Role	Key responsibilities
Construction Inspectors / Engineering Technicians (LC)	• Review all drawings and understand the technical specifications for the assigned work • Ensure the contractor is performing the work as per the drawings and technical specifications, and Environmental Protection Plans. • Monitor and report daily construction progress • Report any safety, environment, quality, material, design, and any other construction related concerns to the contract administrator and field engineer • Work collaboratively with Environmental Officer/Inspector to identify ESS, ensure all ESSs are correctly delineated and flagged/marked in the field locations and ensure that prescribed mitigation is being implemented and meeting regulatory requirements.
Construction contractor(s) (project manager / contract administrator)	• Accountable for all regulatory and environmental prescriptions (i.e., follow CEnvPP and mitigation measures prescribed) • Ensure all contractor project staff are adequately trained/informed of pertinent environmental requirements of the Project related to their position • Report any discoveries of non-compliance, accidents or incidents to the contract administrator and environmental officer / inspector • Ensure that all remedial actions are carried out as per Manitoba Hydro instruction • Ensure all discoveries of heritage resources, human remains, paleontological finds, environmentally sensitive sites, etc. are reported to the contract administrator and environmental officer / inspector • Responsible for providing a Final Environmental Report summarizing the environmental situations encountered, mitigation measures implemented, and rehabilitation completed by the contractor regarding its activities for the contract. • Providing a weekly progress report as part of the weekly progress report that shall include environmental information, descriptions, and statistics for the contactor's site activities.

Role	Key responsibilities
Construction contractor staff	• Accountable for all regulatory and environmental prescriptions (i.e., follow CEnvPP and mitigation measures prescribed) • Ensure adequately trained with respect to, and informed of pertinent, environmental requirements of the project related to their position • Report any discoveries of non-compliance, accidents or incidents to the contract administrator and environmental officer / inspector • Ensures that all remedial actions are carried out as per Manitoba Hydro instruction • Ensures all discoveries of heritage resources, human remains, paleontological finds, environmentally sensitive sites, etc. are reported to the contract administrator and environmental officer / inspector
Construction contractor's environmental representative	• Must possess a post secondary education in an environmental or resource management discipline with minimum of 2 years relevant experience • Responsible for implementation, coordination, and verification of pre-project employee environmental orientation • Ensures that the contractor employees adhere to all aspects of the CEnvPP • Provides information and advice to the construction contractor employees on environmental protection matters • Responsible for implementation of the emergency response and hazardous materials plans, and other related topics • Liaises with MH environmental officer / inspector and MH field safety officers • Delineate and flag/sign all environmentally sensitive sites as identified in CEnvPP in the field as per flagging and signage standards • Identify, delineate, and flag or mark all access, right-of-way and other applicable boundaries in the field • Identify any previously unknown ESS to MH environmental officer / inspector

1.3.1 Environmental protection

Manitoba Hydro will provide copies of all available permits, licences, approvals, and authorizations obtained for the Project to the contractor. Prior to commencing associated work, the contractor will provide Manitoba Hydro with copies of all available permits, licences, approvals, and authorizations obtained for the project. Electronic copies of all permits are available for download from EPIMS.

The contractor will comply with the CEnvPP prepared for the project, including mitigation measures identified during the environmental assessment and contained herein. Environmental aspects of the work including applicable licence/permit conditions will be discussed during the environmental pre-job orientation, weekly progress meetings, and daily job planning meetings.

Without limiting or otherwise affecting the generality or application of any other term or condition of the contract, the contractor shall:

- Strictly comply with all environmental Legislation and have suitable corrective and/or preventive measures in place to address any previous environmental warnings, fines, or convictions; issued by regulatory agencies and/or Manitoba Hydro
- Do or cause to be done all things required or ordered, to mitigate environmental damage caused, directly or indirectly, by itself or by its servants, agents, employees, or subcontractors, accidentally or because of practices that are in contravention of the contract or any environmental legislation

1.3.2 Documentation and reporting

There is a requirement for the contractor to provide reports and documentation to Manitoba Hydro in an acceptable digital format. Manitoba Hydro during pre-job orientation will provide a list of all reporting and documentation submission requirements, timelines for submission, acceptable digital formats, and method of transmittal. (e.g., EPIMS, project Sharepoint site, email, FTP).

Examples of reports and documents that are required for the project are listed below (not an exhaustive list): Annual or post construction environmental reports.

- Weekly environmental monitoring reports
- Spill reports
- Bird survey forms

- Amphibian survey forms
- Landowner permission forms
- Timber scaling records and copies of load slips (more information provided in management plan)
- Copies of all permits and approvals acquired by the contractor
- Copies of any contractor developed plans such as emergency response and hazardous materials plans
- Environmentally related incident reports

1.3.3 Environmental representative(s) / supervisor(s)

Before commencing the on-site work, the contractor shall identify its dedicated on-site representative(s) / supervisor(s), who shall attend the pre-job meeting (environmental component) to review environmental matters for the work. The dedicated on-site contractor environmental representative(s) / supervisor(s) shall be fully conversant with:

- Contractor's environmental practices and policies
- All applicable environmental legislation
- Mitigation measures outlined in the CEnvPP

The contractor will ensure enough environmental representatives are in place to fulfill the commitments of the project's environmental protection and management plans, and any associated licence conditions associated with the project.

Manitoba Hydro and the contractor will jointly determine the resources required through criteria composed of a variety of factors including construction schedules, number of sub-contractors, division of construction segments, phase of construction, season, and the nature of the licence conditions.

1.3.4 Environmental improvement orders

Failure to comply with the environmental protection section above or unsatisfactory performance regarding any other environmental-related matter may result in Manitoba Hydro issuing environmental improvement orders to the contractor.

The environmental improvement order once communicated verbally or in writing is considered "effective immediately". Manitoba Hydro will establish a compliance date for each environmental improvement order issued. The contractor must provide written documentation of the actions taken regarding the environmental improvement order as follows:

The contractor shall:

- Prepare a written report on the measures taken to remedy the contravention and measures yet to be taken within the expiry date of the period specified in the order or any extension thereof
- Send a copy of the report to the Manitoba Hydro representative who made the order as well as all individuals cc'd on the transmittal document
- Provide a copy of the report to the employee(s) involved, if applicable
- Review the contravention with all employees at a regular weekly meeting and post in a prominent place at or near the worksite

1.3.5 Environmental stop-work order

Manitoba Hydro may issue an environmental stop work order where any activities which are being, or are about to be, carried on at a worksite, involve or are likely to involve an imminent risk of serious impact to the environment, or where a contravention specified in an environmental improvement order was not remedied and warning was given. The environmental stop work order, once communicated, verbally or in writing is considered "effective immediately", for any one or more of the following matters:

- The cessation of those activities
- That all or part of the worksite be vacated
- That no resumption of those activities be permitted by the contractor
- That a Manitoba Hydro issued stop work order remains in effect until it is withdrawn in writing by Manitoba Hydro
- That Manitoba Hydro will not be held responsible for delays to the work or be required to compensate the contractor for any matters arising because of the Manitoba Hydro issued environmental stop work order

Note: A Manitoba Hydro-issued environmental stop work order does not prevent the contractor from completing any work or activity that may be necessary to remove the risk of injury referred to above.

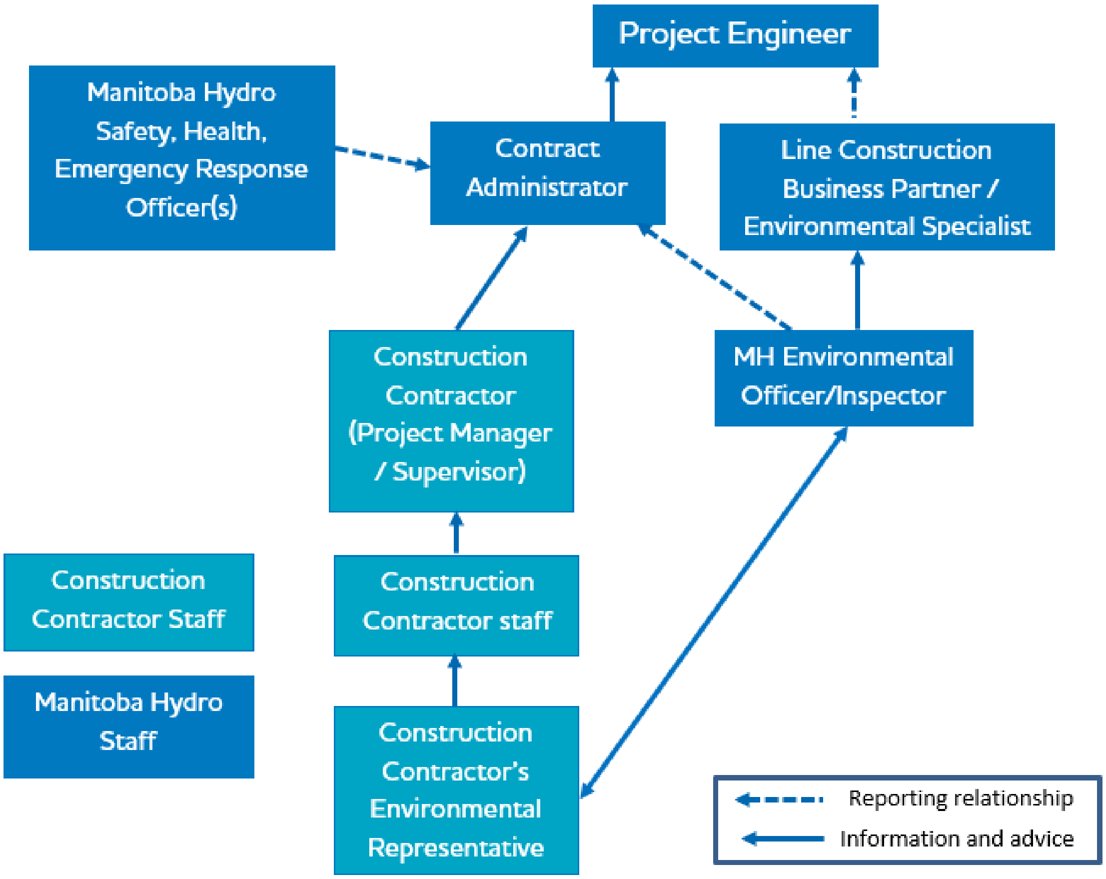


Figure 3: Environmental communication reporting structure

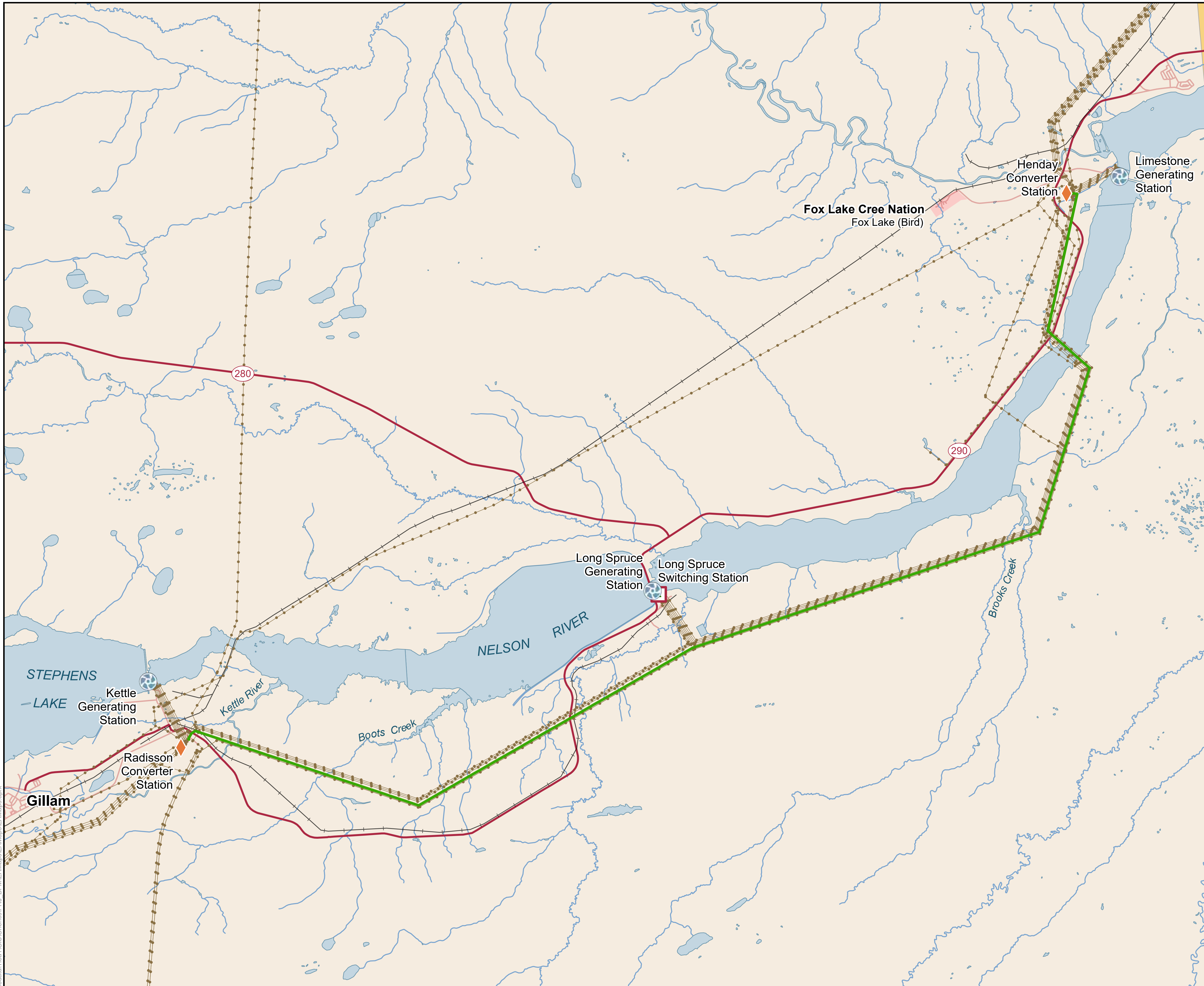
1.4 Environmental protection information management system

EPIMS will provide a single interface to store all environmental documentation. It will be utilized by project staff to submit permits, inspection reports, plans, logs, checklists, etc. for the management of all environmental protection implementation, regulatory compliance, and incident reporting.

1.5 Regulatory requirements

All relevant regulatory approvals for the project will be obtained by Manitoba Hydro prior to construction. All documentation will be kept on-site by both the contractor and Manitoba Hydro personnel. Manitoba Hydro requires that its employees and contractors comply with all federal and provincial regulatory requirements relating to the construction, operations and decommissioning of its projects and facilities. All Project licences, approvals and permits obtained can be found in Appendix B.

Map 1: Radisson to Henday (R44H) 230 kV Transmission Project



Manitoba Hydro

R44H Transmission Line

Project Infrastructure
- Final Preferred Route

Existing Infrastructure
- Converter Station
- Electric Station
- Generating Station
- Existing ≥69kV Transmission Line

Landbase
- Community
- Railway
- Provincial Highway
- Provincial Road
- Local Road
- First Nation Lands
- Ecological Reserve
- Wildlife Management Area
- Provincial Park

Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: December 19, 2023

N

0 1 2 3 4 Kilometres
0 0.5 1 2 Miles

1:120,000

R44H Project

Draft: For Discussion Purposes Only

Map 1

2.0 Environmental considerations

Important environmental considerations for pre-construction planning and construction activities are required at environmentally sensitive sites (ESS), which include locations, features, areas, activities, or facilities that are identified in the CEnvPP mapbook.

These ESS are identified to be ecologically, socially, economically, or culturally important or sensitive to disturbance which will require protection and mitigation during construction.

ESS include riparian areas, valued and protected vegetation, wildlife, and habitats, cultural (heritage/archaeological and spiritual sites), unique terrain features, erosion and compaction prone soils and other important locations requiring specific protection (e.g., resource use, access).

2.1 Timing windows

2.1.1 Wildlife

The “Timing windows” table found in Appendix C outlines wildlife reduced risk work windows applicable to the project. These windows are based on federal and provincial regulatory requirements as well as best management practices. Timing periods may be refined based on further data collection, transmission line final design, and regulatory license and work permits to be issued for the project.
The recommended reduced risk timing windows table demonstrates periods of the year when wildlife species are sensitive to disruptive operations because of a sensitive lifecycle activity such as calving, nesting, and hibernation, etc. The “Timing windows table intends to assist in scheduling construction activities for the time of year when risks of adverse construction impacts are negligible. Where conflicting timing restraints with construction activities exist in a particular area, appropriate mitigation will be implemented to reduce effects.

2.1.2 Burning

Between November 16th to March 31st there is no requirement for a burning permit under the *Wildfires Act*. If burning is required outside of those dates (i.e., between April 1st and November 15th) a burning permit application is made to the local provincial environmental regulator's district office. A copy of the burning permit must be on hand while burning. All fires must be completely extinguished by March 15th.

2.1.3 Fish

Fish habitat can be adversely affected by in-stream work (none currently planned) that occurs during certain periods in their life history or at certain life stages. Life history periods or life stages susceptible to disturbances from in-stream construction work include the following:

- Spawning and egg incubation
- Movements to or from spawning or overwintering areas
- Egg and newly hatched fry

Timing works to avoid sensitive life history periods or life stages is an effective means of mitigating adverse effects. The "Timing windows" table (In Appendix C) contains general timing windows to avoid during construction.

2.2 Setbacks and buffers

Setbacks and buffer distances from sensitive environmental features are provided in a "Buffers and setbacks" table, found in Appendix D.

These setback and buffers may be expanded or refined based on further data collection, transmission line final design, regulatory license and work permits to be issued for the project.

Setbacks are areas to be maintained from a given environmental feature where no work shall occur unless authorized by the MH environmental officer/inspector.

Buffers are work areas where restricted activities such as low ground disturbance clearing are permitted.

Where applicable, site specific setback and buffers are prescribed in specific mitigation measures for each ESS.

2.2.1 Flagging and signage standards

Clear identification of ESS locations and applicable buffers in the field is an important part of successful environmental protection implementation. Establishing consistent use of signage and flagging tape across the project is important to reduce confusion and for the clear identification of environmentally sensitive sites (ESS) and travel routes.

2.2.1.1 Flagging

A system of standardized flagging colors has been established to reduce the potential for confusion during construction where there is multiple or overlapping areas being identified. Due to many ESS types, the flagging has grouped and categorized each category. The color pattern used to identify categories is found below and is also identified with the ESS in the associated CEnvPP mapbook.

Yellow/Black-

Heritage (Archaeological, Cultural or Historic importance)

Orange/Black-

Access routes (Intersections with trails etc.),

Land Use (Conservation, Crown Land Encumbrance, Recreation, Residential)

Resource Use (Agriculture, Food/Medicinal, Forestry, Hunting/Fishing, Trapping)

Pink/Black-

Ecosystem (Habitat, Research or Species of concern, Invasive Species, Traditional Use)

Soils and Terrain (Erosion, Terrain)

Wildlife (Birds and Habitat, Mammals and Habitat, Reptiles/Amphibians and Habitat)

Blue/White-

Water (Water Crossings, Wetlands, Ground Water)

A Cross hatched flagging has been chosen as it is distinct from other flagging present during construction. Figure 4 shows the currently approved patterns and colors.

Figure 4: Examples of approved flagging tape used in delineating ESS

Flagging Instructions

Consistency in flagging procedure is important to its effectiveness. The goal of flagging is to clearly indicate the boundary of an ESS that requires a modification to construction activities in relation to the surrounding area. When identifying an area, flagging tape (color determined by categories above) will be tied to wooden staking and/or sturdy trees or shrubs that will not be cleared during construction activities. Flagging spacing will be decided on a site-by-site basis and will consider density of flagging already present in the area, the size of the area being flagged (smaller area requires higher number of flags), and the density of vegetation or topography present. The primary objective would be to apply flagging at a frequency that would make the line of separation obvious to construction crews.

Flagging a buffer

Environmentally sensitive site mitigation often involves establishing a buffer of a certain size around a location so that activities are modified in that location:

Point- A Buffer is established by measuring out from the center of that point to form a perimeter buffer. (measured as a radius).

Line-When buffering a line feature, the buffer is measured from the edge of the feature that the line indicates (on both sides).

Polygon- The buffer of an area is established by measuring out from the features edge creating a perimeter buffer, similar to a point buffer.

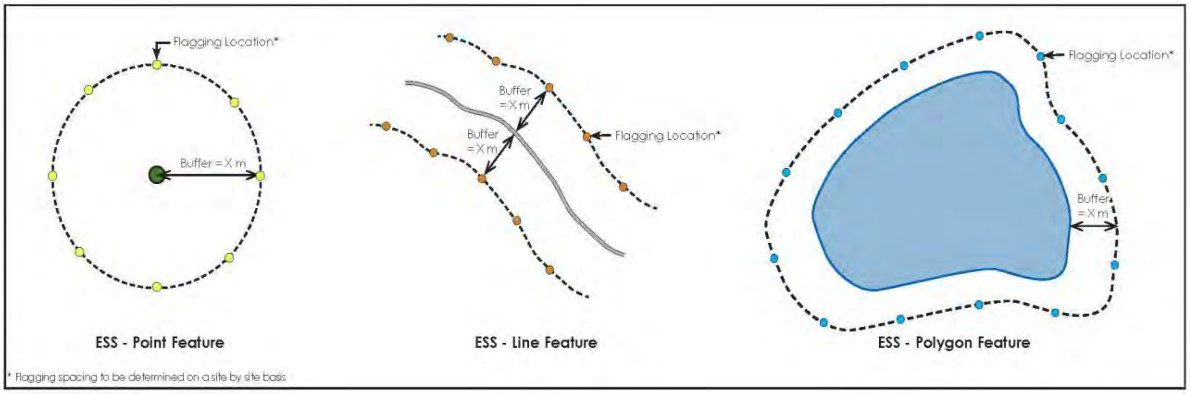


Figure 5: Buffer establishment for geometry types

2.2.1.2 Signage

Signage can be used in conjunction with flagging. Identification of vegetation clearing types, access, or bypass trails as well as identification of ESS can be accomplished with signage.

2.3 Riparian management

Based on characteristics and qualities of waterbodies in, or near the project footprint, contractors will need to modify land clearing, machinery passage and other construction activities. Locations identified in the CEnvPP mapbook as Aqua ESS (or other locations that may be identified in the field) will require riparian management.

2.3.1 Riparian buffers

Riparian buffers (as shown in Table 2) are applied to riparian habitats, which include, streams, rivers, lakes and wetlands within the project footprint in which all shrub and herbaceous vegetation will be retained and all trees that do not violate Manitoba Hydro vegetation clearance requirements will be retained. For slopes greater that 50% site investigation and prescription by the Manitoba Hydro environmental officer is required.

The riparian buffer is composed of two zones: a management zone (variable width based on Table 2) that allows equipment to conduct low ground disturbance clearing and a minimum 7m machine free zone which only allows reaching into zone with equipment but not entering the zone except at trail crossing Figure 6).

Table 2: Riparian buffer and machine free zone distances based on slope

Slope of land entering waterway (%)	Width of machine free zone (m)	Width of riparian buffer (m)
10	7	30
20	10	40
30	15	55
40	20	70
50	25	85

2.3.1.1 Machine free zones

Machine free zones are work areas where restricted activities such as low ground disturbance clearing (e.g., hand cutting or feller buncher) are permitted by reaching into zone with equipment but not entering the zone. Where applicable, site-specific buffers/setbacks are prescribed in specific mitigation measures for each feature.

Due to differences in topography and other site-specific factors the Manitoba Hydro environmental officer retains the ability to adjust the width of the Machine Free Zone-to not less than 7 m, when required.

Setbacks, riparian buffers, and machine free zone distances from sensitive water features are provided in a "Buffers and setbacks" table found in Appendix D. Setbacks are to be maintained from a defined riparian habitat where no work shall occur.

Boundaries of riparian buffers and machine free zones are measured from the ordinary high-water mark (OHWM). If the OHWM is unable to be determined, measure from the tree line (Figure 6). Setbacks (if required) are measured from the tree line or from a defined riparian boundary as delineated by an aquatic specialist.

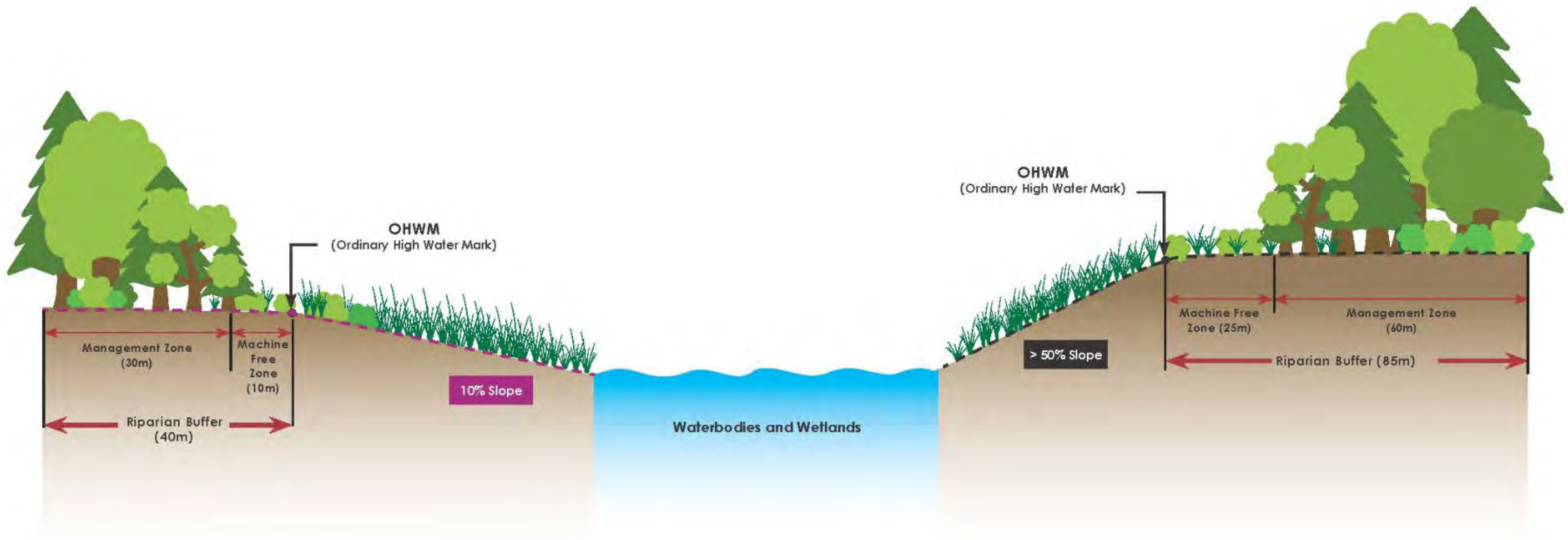


Figure 6: Example of zones in a riparian buffer

2.3.2 Riparian mitigation

Activities associated with project construction pose a minimal risk to fish habitat. Because of this low level of risk, general mitigation measures will be applied to modify construction of overhead lines, temporary water crossings, ice bridges and clean snow fills.

In addition to these general mitigation measures, contractors will implement setbacks and buffers as indicated on Site-specific information found in the map sheets of the construction section mapbook "Part 2".

2.3.3 Tower foundations within riparian buffers

In instances where tower placements are located within a riparian buffer, a tracked excavator will be allowed to excavate the foundation while minimizing ground disturbance as much as possible. The excavator must make one trail only and exit on that same trail. Each site where this occurs will be noted by MH environmental inspector/officers for monitoring by vegetation specialist the following season to determine if any further re-vegetation or rehabilitation is required.

2.4 Wildlife and habitat

2.4.1 Birds and habitat

Vegetation removal activities such as clearing and ground stripping can be destructive to birds and their habitat, such as tree and ground nests, as well as areas in which they find food (foraging areas).

Birds and their habitat are particularly vulnerable during the breeding season when they mate, lay eggs, and raise their young, as they are not able to relocate away from areas of disturbance. Migratory birds, such as geese, ducks and songbirds, and their habitat are protected by federal regulation, which prohibits killing, harassing, or destroying the nests of these birds.

Potential effects of the project on birds include mortality, habitat alteration and fragmentation, sensory disturbance, and disruption of movements. Increases in bird mortality can occur in a variety of forms including collisions with transmission wires and construction vehicles, electrocutions, increased predation, and hunting.

Bird-wire strikes are one of the most common causes of mortality for birds, particularly birds with short wings and large body masses. Collisions with wires are more likely over or near open water, the risk of collision would be greatest near rivers. As mitigation, bird diverters or aerial markers may be installed in high bird traffic areas. The location of theses bird diverter installations will be provided through design specifications and engineering drawings.

Should construction activities be required during breeding bird timing windows (see "Timing windows" table in Appendix C) please refer to the general mitigation approach for reducing risk to nesting birds found in the "Avian protection documents" (Appendix E; E-1). This decision tree will help to apply the appropriate approach and direct mitigation measures found in Appendices E-1 to E-5. These appendices prescribe levels of disturbance, the breeding bird timing windows, nest sweep and reporting procedures as well as buffer guidelines for each species identified. Through this process, Manitoba Hydro and its contractors will reduce the effects to birds and continue to meet regulatory compliance requirements.

2.4.2 Reptiles / amphibians

Areas where reptiles and amphibians, such as garter snakes, frogs, and toads, mate, and lay eggs (i.e., breed) are sensitive to ground disturbance. Heavy equipment traffic and ground clearing activities that coincide with breeding activities can have a measurable effect on local populations. Further, Manitoba is home to unique and endangered reptiles and amphibians, such as northern leopard frog (found throughout the province) that are protected by legislation and policy.

Potential project effects on northern leopard frog and common snapping turtle during construction include habitat loss and alteration, which are threats to these populations. As these species are found in riparian areas near large rivers, bodies of water or productive marshes, minimal habitat effects are anticipated with mitigation such as riparian buffers.

Mortality could increase in the project study area during construction due to increased road traffic. Northern leopard frogs are particularly susceptible to road mortality during migration and dispersal.

2.4.2.1 Habitat identification

Amphibians should be assumed present in all wetland or shallow water areas supporting emergent vegetation (cattails, bulrushes, lily pads) during the amphibian emergence and breeding period (April 1st to August 15th). Where construction activities occur during this period, mitigations measures will be prescribed on a site-by-site basis, mitigations such as those found in the "Reptile and Amphibian protection document" found in Appendix F.

2.4.3 Mammals

Large-bodied mammals, such as white-tailed deer, are considered sensitive to disturbance. Sensory disturbance from construction activity could result in a temporary loss of effective habitat and disruption of movement, as individuals will avoid the construction zone. The risk of wildlife-vehicle collisions could increase due to a greater volume of traffic on roadways, increasing mortality of some mammal species, particularly larger ones such as white-tailed deer.

2.5 Species of concern

Species of concern can include rare vascular plants, rare non-vascular plants, rare wildlife species, and rare ecological communities. The environmental officer / inspector may develop additional mitigation measures in consultation with a qualified biologist and, when necessary, the appropriate regulatory authority.

2.5.1 Species of concern discovery during pre-project construction

Species of conservation concern discovered during pre-project studies along the route have been assessed by an environmental specialist and appropriate mitigation measures have been outlined in the Part 2 CEnvPP mapbook. If rare plants or wildlife species are discovered during future studies along the transmission line refer to the "Species of Concern contingency measures" document found in Appendix G. Further information regarding the discovery of bird nests can be found in Appendix E-3.

2.5.2 Species of concern discovery during project construction

If rare plants, wildlife species or rare ecological communities are identified or suspected along the construction right-of-way during construction (*e.g.*, during survey activities, prior to clearing and construction).

Suspend work immediately in the vicinity of any newly discovered species of concern and follow the measures outlined in “Species of Concern contingency measures” document found in Appendix G. Further information regarding the discovery of bird nests can be found in Appendix E-3.

2.6 Soils and terrain

As the basis of natural, medicinal, spiritual, and commercial vegetation, soils and their quality are an important part of ecosystem health and human wellbeing. The types of soil considered to be sensitive are topsoil (the thin, nutrient rich surface soil layer), and soils susceptible to wind erosion. Soils are sensitive to loss by erosion or mixing with less suitable soils and quality degradation from compaction. For soil protection measures refer to the Erosion and Sediment Control Plan (Appendix H).

During construction, soil compaction and rutting can result from the movement of vehicles and equipment, storage of materials, and assembly and erection of towers. Effects of soil compaction and rutting can be mitigated by managing equipment traffic routes and activities for clearing of the transmission right-of-way, and installation of transmission towers to minimize the impact.

The risk to soils is highest with saturated soil conditions, should this situation arise during construction refer to Saturated/Thawed Soils Operating Guidelines (In Appendix I). Existing access routes are planned to be utilized wherever possible to avoid disturbing new areas.

2.6.1 Encountering unexpected contamination

If environmental contamination in the project work area is discovered that is not a result of project activities, report to Manitoba Hydro. Rules for reportable spills is included as Appendix J

2.7 Cultural and heritage resources

Archaeological sites, or sites where historic and pre-historic artefacts of human activity are found, are sensitive to disturbance and loss from ground disturbance activities, such as clearing and excavation. Artefacts may include tools and objects, such as arrowheads, pottery shards or bottles, or burial sites and human remains. These sites and objects are protected under legislation as a part of our common heritage. Manitoba Hydro is committed to protecting and preserving the environment including, cultural landscapes, and heritage resources affected by the Project. Sites identified as having spiritual or cultural importance through an ongoing First Nations and Red River Métis engagement process (FNMEP) or other communications are considered sensitive to disturbance and should be respected for the values they have to communities.

The Cultural and Heritage Resources Protection Plan (CHRPP; Appendix K) is part of the environmental protection program.

The CHRPP sets out Manitoba Hydro’s commitment to safeguard cultural and heritage resources and appropriately handle human remains or cultural and heritage resources discovered or disturbed during the construction of the project.

2.8 Access

Existing intersections, such as those for trails, provincial trunk highways (PTHs), provincial roads (PRs) and railways, are considered sensitive to change or conflicting land uses and as a fixed component of the larger transportation network, intersections are difficult to close or relocate. In conjunction with mitigation measures a standalone document, the access management plan (Appendix L), has been developed to safeguard and support the preservation of environmental, socio-economic, cultural and heritage values within the projects’ area of direct impact in the creation of new access.

3.0 Orientation and awareness

3.1 Pre-job meeting (environmental component)

A pre-job meeting will be held between the contractor (senior project staff including contract administrators, environmental/safety officer) and Manitoba Hydro (senior staff including project engineer or designate, the senior environmental assessment officer/ Line Construction business partner, contract administrator and the MH environmental officer / inspector). Upon completion of the meeting, all individuals present at the orientation, both Manitoba Hydro and the contractor representatives, will sign the "Example Environmental pre-work orientation record" found in Appendix M.

The environmental portion of this meeting will include review of:

- Manitoba Hydro's environmental principles and key environmental specifications of the contract
- Further relevant information or precautions that Manitoba Hydro is aware of which pertain to the job
- Procedures/requirements for dealing with environmental stop work orders or improvement orders
- Reporting requirements for environmental incidents and emergencies
- Documentation needs including the review of all pertinent forms (e.g., job planning form; environmental checklist)
- Requirement to educate/train all project employees with respect to the requirements of the CEnvPP

The contractor shall communicate to all field supervisors, subcontractors, and work crews the work specifications, environmental requirements and information provided during the pre-job meeting and notify the senior environmental assessment officer in writing when it has been completed.

3.2 Contractor project orientation

A pre-work orientation meeting is held by the contractor with field crews prior to the initiation of work to ensure that they are aware of the environmental requirements of work at that location. Should project conditions dictate a change in work location, another start-up meeting may be convened.

The contractor is required to ensure minutes, attendance records, and all other pertinent information is recorded and distributed. Manitoba Hydro will attend and if asked, could provide an overview of the environmental concerns / ESS.

In situations where a new employee joins the project, it is the responsibility of the contractor's environment officer to ensure that that employee has been provided with the necessary information and/or training related to the environmental aspects of the project. The contractor will be required to document all instances of new employees to demonstrate that they have received the necessary training.

3.3 Weekly progress meetings

Key personnel will meet on a weekly basis to review and discuss progress to date and planned upcoming work. Environmental requirements for the Project and other environmental issues/concerns may also be discussed during this time. Manitoba Hydro will be responsible for the maintenance of minutes/documents related to these meetings.

3.4 Daily job planning meetings

Field crew job planning meetings will be held daily prior to the commencement of any work. The daily job-planning meeting will include a review of environmental requirements of the planned work and the applicable environmental precautions. All job planning meetings, including the environmental content, shall be documented by the contractor.

4.0 Contractor-developed environmental management plan

Construction contractors will be required to develop environmental management plans as part of the Environmental Protection Program for this project component.

The contractor shall be responsible to develop and implement specific plans for its work as described in Figure 1. The plans will require approval by the MH Line Construction Business Partner / Environmental Specialist.

5.0 Environmental mitigation requirements

Contractors must follow all mitigation measures identified to protect the environment, including environmental sensitive sites (ESS). Two types of mitigation measures must be followed:

- General mitigation measures apply to all project areas
- Specific mitigation measures apply to individual ESS

Contractors will need to modify construction activities in accordance with general mitigation measures (Section 5.2) and site-specific mitigation measures (see detailed maps and specific mitigation in the construction section CEnvPP Mapbook "Part 2").

5.1 General mitigation requirements

Construction considerations required for all Project areas are considered general mitigation and are applicable to all construction areas.

NOTE: Site specific mitigation measures found in mapbooks will override the general mitigation measures found below.

The mitigation measures that have been developed for the general mitigation tables have been assigned mitigation ID numbers that are included in the environmental protection plans. ID numbers may not be in a sequential order as only relevant mitigations to the project have been included.

There is overlap and duplication of mitigation measures amongst the above categories, this allows the user to look up the actions they must perform by distinct categories. The general mitigation measures are provided under the following five categories: 1) Management (MM); 2) Project activity (PA); 3) Project component (PC); 4) Environment component (EC); and 5) Environmental issue (EI), as follows:

(MM) Management environmental protection measures include management, contractual, administrative, and other measures that are common to all environmental protection categories and topics.

(PA) Project activity environmental protection measures include construction activities that are likely to cause direct environmental effects. Project activities are action words or phrases that are carried out during construction of the Project such as drilling, clearing, etc.

(PC) Project component environmental protection measures relate to major components of the Project. Some examples of major components include transmission lines, converter stations and ground electrode facilities. Which may also include access trails, stream crossings, construction camps, marshalling yards, etc**.**

(EC) Environmental component protection measures include important or vulnerable components of the environment that are subject to environmental effects of the Project. Some environmental components are particularly vulnerable to the construction of transmission lines, converter stations, ground electrode facilities and other project components and activities, and warrant separate consideration. Example environmental components include agricultural areas, fish habitat, heritage sites and wetlands.

(EI) Environmental issue and topic protection measures include critical issues and topics identified for the Project. Environmental issues and topics include emergency response, erosion/sediment control, hazardous substances, petroleum products and soil contamination.

5.2 General mitigation tables

Map sheets and mitigation tables

The map sheets and specific mitigation tables are presented in “Part 2” of the CEnvPP “map book” format. The map sheets provide an overview of environmentally sensitive sites (ESS), while the associated mitigation tables provide specific mitigation requirements related to these ESS.

Access roads and trails (PC-1)	
ID	**Mitigation**
PC-1.01	Access roads and trails developed for construction and no longer required for future operational maintenance access will be decommissioned and rehabilitated in accordance with the Rehabilitation and Invasive Species Management Plan.
PC-1.02	Access roads and trails required for future monitoring, inspection or maintenance will be maintained in accordance with the Access Management Plan.
PC-1.03	Access roads and trails will be constructed to a minimum length and width to accommodate the safe movement of construction equipment.
PC-1.04	Access roads and trails will be located, constructed, operated, and decommissioned in accordance with contract specifications.
PC-1.05	Access roads and trails will be provided with erosion and sediment control measures in accordance with the Erosion and Sediment Control Plan.
PC-1.06	All season access roads will not be permitted within established buffer zones and setback distances from waterbodies, wetlands, riparian areas, and water bird habitats.
PC-1.07	Approach grades to waterbodies will be minimized to limit disturbance to riparian areas.
PC-1.08	Bypass trails, sensitive sites and buffer areas will be clearly marked prior to clearing, to identify that prescribed selective clearing is to occur as per CEnvPP mapbook and Clearing Management Plan.
PC-1.09	Contractor will be restricted to established roads, trails and cleared construction areas in accordance with the Access Management Plan.
PC-1.10	During winter construction, where necessary (i.e., unfrozen wetlands, creeks), equipment will be wide-tracked or equipped with low-ground pressure tires to minimize rutting and limit damage and compaction to surface soils. If wet conditions exist, the use of construction matting/temporary bridge is also permitted.

Access roads and trails (PC-1)	
ID	**Mitigation**
PC-1.11	Equipment, machinery, and vehicles will only travel on cleared access roads and trails and will cross waterways at established temporary and permanent crossings.
PC-1.12	Existing access roads, trails or cut lines will be used to the extent possible. Permission to use existing resource roads (i.e., forestry roads) will be obtained.
PC-1.13	Provincial environmental regulatory work permits will be obtained prior to the commencement of the project (as applicable).
PC-1.14	No chemical melting agents are to be utilized.
PC-1.15	Only water and approved dust suppression products will be used to control dust on access roads where required. Oil or petroleum products will not be used.
PC-1.18	Routing for access roads and trails should follow natural terrain contours to the extent possible and should be minimized adjacent to and approaching waterbodies.
PC-1.19	Surface water runoff will be directed away from disturbed and erosion prone areas but not directly into waterbodies.
PC-1.20	Invasive species will be controlled along access roads and trails in accordance with Rehabilitation and Invasive Species Management Plan.
PC-1.21	The contractor's environmental representative shall inspect access roads and trails prior to decommissioning to evaluate adherence to environmental protection measures and to document areas of potential contamination.
PC-1.22	The contractor's environmental representative shall inspect decommissioned and rehabilitated access roads and trails to assess the success of re-vegetation and to determine if additional rehabilitation is required in accordance with the Rehabilitation and Invasive Species Management Plan.
PC-1.23	The contractor shall check that rock utilized for access road construction does not have acid or alkali generating properties.

Access roads and trails (PC-1)	
ID	**Mitigation**
PC-1.24	Applicable permits /approvals for all constructed access points (including driveways, roads, culverts etc.) connecting to roadways will be obtained from the appropriate authority (MTI, municipality, city, water licensing) prior to construction.
PC-1.25	Heavy equipment will not be allowed access to MTI roadways without the appropriate protection and permits.
PC-1.26	Access roads and trails that use or cross MTI roadways, care will be taken to ensure excessive amounts of material are not tracked onto the roadway, with contractor being responsible for cleanup in a timely manner.
PC-1.27	Any temporary constructed access and associated debris within an MTI right of way will need to be removed once the project is completed.
PC-1.28	All works undertaken within the MTI right-of-way (ROW) will adhere to the MTI traffic control policies.
PC-1.31	The contractor is required to install and maintain access road signage indicating road or trail number in accordance with the Access Management Plan.

Aircraft use (EI-1) [If applicable]	
ID	Mitigation
EI-1.01	Contractors using aircraft (including drones) will submit flight plans in advance of flying to the Manitoba Hydro project engineer.
EI-1.02	Fuel storage, handling and dispensing at aircraft landing areas will conform to provincial legislation and guidelines. Fuel dispensing/staging locations to be shared with MH prior to use.

Blasting and exploding (PA-1)	
ID	Mitigation
PA-1.01	A communication protocol will be developed to notify affected parties of blasting operations and implosive connector use. Affected parties may include the Provincial environmental regulator, RCMP, municipalities, landowners, and resource users.
PA-1.02	Blasting will be conducted and monitored in accordance with Fisheries and Oceans Canada Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters.
PA-1.03	If the blasting is taking place in a known caribou calving area, blasting will be scheduled outside of the period from May 1 to June 30, or as approved by Manitoba Hydro.
PA-1.04	To the extent possible, methods that will prevent disruption to bird nesting during the bird breeding season (in Manitoba generally April 1-August 31) must be incorporated into blast plans. These dates are a general guide as bird breeding season dates vary throughout Manitoba.
PA-1.05	Explosives will be stored, transported, and handled in accordance with federal requirements through *The Explosives Act* and *Transportation of Dangerous Goods Act* and provincial regulations stated in *The Workplace Safety and Health Act*.
PA-1.06	Implosive connector use will be minimized to extent possible on weekends and after normal working hours in residential areas.
PA-1.07	Quarry blasting operations and implosive connector use will be scheduled to minimize disturbance to wildlife and area residents, and to ensure the safety of workers.
PA-1.08	The blasting contractor will be in possession of valid licenses, permits and certificates required for blasting in Manitoba.

Blasting and exploding (PA-1)	
ID	Mitigation
PA-1.09	The blasting contractor will submit a blasting plan to the contract administrator for review and approval prior to commencement of blasting operations.
PA-1.10	Use of ammonium nitrate and fuel oil will not be permitted in or near waterways. Only DFO approved explosives shall be permitted in or near waterways.
PA-1.11	Warning signals will be used to warn all project personnel and the public of safety hazards associated with blasting.
PA-1.12	Written and/or oral notification will be outlined in the communication plan prior to each blasting period.
PA-1.13	Drillhole sites will be clearly marked with flagging tape and tape will be removed upon completion of the blasting.
PA-1.14	Large explosive charges shall be divided into smaller multiple time-delay charges, where practical. The practicality and feasibility of the works shall be at the determination of the resident engineer/manager.
PA-1.15	The blasting contractor shall check that blast rock does not have acid or alkali generating properties.

Borrow pits and quarries (PC-2)	
ID	Mitigation
PC-2.01	Access to abandoned borrow pits and quarries will be managed in accordance with the Access Management Plan.

Borrow pits and quarries (PC-2)	
ID	Mitigation
PC-2.02	All equipment and structures will be removed from borrow pits prior to abandonment.
PC-2.03	Borrow pits and quarries will be designed, constructed, and operated in compliance with provincial legislation and guidelines.
PC-2.04	Borrow pits and quarries will not be located within 150 m of a provincial trunk highway or provincial road unless an effective vegetated berm is provided to shield the area from view.
PC-2.05	Borrow pits and quarries will not be located within established buffer zones and setback distances from identified environmentally sensitive sites without approval from MH environmental officer.
PC-2.06	Drainage water from borrow pits and quarries will be diverted through vegetated areas, existing drainage ditch(es) or employ a means of sediment control prior to entering a waterbody.
PC-2.07	Erosion protection and sediment controls will be put in place in accordance with the Erosion and Sediment Control Plan before borrow pit excavation commences, when required as determined by the MH environmental officer / inspector.
PC-2.08	Fuel storage will not be permitted near stockpiles outlined in PC 5.21.
PC-2.09	Garbage, debris, or refuse will not be discarded into borrow pits and quarries.
PC-2.10	Only water and approved dust suppression products will be used to control dust on access roads where required. Oil or petroleum products will not be used.
PC-2.11	Organic material, topsoil, and subsoil with-in borrow pits and quarries will be stripped and stockpiled for use in future site rehabilitation.

Borrow pits and quarries (PC-2)	
ID	Mitigation
PC-2.12	Previously developed borrow sites and quarries will be used to the extent possible before any new sites are developed.
PC-2.13	Signs will be posted at borrow pits and quarries to warn all persons of safety hazards.
PC-2.14	Surface drainage will be redirected away from the borrow pits and quarries before excavation commences.
PC-2.15	Vegetated buffer areas will be left in place when borrow pits are cleared in accordance with provincial guidelines.
PC-2.16	Vegetation control at borrow pits and quarries will be in accordance with the Rehabilitation and Invasive Species Management Plan.
PC-2.17	Vegetation in active Manitoba Hydro permitted borrow pits and quarries will be maintained as per the Rehabilitation and Invasive Species Management Plan.
PC-2.18	Borrow pits and granular quarries will be left maximum 4:1 (horizontal to vertical) side slope unless otherwise approved by Manitoba Hydro.
PC-2.19	Borrow pits and quarries will not be permitted within established buffer zones and setback distances from waterbodies, wetlands, and riparian areas.
PC-2.20	Discharges from dewatering operations shall be carried out so that it avoids entering natural water systems unless sediment is controlled.
PC-2.21	The contractor’s environmental representative will inspect borrow pits and quarries prior to decommissioning to evaluate adherence to environmental protection measures and to document areas of potential contamination.

Borrow pits and quarries (PC-2)	
ID	Mitigation
PC-2.22	The contractor’s environmental representative will inspect rehabilitated borrow pits and quarries in accordance with the site Reclamation Plan to assess the success of re-vegetation and to determine if additional rehabilitation is required.
PC-2.23	Borrow pits will be accessed using existing access routes and rights-of-way where possible. Acceptance of the access location by the resident engineer/manager will be required.
PC-2.24	The blasting contractor shall check that blast rock does not have acid or alkali generating properties.
PC-2.25	All stockpiles or spoil piles will be maintained as to minimize dust associated with wind erosion.
PC-2.26	Vehicles hauling materials to or from the work site that have the potential for dust emissions should be hauled with the load enclosed by an anchored tarp, plastic, or other material.
PC-2.27	As marshalling yards, borrow sources, temporary workspaces, work camps are identified or route changes required, additional heritage monitoring activities may be required to be conducted prior to approval.
PC-2.28	If weeds (invasive species) are present on the surface of a borrow or quarry where material is being sourced, the surface must be stripped (to a minimum depth of 10 cm) and stockpiled separately from materials that will be transported away from the site.

Burning (PA-2)	
ID	Mitigation
PA-2.01	All occurrences of uncontrolled burning or fire spreading beyond the debris pile will be reported immediately to Manitoba Hydro.
PA-2.02	Any residue or unburned materials remaining post-burn is not to encumber operations or re-vegetating activities.
PA-2.03	Burning of slash on permafrost soils should be avoided. If it is unavoidable, the utilization of other methods such as a metal container that can removed from site.
PA-2.04	Burning of waste including household, kitchen, food, and wood containing resins, glues, and any other chemicals (plywood, pressure treated lumber, MDF, etc.) will not be permitted.
PA-2.05	Burning will be monitored to ensure that fires are contained, and subsequent fire hazards are not present. Post season all burn piles will be scanned for hot spots using infrared scanning technology.
PA-2.06	Burning will not be carried out within riparian buffer zones or setbacks for stream crossings or waterbodies.
PA-2.07	A burning permit is required between April 1st and November 15.
PA-2.08	Debris and wood chip piles located near habitation or highways will only be burned when weather conditions are favorable to ensure the safe dispersal of smoke and in accordance with burning permits where applicable.
PA-2.10	Firefighting equipment required by legislation, guidelines, contract specifications and work permits will be kept on site and maintained in serviceable condition during burning.

PA-2.11	Slash will be piled in a manner that allows for clean, efficient burning of all material and on mineral soils where applicable.
PA-2.12	Burning of any material is not permitted on Manitoba Transportation and Infrastructure (MTI) roadway rights-of-way.
PA-2.13	The contractor will take steps (such as choosing location and weather conditions) to minimize the impact that smoke from slash burning may have on landowners, and specifically landowner residences.

Clearing (PA-3)	
ID	Mitigation
PA-3.01	At locations where construction crosses a water body or takes place in water, a 30 m buffer of low growth shrubs and understory vegetation will be maintained from the ordinary high water mark of the riparian area. The buffer zone increases in size the steeper the slope of land entering waterway (see riparian buffer table in CEnvPP).
PA-3.02	Access to clearing areas will utilize existing roads and trails to the extent possible.
PA-3.03	All clearing and construction equipment is to remain within the bounds of access routes and the project footprint identified.
PA-3.04	Areas identified for selective clearing (e.g., buffer zones, sensitive sites) will be flagged prior to clearing.
PA-3.05	Chipped or mulched material may be collected for use in construction areas and sediment / erosion control on site.
PA-3.07	Cleared trees and woody debris will not be pushed into (or adjacent) to standing timber, or within the high-water mark of wetlands or waterbodies
PA- 3.08	Clearing activities will be carried out in accordance with contract specifications and the Clearing Management Plan.
PA-3.10	Clearing is allowed only within the reduced risk time period for wildlife illustrated in the Timing Windows appended to the CEnvPP. If clearing within the sensitive time period for wildlife, further mitigation and approvals would be required.
PA-3.11	Clearing within environmentally sensitive sites, not designated for organic removal will be carried out in a manner that minimizes disturbance to existing organic soil layer.

Clearing (PA-3)	
ID	Mitigation
PA-3.12	Where possible, heavy equipment will be wide-tracked or equipped with low-ground pressure tires to minimize rutting and limit damage and compaction to surface soils.
PA-3.13	Construction vehicles, machinery and heavy equipment will not be permitted in designated machine-free zones except at designated crossings.
PA-3.14	Danger trees will be flagged/marked for removal using methods that do not damage soils and adjacent vegetation.
PA-3.16	Maintain low growth shrubs and understory vegetation to the extent possible, unless stripping and grubbing is required for the project.
PA-3.18	Property limits, right-of-way boundaries, buffers, and sensitive areas (where applicable) will be clearly marked with stakes and/or flagging tape prior to clearing.
PA-3.19	Selective clearing to retain low growing vegetation will be carried out in erosion prone areas. Low ground disturbance methods will be employed to minimize soil disturbance.
PA-3.20	Slash piles will be placed at least 15 m from forest stands.
PA-3.21	Slash piles will not be placed on the surface of frozen waterbodies and will not be located within established setbacks from waterbodies or within the ordinary high-water mark.
PA-3.22	If extreme wet weather or insufficient frost conditions results in soil damage from rutting and/or soil erosion, work may need to be modified until conditions improve. (See CEnvPP Saturated and thawed soils Management Plan).

Clearing (PA-3)	
ID	Mitigation
PA-3.23	Trees containing active nests and areas where active animal dens or burrows are encountered will be appropriately buffered and flagged then left undisturbed until unoccupied.
PA-3.24	Trees will be felled toward the middle of rights-of-way or cleared area to avoid damage to standing trees.
PA-3.27	Herbicides will not be applied for the purposes of initial clearing of vegetation on the right-of-way.
PA-3.28	If clearing is needed on a Manitoba Transportation and Infrastructure (MTI) roadway right-of-way, approval must be obtained from MTI in advance.
PA-3.32	Trees will not be felled into waterbodies. During mulching or chipping activities, debris must be directed away from, and not enter, waterbodies.

Concrete wash water and waste (EI-13)	
ID	Mitigation
EI-13.01	Wash water and solid waste will not be discharged onto the ground at the project site.
EI-13.02	All concrete solid waste and wash water will be collected and removed from the project site by the concrete supplier or treated on site in an approved settling pond.
EI-13.03	High density polyethylene geomembrane liners and either earth or physical berms may be used for a temporary concrete washout for uncured or partially cured concrete.

Concrete wash water and waste (EI-13)	
ID	Mitigation
EI-13.04	All water from chute washing activities will be contained in leak proof containers or in an approved settling pond.
EI-13.05	All water that has been used for washout purposes and associated activities will be disposed in an appropriately sized settling pond(s) treated to meet turbidity (total suspended solids [TSS]) and pH requirements prior to discharge. Turbidity will be treated by settlement or filtration; pH will be treated by use of acid, dry ice, carbon dioxide gas or other methods.
EI-13.06	All water that has been used for washout purposes and associated activities will be treated to meet the Manitoba Water Quality Standards, Objectives, and Guidelines (Tier 1) for municipal wastewater effluents of 25 mg/L TSS prior to discharge.
EI-13.07	All water that has been used for washout purposes and associated activities will be treated to meet the Manitoba Water Quality Standards, Objectives, and Guidelines (Tier 3; MWS 2011) for the protection of aquatic life for pH 6.5-9.0, prior to discharge into a watercourse.
EI-13.08	Cured concrete can be transported in non-hazardous waste containers and disposed of at a licensed facility.
EI-13.09	Any uncured and partly cured concrete will be kept isolated from watercourses/ditches.

Construction camps (PC-3) [If applicable]	
ID	Mitigation
PC-3.01	A food handling permit will be obtained from the local public health inspector prior to the operation of kitchens.

Construction camps (PC-3) [If applicable]	
ID	Mitigation
PC-3.02	Animal-proof garbage containers with regular removal of food waste to approved waste management facilities will be used to manage food waste.
PC-3.03	Construction camp sites will be always kept tidy. Waste materials including litter will be collected for disposal.
PC-3.04	Construction camps will be located based on criteria that consider soil type, topography, landform type, wildlife habitat and other environmental factors.
PC-3.05	Crown land permits will be obtained for construction camps as required.
PC-3.06	Erosion sediment control in accordance with the Erosion and Sediment Control Plan and drainage management measures will be put in place prior to construction where applicable.
PC-3.07	Feeding or harassment of any wildlife is prohibited.
PC-3.08	Firebreaks will be constructed around camp locations where there is a risk of fire.
PC-3.09	Hunting and harvesting of wildlife by project staff will not be permitted while working on the project sites.
PC-3.10	Liquid and solid sewage wastes held in tanks will be removed in accordance with the Waste and Recycling Management Plan (appended to CEnvPP) by a licensed contractor and taken to licensed or approved disposal areas.
PC-3.11	Problem wildlife will be reported immediately to the nearest provincial regulator’s office.

Construction camps (PC-3) [If applicable]	
ID	Mitigation
PC-3.12	Propane tanks for camp use will be stored in dedicated, vehicle protected and secure areas at a safe distance from kitchen and sleeping quarters in accordance with provincial legislation and national codes.
PC-3.13	Sewage and grey water holding tanks will be sited and operated in accordance with provincial legislation, and federal and provincial guidelines, and a minimum of 100 m from the ordinary high-water mark of any waterbody.
PC-3.15	Adequate spill control, clean-up equipment and materials will be available at construction camps.
PC-3.16	The contractor's environmental representative will inspect rehabilitated construction camps in accordance with the Rehabilitation and Invasive Species Management Plan to assess the success of re-vegetation and to determine if additional rehabilitation is required.
PC-3.17	Invasive species will be controlled at construction camps in accordance with the Rehabilitation and Invasive Species Management Plan.
PC-3.18	Waste and recyclables will be sorted, segregated, and removed in accordance with the Waste and Recycling Management Plan to a licensed or approved waste management facilities site and/or recycling facility.
PC-3.19	Food, greases, and wastes will be stored in sealed, air-tight containers and managed as per PC-3.2.
PC-3.20	If a prospective camp is to be located on private land, a private land agreement must be submitted to Manitoba Hydro for approval prior to any setup occurring.

Construction camps (PC-3) [If applicable]	
ID	Mitigation
PC-3.21	As marshalling yards, borrow sources, temporary workspaces, work camps are identified or route changes required, additional heritage monitoring activities may be required to be conducted prior to approval.
PC-3.22	Burning of solid wastes including kitchen wastes will not be permitted.

Construction matting (PA-11)	
ID	Mitigation
PA-11.02	Mats cannot be constructed of chemically treated wood products.
PA-11.03	In wetlands three mats is the maximum number that can be stacked and used in one location.
PA-11.05	Visually inspect mats and clean as required prior to mobilization to a new project location to ensure that no plants, seeds, soil, or insects are present.
PA-11.06	Matting should not impede or redirect natural drainage patterns or water courses.
PA-11.07	Mat removal will take place from the existing mat road, working in a backwards fashion (from work site to initial access point).
PA-11.08	When mat removal is complete all remaining matting debris will be cleaned, up and transported to an approved waste disposal facility.
PA-11.09	When matting is removed any compaction of soils will have to be rehabilitated.

Demobilizing and cleaning up (PA-4)	
ID	Mitigation
PA-4.01	Temporary buildings, structures, trailers, equipment, utilities, waste materials, etc. will be removed from construction areas and sites when work is completed.
PA-4.02	Construction access roads/trails will be decommissioned and rehabilitated as per the Access Management Plan.
PA-4.03	After demobilizing and clean-up, construction areas and sites will be assessed by the contractor for rehabilitation. Contractor prescriptions will be developed as per Rehabilitation and Invasive Species Management Plan and submitted for approval to MH environmental officer.
PA-4.04	Petroleum product and other temporary hazardous material storage areas will be cleaned up, assessed and, if necessary, remediated in accordance with provincial and Manitoba Hydro guidelines.
PA-4.05	Water crossings, ditches and drains will be left free of obstructions so as not to impede water flow.

Directional drilling (PA-12)	
ID	Mitigation
PA-12.01	A frac-out contingency plan will be prepared by the contactor and available for review upon request by Manitoba Hydro. The Frac-out contingency plan will include measures to stop work, contain the drilling mud and prevent its further migration into waterbodies.
PA-12.02	When drilling takes place under a waterbody, the drill entry and exit points will be outside of the riparian buffer of that waterbody.
PA-12.03	A dugout/settling basin at the drilling exit site will be constructed to contain drilling mud to prevent sediment and other deleterious substances from entering the waterbody. If this cannot be achieved, silt fences or other effective sediment and erosion control measures will be installed to prevent drilling mud from entering the waterbody.
PA-12.04	Any drilling fluids and waste materials, including drill cuttings, shall be collected and properly disposed of. Under no circumstances should they be allowed to drain into water bodies, riparian areas or wetlands.
PA-12.05	Keep all material and equipment needed to contain and clean up drilling mud releases on site and readily accessible in the event of a frac-out.
PA-12.06	In the event of a frac-out, implement the frac-out contingency plan and notify all applicable authorities. Prioritize clean-up activities relative to the risk of potential harm and dispose of the drilling mud in a manner that prevents re-entry into the waterbody.
PA-12.07	Stabilize any spoil materials to prevent them from entering the waterbody.
PA-12.08	Re-vegetate any disturbed native vegetation by seeding with native grass species. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with

Directional drilling (PA-12)	
ID	Mitigation
	erosion control blankets to keep the soil in place and prevent erosion) and be revegetated the following spring.
PA-12.09	Stabilize disturbed soil as required, in accordance with the Erosion and Sediment Control Plan until re-vegetation of disturbed areas is achieved.
PA-12.10	When obtaining water from fish bearing waterways all pump intakes will be screened in accordance with Fisheries and Oceans Canada's *Interim Code of Practice- End of pipe fish protection screens for small water intakes in freshwater*.
PA-12.11	Water, to mix the drilling mud, either will be brought in from off site and stored in tanks at the entry locations or be withdrawn from waterbodies if approved by the provincial environmental regulator.
PA-12.12	Drilling activities in permafrost shall be carried out under frozen ground conditions to the extent possible.
PA-12.13	For gas pipeline projects a written directional drilling plan that meets or exceeds the requirements of CSA Z662 (current edition) shall be prepared prior to the start of drilling.
PA-12.14	Drilling equipment and machinery shall not be fueled or serviced within 100 m of waterbodies or riparian areas.

Draining (PA-5)	
ID	Mitigation
PA-5.01	Construction activities shall not block natural drainage patterns.
PA-5.02	Culverts will be installed and maintained in accordance with *Manitoba Stream Crossing Guidelines* (DFO and MNR 1996) and relevant provincial and municipal acts, regulations, and bylaws.
PA-5.03	Dewatering discharges from construction activities will be directed into vegetated areas, existing drainage ditch(s) or a means of sediment control at such a rate that will have adequate flow dissipation at the outlet to ensure it does not cause erosion at the discharge point or at any point downstream.
PA-5.04	Drainage water from construction areas will be diverted through vegetated areas, existing drainage ditch(s) or a means of sediment control prior to entering a waterbody.
PA-5.05	Erosion and sediment control will be provided by the contractor in accordance with the Erosion and Sediment Control Plan.
PA-5.06	Existing, natural drainage patterns and flows will be identified and maintained to the extent possible.
PA-5.07	No debris or slash is allowed to be placed in drainage channels/ditches.
PA-5.08	Drainage ditches will be provided with elevation controls to prevent water ponding.
PA-5.09	Drainage ditches and culverts will be installed during periods with minimal or no stream flows.
PA-5.10	Drainage channels and ditches will be identified and flagged prior to construction.

Draining (PA-5)	
PA-5.11	Disturbance of natural drainages including seepage areas, discharge and recharge areas, wetlands, and ephemeral and permanent watercourses will be avoided.
PA-5.12	Where construction must be carried out within a drainage channel, water will be diverted around the work until completed in accordance with the contract specifications.
PA-5.13	Dewatering of excavations or alterations to existing drainage patterns will be done so that it avoids entering natural water systems unless sediment is controlled.
PA-5.14	Flows to Manitoba Transportation and Infrastructure (MTI) roadway drains and ditches will not be altered by construction (increased flow, de-watering, and other flow effects) without department approval in advance.
PA-5.15	All drainage, natural or manmade that may deposit construction generated sediments on the MTI roadway right-of-way will be managed through the Erosion and Sediment Control Plan.

Drilling (PA-6)	
ID	Mitigation
PA-6.01	Abandoned drill holes will be sealed with bentonite or other effective sealers to prevent interconnection and cross-contamination of ground and surface waters.
PA-6.02	Drilling activities in northern Manitoba will be carried out under frozen ground conditions to minimize damage to surface vegetation, soils and permafrost to the extent possible.
PA-6.03	Drilling equipment and machinery will not be serviced within 100 m of waterbodies or riparian areas.
PA-6.04	Drilling fluids and waste materials will be contained and not allowed to drain into waterbodies, riparian areas, or wetlands.
PA-6.05	Drilling in environmentally sensitive sites, features and areas will not be permitted unless approved in advance by MH Environmental Officer /Inspector and mitigation measures are implemented.
PA-6.06	
PA-6.07	Drilling will not be permitted within established buffer zones and setback distances from waterbodies unless approved in advance by MH environmental officer.
PA-6.08	Spill control and clean-up equipment will be provided at all drilling locations.
PA-6.09	The drilling contractor will ensure that equipment and materials are available on site for sealing drill holes.
PA-6.10	The drilling contractor will inspect drilling equipment and machinery for fuel and oil leaks prior to arrival at the project site, and will inspect for fuel and oil leaks and spills regularly.

Drilling (PA-6)	
PA-6.11	Where there is potential for mixing of surface and groundwater, precautions will be taken to prevent the interconnection of these waters.
PA-6.12	The contractor must submit a plan to the MH environmental officer describing how surface water, drill flush, and excess waste grout will be controlled and disposed of, including emergency response plans for working in groundwater environmentally sensitive sites for sealing/grouting artesian wells and pumping (if required) excess groundwater.

Emergency response (EI-2)	
ID	Mitigation
EI-2.01	All fires will be reported to Manitoba Hydro
EI-2.02	All spills at construction sites will be reported to Manitoba Hydro
EI-2.03	All vehicles hauling petroleum products will carry spill containment and clean-up equipment.
EI-2.04	Clean-up and the disposal of contaminated materials will be managed in accordance with provincial guidelines and Manitoba Hydro guidelines.
EI-2.05	Emergency Preparedness and Response Plans and procedures will be communicated to all project staff and a copy will be made available at the project site.
EI-2.06	Emergency spill response and clean-up materials and equipment will be available at construction sites, marshaling yards, fuel storage facilities and standby locations.

Emergency response (EI-2)	
ID	Mitigation
EI-2.07	Fire extinguishers will be mounted on buildings at locations where they will be most readily accessible. Safety officers will conduct annual inspections of fire extinguishers.
EI-2.08	Orientation for contractor and Manitoba Hydro employees working in construction areas will include emergency response awareness.
EI-2.09	Contractor to conduct investigation for all provincially reportable spills and fires reported to ensure that procedures are followed, and plans remain effective.
EI-2.10	Project emergency response and evacuation procedures in the Emergency Preparedness and Response Plan will be adhered to in the event of forest fires.
EI-2.11	Reasonable precautions will be taken to prevent fuel, lubricant, fluids, or other products from being spilled during equipment operation, fueling and servicing.
EI-2.12	Spill response and clean up equipment will be available for responding to releases for a site location.
EI-2.13	Temporary construction camps will have a designated fire marshal in accordance with the Emergency Preparedness and Response Plan.
EI-2.14	The Emergency Preparedness and Response Plan will be prepared by the contractor, approved by the MH environmental officer prior to construction and updated annually.
EI-2.15	The hazardous materials incident report form will be completed when reporting a spill.
EI-2.16	Should a forest fire be caused by project activities, it must be reported to Manitoba Hydro immediately.

Emergency response (EI-2)	
ID	Mitigation
EI-2.17	Firefighting equipment required by legislation, guidelines, contract specifications and work permits will be kept on site and maintained in serviceable condition.

Erosion and sediment control (EI-3)	
ID	Mitigation
EI-3.01	Accumulated sediment will be removed from silt fences and other barriers in accordance with the Erosion and Sediment Control Plan to ensure proper functioning.
EI-3.02	Construction activities may be suspended during extreme wet weather events as per the Saturated/Thawed Soils Operating Guidelines.
EI-3.03	Contractor specific Erosion Protection and Sediment Control Plans will be prepared by the contractor, accepted by Manitoba Hydro prior to construction and updated annually.
EI-3.04	Erosion and sediment control installations will only be removed after disturbed areas are protected and sediments are disposed of in accordance with Erosion and Sediment Control Plan.
EI-3.05	Erosion and sediment control measures will be left in place and maintained until either natural vegetation or permanent measures are established.
EI-3.06	Erosion and sediment control measures will be put in place in accordance with the Erosion and Sediment Control Plan prior to commencement of construction activities and will remain intact for the duration of the project.
EI-3.08	The contractor will be responsible for implementing the Erosion and Sediment Control Plan with procedures put in place prior to commencement of applicable construction activities.
EI-3.09	The contractor will be responsible for monitoring and if required modifying erosion and sediment control installations to ensure continued effectiveness.

Erosion and sediment control (EI-3)	
EI-3.10	The contractor will communicate the requirement to follow the Erosion and Sediment Control Plan to all project staff and a copy will be made available at the project site.
EI-3.11	The MH Environmental Officer /Inspector will make inspections of erosion and sediment control measures to confirm implementation and continued effectiveness.

Fish protection (EC-3)	
ID	Mitigation
EC-3.01	When a work, undertaking or activity results in the deposit of a deleterious substance or creates the potential for such a deposit, Manitoba Hydro will advise DFO of the situation.
EC-3.02	Disturbances to waterbodies, shorelines, riparian areas, etc. will be stabilized to prevent erosion immediately.
EC-3.03	Erosion and sediment control measures will be put in place in accordance with the Erosion and Sediment Control Plan at all project locations where surface drainage is likely to flow into fish bearing waters.
EC-3.04	Fish and fish habitat will be protected in accordance with federal legislation and federal and provincial guidelines.
EC-3.05	Prior to seeking authorization from the provincial environmental regulator for removal of a Muskrat house, Beaver Dam or Lodge documentation of reasonable attempts to trap resident beavers/muskrat must be provided. Attempts to trap resident Beavers/muskrats must be undertaken by a licensed trapper or person with a valid Wild Animal Kill Permit.

EC-3.06	Project personnel will be prohibited from fishing at project locations or along rights-of-way.
EC-3.07	When obtaining water from fish bearing waterways all pump intakes will be screened according to the *Freshwater Intake End-of-Pipe Fish Screen Guideline* (DFO 1995).
EC-3.08	The withdrawal of any water will not result in reduction in the wetted width of a stream, to maintain existing fish habitat
EC-3.09	In watercourses where mussel species of conservation concern are known to occur, watercourse crossings may occur by boat or barge, or during winter (i.e., under frozen conditions) to prevent mortality of the mussels.
EC-3.10	Muskrat house, Beaver Dam or Lodge removal requires consultation with and the Department of Fisheries and Oceans who may require additional authorizations. House, Dam or Lodge removal may require heavy equipment or explosives which would require an additional Work Permit from the provincial environmental regulator when located on Crown Land.

Grading (PA-7)	
ID	Mitigation
PA-7.01	A thick gravel layer (1.2m) or compacted snow layer (0.6m) will be used in temporary workspaces or marshaling yards located in permafrost areas where required to prevent damage to surface materials.
PA-7.02	Grading for gravel pads for construction areas and access roads will be limited to areas where it is needed for the safe and efficient operation of vehicles, machinery, and construction equipment.
PA-7.03	Grading for site rehabilitation and restoration will be in accordance with the Rehabilitation and Invasive Species Management Plan.
PA-7.04	Grading will not be permitted within established buffer zones and setback distances from waterbodies.
PA-7.05	Grading will only be permitted within rights-of-ways and construction areas.
PA-7.06	Gravel pads will be graded so the surface runoff is directed away from waterbodies, riparian areas, and wetlands.
PA-7.07	Required erosion and sediment control measures will be put in place prior to grading in accordance with the Erosion and Sediment Control Plan.

Groundwater (EC-4)	
ID	Mitigation
EC-4.01	Potable water samples will be collected every two weeks and submitted for analysis according to provincial sampling and analysis protocol.
EC-4.02	Well locations will be marked with flagging tape prior to construction.
EC-4.03	Where there is potential for mixing of surface and groundwater, precautions will be taken to prevent the interconnection of these waters.
EC-4.04	The contractor must submit a plan to the MH environmental officer describing how surface water, drill flush, and excess waste grout will be controlled and disposed of, including emergency response plans for working in groundwater environmentally sensitive sites for sealing/grouting artesian wells and pumping (if required) excess groundwater

Grubbing (PA-8)	
ID	Mitigation
PA-8.01	Construction areas containing soil with high silt content, artesian springs or areas of previous erosion will be assessed by MH environmental officer / inspector for additional erosion and sediment control measures.
PA-8.02	Construction areas requiring extensive grubbing will be stabilized as soon as possible to minimize erosion.
PA-8.03	Grubbing will be halted during heavy precipitation events when working in areas of finely textured soils.
PA-8.04	Grubbing will not be permitted within 6 m of standing timber to prevent damage to root systems and to limit the occurrence of blow down.
PA-8.05	Stripping and grubbing will not be permitted within 100 m of the high-water mark of a water body, unless otherwise approved by Manitoba Hydro or specified in the contract.
PA-8.06	Stockpiled materials from grubbing will not block natural drainage patterns and will be placed a minimum of 100 m from any water body, except where approved by Manitoba Hydro or specified in the contract.
PA-8.07	Unless required for the work, grubbing will be minimized to the extent possible.
PA-8.08	When not under frozen conditions, erosion and sediment control measures will be put in place in accordance with the Erosion and Sediment Control Plan prior to grubbing in accordance with the Erosion and Sediment Control Plan.
PA-8.09	Windrows of grubbed materials will be piled at least 15 m from standing timber.
PA-8.10	If grubbing is needed on a Manitoba Transportation and Infrastructure (MTI) right-of-way, clearance must be obtained from MTI in advance.

Hazardous materials (EI-4)	
ID	Mitigation
EI-4.01	A contractor specific Hazardous Substances Management Plan will be prepared by the contractor; approved by the MH environmental officer prior to construction and updated annually.
EI-4.02	Access to hazardous materials storage areas will be restricted to authorized and trained contractor and Manitoba Hydro personnel.
EI-4.03	An inventory of Workplace Hazardous Information System (WHMIS) controlled substances, including Safety Data Sheets (SDS) will be prepared and maintained by the contractor at each project site and updated as required.
EI-4.04	Bulk waste oil will be stored in approved aboveground tanks provided with secondary containment in accordance with provincial legislation.
EI-4.05	Containers of hazardous materials stored outside will be labeled, weatherproof, placed on spill containment pallets, and covered by a weatherproof tarp.
EI-4.06	Contractor personnel will be trained and certified in the handling of hazardous materials including emergency response procedures in accordance with provincial legislation.
EI-4.07	Contractor personnel will receive WHMIS training in accordance with provincial legislation.
EI-4.08	Controlled substances will be labeled in accordance with WHMIS requirements. Required documentation will be displayed and current Materials Safety Data Sheets will be available at each project site in accordance with the Hazardous Substances Management Plan.

Hazardous materials (EI-4)	
EI-4.09	Empty hazardous waste containers will be removed to a licensed or approved disposal site by the contractor.
EI-4.10	Hazardous materials storage sites will be secured, and signs will be posted that include hazard warnings, contacts in case of a release, access restrictions and under whose authority the access is restricted.
EI-4.11	Hazardous materials shall be adequately contained and shall be protected from wind and rain to prevent deposition of fine particles or dust into watercourses through runoff.
EI-4.12	Hazardous materials and WHMIS inventories will be completed prior to construction. Inventories will be updated in accordance with regulatory requirements.
EI-4.13	Hazardous substances management procedures will be communicated to all project staff and a copy will be made available at the project site.
EI-4.14	Hazardous substances storage areas including coke materials for ground electrode facilities will be located a minimum of 100 m from the ordinary high-water mark of a waterway and above the 100-year flood level.
EI-4.15	Hazardous substances will be transported, stored and handled according to the procedures prescribed by provincial legislation at a minimum follow Manitoba Hydro policies.
EI-4.16	Hazardous waste materials will be segregated and stored by type in approved containers within a secondary containment system.
EI-4.17	Indoor storage of flammable and combustible substances will be in fire resistant and ventilated enclosed storage area or building in accordance with national codes and standards.
EI-4.19	Non-hazardous products will be used in place of hazardous substances to the extent possible.

Hazardous materials (EI-4)	
EI-4.20	Orientation for contractor and Manitoba Hydro employees working in construction areas will include hazardous substance awareness.
EI-4.21	Pesticide storage will be in accordance with provincial legislation.
EI-4.22	The contractor will be responsible for the safe use, handling, storage, and disposal of hazardous materials including waste as well as procedures for emergency conditions in accordance with provincial and federal legislation and standards.
EI-4.23	The contractor will monitor containers of hazardous substance containers regularly for leaks and to ensure that labels are legible and prominently displayed.
EI-4.24	The MH Environmental Officer /Inspector will make routine inspections of hazardous substance storage sites to confirm that environmental protection measures are implemented and effective.
EI-4.25	Waste oil will be transported by licensed carriers to licensed or approved waste oil recycling facilities.
EI-4.26	Wet batteries will be stored and transported to licensed or approved waste recycling facilities.
EI-4.27	Hazardous waste can be stored temporarily for no longer than 30 days before removal to a licensed or approved disposal site.
EI-4.28	Temporary hazardous material storage containers will be located on level ground and within a structure that is covered by roofing preventing precipitation from entering the storage area or the secondary containment system

Heritage resources (EC-5)	
ID	Mitigation
EC-5.01	All archaeological finds discovered during site preparation and construction will be left in their original position until the project archaeologist is contacted and provides instruction.
EC-5.02	Construction activities will not be carried out within established buffer zones for heritage resources except as approved by the project archaeologist.
EC-5.03	Environmental protection measures for heritage resources will be reviewed with the contractor and employees prior to commencement of any construction activities.
EC-5.04	Orientation for project staff working in construction areas will include heritage resource awareness and training including the nature of heritage resources and the management of any resources encountered.
EC-5.05	Orientation information will include typical heritage resource materials and reporting procedures.
EC-5.06	The contractor will report heritage resource materials immediately to the contract administrator. Construction activities will cease in the immediate vicinity until the project archaeologist is contacted and provides further instruction.
EC-5.07	The Culture and Heritage Resource Protection Plan will be adhered to during preconstruction and construction activities.
EC-5.08	The MH environmental officer / inspector will inspect borrow pits and other excavations for the presence of heritage resource materials.
EC-5.09	As marshalling yards, borrow sources, temporary workspaces, work camps are identified or route changes required, additional heritage monitoring activities may be required to be conducted prior to approval.

Management measures (MM)	
ID	Mitigation
MM-01	All licenses, permits, contracts, project specifications, guidelines and other applicable documents will be obtained and in the possession of both the contractor and Manitoba Hydro prior to commencement of applicable work.
MM-02	All project participants will ensure that project activities are carried out in compliance with applicable legislation, guidelines, contractual obligations, and environmental protection plan provisions.
MM-03	Environmental concerns will be identified and discussed at planning meetings on an as required basis.
MM-04	Manitoba Hydro will notify First Nation and Red River Métis leadership of active construction schedules, prior to project start-up as per project Communication Plan.
MM-05	Manitoba Hydro will contact local municipal authorities prior to project start-up as per project Communication Plan.
MM-06	Manitoba Hydro will contact local resource users, lodge operators, outfitters and recreational resource users and associations to the extent feasible and practical prior to project start-up as per project Communication Plan.
MM-07	Manitoba Hydro will contact the provincial environmental regulator and forest management licence holders prior to clearing regarding timber use opportunities.
MM-08	Manitoba Hydro will meet the contractor at the beginning of each new contract to review environmental protection requirements including mitigation measures, inspections, and reporting.
MM-11	Project construction update meetings will be held weekly and include discussion of environmental and safety issues.

Management measures (MM)	
MM-12	Relevant documents including licenses, permits, approvals, legislation, guidelines, environmental protection plans, orthophotos maps, etc. will be made available to project participants.
MM-13	Response to enforcement actions by regulatory authorities will be in accordance with Manitoba Hydro policy P602.
MM-14	The contractor will obtain all licenses, permits, contracts and approvals other than those that are Manitoba Hydro's responsibility prior to project start-up.
MM-15	The contractor will review terms and conditions of all authorizations, contract specifications, agreements, etc. prior to project start-up or as authorization are acquired and will discuss any questions or concerns with Manitoba Hydro.
MM-16	In areas of active construction, the contractor must provide Manitoba Hydro representatives with full and unrestricted access to the right-of-way and all project related work areas so that inspections can occur.
MM-17	The CEnvPP text and map book will be available at active construction project sites.
MM-18	The contractor's environment officer is responsible for the delineation and flagging of all identified project environmentally sensitive sites as per CEnvPP.
MM-19	The contractor must submit all contractor developed environmental plans to Manitoba Hydro before work on the project can commence, the plan may be updated as required.
MM-20	Aside from service animals, pets are not permitted on active construction project sites.

Management measures (MM)	
MM-21	Affected private landowners and Crown land encumbrance holders will be notified in advance of the schedule for construction, operation, and maintenance.
MM-22	Temporary work spaces are prohibited from being placed within ESS without written approval from Manitoba Hydro, exceptions may be subject to provincial environmental regulator approval.

Marshaling yards (PC-5) [If applicable]	
(These measures may also apply to Fly yards, Temporary workspaces, Staging areas, Material placement areas etc.)	
ID	Mitigation
PC-5.01	Contractor employees responsible for receipt and distribution of hazardous substances will be trained in handling and transportation of dangerous goods, and WHMIS.
PC-5.02	Emergency Preparedness and Response Plan and procedures for marshaling yards will be developed.
PC-5.03	Erosion, sediment control and drainage management measures will be put in place in accordance with Erosion and Sediment Control Plan.
PC-5.04	Fire breaks will be established a minimum of 6 m around marshaling yards in areas where there is a risk of fire.
PC-5.05	Garbage and debris will be stored in approved containers, sorted for recycling, and disposed of at a licensed or approved waste management facilities site.
PC-5.06	Hazardous materials entering and leaving the marshaling yards will be inventoried and accounted for.
PC-5.07	Hazardous materials will be stored in accordance with provincial legislation, and provincial and national codes and standards.

Marshaling yards (PC-5) [If applicable]	
PC-5.08	Marshaling yards will be located based on criteria that consider soil type, topography, landform type, wildlife habitat and other environmental factors.
PC-5.09	Marshaling yards will be in existing clearings or natural openings.
PC-5.10	Marshaling yards will be located, constructed, operated, and decommissioned in accordance with contract specifications and in accordance with the Rehabilitation and Invasive Species Management Plan.
PC-5.11	Once marshaling yards are no longer required, structures, equipment, materials, fences, etc. will be dismantled and moved to storage or a new location.
PC-5.12	Organic material, topsoil and sub-soil stripped during site preparation will be stockpiled separately for later use in site rehabilitation.
PC-5.13	Petroleum products will only be stored, handled and dispensed in designated areas within marshaling yards in accordance with provincial legislation and guidelines.
PC-5.14	Spill control and clean-up equipment to be located at designated areas within marshaling yards.
PC-5.16	Vegetation control at marshaling yards will be in accordance with Rehabilitation and Invasive Species Management Plan.
PC-5.17	Vehicle, machinery and equipment maintenance and repairs will be carried out in designated areas within marshaling yards.
PC-5.18	Hazardous waste materials, fuel containers and other materials will be stored in approved containers and transported to licensed or approved waste management facilities by a licensed carrier.
PC-5.19	Welding mats will be used to minimize the risk of fire.

Marshaling yards (PC-5) [If applicable]	
PC-5.20	The MH environmental specialist will inspect rehabilitated marshaling and work storage areas in accordance with the Rehabilitation and Invasive Species Management Plan to assess the success of re-vegetation and to determine if additional rehabilitation is required.
PC-5.21	The contractor will assess lands required for marshaling yards, camps or petroleum storage, dispensing areas and hazardous materials storage areas for potential contamination following Canadian Standards Association Environmental Site Assessment (CSA Z768- 01) procedures.
PC-5.22	As marshalling yards, borrow sources, temporary workspaces, work camps are identified or route changes required, additional heritage monitoring activities may be required to be conducted prior to approval.
PC-5.23	If a prospective camp is to be located on private land, a private land agreement must be submitted to MH for approval prior to any setup occurring.

Permafrost (EC-6)	
ID	Mitigation
EC-6.01	Alterations to natural drainage patterns by rutting and scouring of surface materials in permafrost areas will be avoided to the extent possible.
EC-6.02	Construction activities in northern Manitoba will normally occur under frozen ground conditions during established timing windows to minimize disturbance and rutting.
EC-6.07	Excavations of permafrost areas in northern Manitoba will be minimized to the extent possible.
EC-6.08	Permafrost areas in northern Manitoba will be identified and mapped in advance of project construction activities. All (or almost all) of the project area for the R44H project is considered to be in permafrost areas.
EC-6.09	Clearing activities will ensure that the top layer of vegetation and organic materials will be retained as an insulating layer in permafrost areas (i.e. no clearing down to the organic layer will be allowed).

Petroleum products (EI-5)	
ID	Mitigation
EI-5.01	Aboveground tanks will be equipped with overfill protection, spill containment and collision protection as per legislation.
EI-5.02	All aboveground petroleum product tanks with a capacity greater than or equal to 5,000 litres (1,100 gallons) on Provincially regulated land

Petroleum products (EI-5)	
	must be registered with provincial environmental regulator and have a valid operating permit posted onsite.
EI-5.03	Construction, installation, or removal of petroleum product storage tank systems will only occur under the supervision of a registered licensed petroleum technician.
EI-5.04	Use of stationary petroleum product storage tanks with a capacity over 230 liters requires containment for the tank and fueling area (i.e., HDPE spill containment berm).
EI-5.05	Contractors will inspect all mobile and stationary equipment using petroleum products on a regular basis to ensure that measures are taken immediately to stop any leakage discovered.
EI-5.06	Fueling of equipment or portable storage tanks will be a minimum of 100 m from the ordinary high-water mark of any waterbody, unless approved by Manitoba Hydro Environmental Officer, additional mitigations measures will apply, including: • Equipment will fuel up prior to moving into these areas so the need to refuel will be minimized. • Two people will be utilized during refueling - one operator at the switch and another operator at the pump. • The person fueling will always attend the nozzle during the fueling operation and not lock out the nozzle. • Personnel involved in fueling will be versed in the requirements of the Spill Response Plan. • Once fueling is complete the fuel truck will leave the area immediately. • All equipment will be inspected for leaks, frayed hoses, and loose fittings before operating. • Large sized spill kit will be present onsite during activities and crews made aware of location of kit and spill procedures.

Petroleum products (EI-5)	
EI-5.07	Fueling operations require the operator to visually observe the process 100% of the time.
EI-5.08	Containment areas (berms/dykes/trays, etc.) will be dewatered after precipitation events and the containment water disposed of as specified in contract specifications.
EI-5.10	Only approved aboveground petroleum storage tanks will be used during the construction phase of the project. No underground tanks will be permitted.
EI-5.11	Orientation for contractor and Manitoba Hydro employees working in construction areas will include petroleum product storage and handling awareness.
EI-5.12	Petroleum product dispensing systems will be secured and locked by authorized personnel when not in use by authorized.
EI-5.13	Petroleum product inventories will be taken weekly by the owner/operator on all aboveground tanks greater than 5,000 L and retained for inspection by Manitoba Hydro or provincial environmental regulator upon request.
EI-5.14	Petroleum product storage containers more than 230 L will be located on level ground and will incorporate secondary containment with a capacity of 110% of the largest container volume. Water collected in the containment shall be removed regularly so as not to diminish the capacity of the containment.
EI-5.15	Petroleum product storage sites and mobile transportation units will be equipped with fire suppressant equipment and products.
EI-5.16	Petroleum product storage tanks will have adequate collision protection.

Petroleum products (EI-5)	
EI-5.17	Petroleum product storage will be located a minimum of 100 m from waterbodies, riparian areas, or wetlands.
EI-5.18	Petroleum products stored outside will be in waterproof and labeled containers, placed on spill containment pallets.
EI-5.20	Petroleum products will display required signage, placards, and labeling, and will be transported, handled and stored in accordance with provincial legislation.
EI-5.21	Petroleum products will only be stored and handled within designated areas at construction camps and marshaling yards.
EI-5.22	Portable petroleum product storage containers will be placed on spill trays with a capacity of 110% of the largest container when not in use. Accumulated precipitation collected in the containment shall be removed regularly so as not to diminish the capacity of the containment.
EI-5.23	Slip tanks and barrels will be securely fastened to the vehicle during transport and fueling operations.
EI-5.24	Spill control and clean-up equipment and materials will be available at all petroleum product storage and dispensing locations.
EI-5.25	Spill trays will remain impervious at extremely low temperatures (-45°C) and have accumulated precipitation removed regularly.
EI-5.26	The contractor will be responsible for the safe use, handling, storage, and disposal of petroleum products including waste as well as procedures for emergency conditions in accordance with provincial and federal legislation and standards.
EI-5.27	The contractor will inspect all petroleum product storage tanks and containers regularly for leaks, and product inventories will be recorded

Petroleum products (EI-5)	
	and retained for inspection by Manitoba Hydro and the provincial environmental regulator.
EI-5.28	Ignition sources (i.e., smoking) must be at least 7.5m from petroleum product storage areas.
EI-5.29	Transfer of petroleum products between storage areas and work sites will not exceed daily requirements and will be in accordance with provincial legislation and guidelines.
EI-5.30	Used petroleum products (including empty containers) will be collected and transported to a licensed oil recycling facility in approved storage containers.
EI-5.31	Vehicles hauling petroleum products will carry equipment and materials for emergency spill containment and clean-up.
EI-5.32	Warning signs will be posted in visible locations around petroleum product storage areas. Signs will indicate hazard warning, contact in case of a spill, access restrictions and authority.
EI-5.33	All slip tanks are to meet ASTM or ISO or CSA or FMCSA (Federal Motor Carrier Safety Administration) certification.
EI-5.34	Drip containers will be placed beneath all Slip tank nozzles when not in use and regularly monitored, any accumulation removed and appropriately disposed.
EI-5.35	Nozzles used for dispensing petroleum products will have their lever catches removed so that the operator will be present while product is being dispensed.
EI-5.36	When a spill or release is identified, it shall be flagged off to prevent disruption of that area until clean up takes place.

Petroleum products (EI-5)	
EI-5.37	The contractor is responsible for reporting a spill to Manitoba Hydro of any quantity within 2 hours, with a written report due in 24 hours.
EI-5.38	In the case of an externally reportable spill, the contractor is required to contact an MH Environmental Officer /Inspector immediately

Potable water (EI-11)	
ID	Mitigation
EI-11.01	Drinking water holding tanks will be designed for potable water containment.
EI-11.02	Drinking water holding tanks will be cleaned and disinfected before use.
EI-11.03	Potable water used to fill the drinking water holding tanks will comply with federal legislation.
EI-11.04	Potable water will be conserved by personnel at the site.
EI-11.05	Leaking fixtures will be repaired in a timely manner.

Rehabilitating and re-vegetation (PA-9)	
ID	Mitigation
PA-9.01	Construction areas no longer required will be re-contoured, stabilized, re-vegetated and restored to near natural conditions in accordance with Rehabilitation and Invasive Species Management Plan.
PA-9.02	Natural re-vegetation will be allowed to occur although active rehabilitation programs may be required at specific sites where erosion warrants seeding or planting.
PA-9.03	Organic material, topsoil and subsoil stripped from construction areas will be stockpiled and protected to be used for future site rehabilitation.
PA-9.04	Rehabilitation of construction areas will incorporate erosion and sediment control measures in accordance with the Erosion and Sediment Control Plan as required.
PA-9.05	Rehabilitation plans will include objectives for restoration of natural conditions, erosion and sediment control, non-native and invasive plant species management, wildlife habitat restoration and restoration of aesthetic values as required.
PA-9.06	Where appropriate, regional native grass mixtures will be used to assist re-vegetation of disturbed areas to control erosion or prevent invasion of non-native species. The mixtures will not contain non-native or invasive species.

Rights-of-way (PC-8)	
ID	Mitigation
PC-8.01	Access to transmission line rights-of-way for clearing and construction will utilize existing roads and trails to the extent possible.
PC-8.02	Access to transmission line rights-of-way will be closed, signed and/or controlled in accordance with an Access Management Plan (appended to CEnvPP).
PC-8.03	Additional clearing outside established rights-of-way is subject to provincial environmental regulatory approval.
PC-8.04	Clearing and disturbance will be limited to defined rights-of-way and associated access routes to the extent possible.
PC-8.05	Clearing of rights-of-way will occur under frozen or dry ground conditions to minimize rutting and erosion.
PC-8.06	Construction equipment will be wide-tracked or equipped with low-ground pressure tires if there is a potential for rutting and/or compaction to surface soils.
PC-8.07	Disturbed areas along transmission line rights-of-way will be rehabilitated in accordance with site Rehabilitation and Invasive Species Management Plan.
PC-8.08	Environmentally sensitive sites, features and areas will be identified and mapped prior to clearing.
PC-8.09	In situations where the right-of-way does not have completely frozen or dry ground conditions alternate products such as construction mats may be used as per the contract specifications.
PC-8.10	Contractors are to develop wet weather protocols that provide for mitigation measures to be implemented when wet soil conditions exist (see wet soil section).

Rights-of-way (PC-8)	
PC-8.11	Temporary workspaces are prohibited from being placed within ESS without written approval from Manitoba Hydro, exceptions may be subject to provincial environmental regulatory approval.

Safety and Health (EI-6)	
ID	Mitigation
EI-6.01	Orientation for Contractor and Manitoba Hydro employees working in construction areas will include safety and health awareness.
EI-6.02	Safety and health information will be posted at each project location and made available to all project personnel.
EI-6.03	Workplace safety and health committees will be established, and safety meetings will be held as required by provincial legislation and Manitoba Hydro guidelines at all project locations.

Soil contamination (EI-7)	
ID	Mitigation
EI-7.01	A closure report will be prepared for completed soil remediation projects in accordance with provincial guidelines.
EI-7.02	A remediation plan will be prepared by the contractor and submitted to MH environmental officer for sites contaminated by project activities and will remediate soils according to provincial standards.
EI-7.03	All spills and releases reported will be responded to in accordance with provincial legislation and Manitoba Hydro external reporting requirements.
EI-7.04	Any contaminated soil treatment areas must be designed and constructed to contain surface runoff and prevent leaching to soil and groundwater.
EI-7.05	Contractor personnel will take all reasonable steps to prevent soil, groundwater, and surface water contamination.

Soil contamination (EI-7)	
EI-7.06	If contamination is suspected or evident, a Phase II Environmental Site Assessment will be carried out on previously used construction site following Manitoba Hydro procedures where applicable.
EI-7.07	If laboratory results show that the soil is contaminated the soil must be transported to an approved landfill or land farm for remediation, in accordance with a Manitoba Hydro approved remediation plan.
EI-7.08	If laboratory results show that the soil is not contaminated, then the soils may be used in accordance with contract specifications.
EI-7.09	Remediation Plans will be prepared by the Contractor and approved by the Construction Supervisor/Site Manager prior to implementation if remediation of contaminated soils is determined to be required.
EI-7.10	The contractor will assess lands required for marshaling yards, camps or petroleum storage, dispensing areas and hazardous materials storage areas for potential contamination following Canadian Standards Association Environmental Site Assessment (CSA Z768- 01) procedures.
EI-7.11	The contractor will carry out a CSA Phase I Environmental Site Assessment (CSA Z768-01) at abandoned construction camps, marshaling yards, petroleum product storage, dispensing areas and hazardous materials storage areas if contamination is suspected by MH environmental officer. If required Phase II Environmental Site Assessment (CSA Z769-00) will be conducted by contractor.
EI-7.12	The MH environmental officer / inspector will inspect contaminated site assessment and remediation work regularly to confirm that environmental protection measures are implemented and effective.
EI-7.13	When a spill or release is identified, it shall be flagged off to prevent disruption of that area until clean up takes place.

Stream crossings (PC-9)	
ID	Mitigation
PC-9.01	Access road crossings will be at right angles to waterbodies, where practicable, to minimize disturbance.
PC-9.02	Riparian buffers shall be a minimum of 30 m and increase in size based on slope of land entering waterway (see riparian buffer table in CEnvPP). Within these buffers shrub and herbaceous understory vegetation will be maintained along with trees that do not violate Manitoba Hydro vegetation clearance requirements.
PC-9.03	Construction vehicles and equipment will not be permitted in designated machine-free zones except at designated crossings.
PC-9.04	Construction of stream crossings will follow the *Manitoba Stream Crossing Guidelines For The Protection of Fish and Fish Habitat* (DFO and MNR 1996).
PC-9.05	Ice bridges will be constructed of clean water, ice, and snow. Snow fills will be constructed using clean snow. Materials such as gravel, rock and loose woody material will not be used. Crossings will not impede water flow at any time of the year.
PC-9.06	The withdrawal of any water will not result in reduction in the wetted width of a stream, to maintain existing fish habitat. Water flow is maintained under the ice, where this naturally occurs, and if water is being pumped from a lake or river to build up the ice bridge, the intakes are sized and adequately screened to prevent debris blockage and fish mortality.
PC-9.07	Where logs are required for use in stabilizing shoreline approaches, they are clean and securely bound together, and they are removed either before or immediately following work or before the spring freshet.
PC-9.08	When the crossing season is over and where it is safe to do so, create a v-notch in the center of the ice bridge to facilitate water flow and to

Stream crossings (PC-9)	
	prevent blocking fish passage, channel erosion and flooding. Compacted snow and all crossing materials will be removed prior to the spring freshet.
PC-9.09	No logs or woody debris are to be left within the water body or on the banks or shoreline where they can wash back into the water body.
PC-9.10	Grading of the stream banks for the approaches should not occur. Establish a single entry and exit. If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
PC-9.11	Fording should occur only after authorization from an MH environmental Officer/Inspector. Machinery fording a flowing watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and is to occur only if an existing crossing at another location is not available or practical to use. One-time fording will be timed to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows and will not be permitted to occur in areas that are known fish spawning sites.
PC-9.12	Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding. The channel width at the crossing site should be no greater than 5 m when measured within the ordinary high-water mark.
PC-9.13	In watercourses where mussel species of conservation concern are known to occur, watercourse crossings may occur by boat or barge, or during winter (i.e., under frozen conditions) to prevent mortality of the mussels.
PC-9.14	The contractor is responsible for ensuring adequate ice conditions and thickness to safely support the bearing weight of all vehicles and equipment that will be utilizing the ice bridge crossing. Signage shall be posted at each end of any ice bridges indicating the ice thickness and the date it was last measured

Stream crossings (PC-9)	
PC-9.15	Cleared trees and woody debris will not be pushed into (or adjacent) to standing timber, or within the high-water mark of wetlands or waterbodies.
PC-9.16	The contractor requires approval from a Manitoba Hydro Environmental Officer prior to withdrawing water from any waterbody. The withdrawal of water from a waterbody will not reduce water levels to the point of exceeding that waterbody's ability to sustain an active beaver lodge.
PC-9.17	All water related equipment and other items for use in or adjacent to water bodies must free of Aquatic Invasive Species at all life stages. Work will be carried out in accordance with The Manitoba AIS Regulation (173/2015).

Stripping (PA-10)	
ID	Mitigation
PA-10.01	Construction areas containing soil with high silt content, artesian springs or areas of previous erosion will receive special erosion and sediment control techniques in accordance with the Erosion and Sediment Control Plan.
PA-10.02	Erosion and sediment control measures will be put in place prior to stripping in accordance with the Erosion and Sediment Control Plan as required.
PA-10.03	In areas of known salinity, excavated or stripped soil will be stored on liners or in designated areas were possible.

Stripping (PA-10)	
PA-10.04	Mineral topsoils and surficial organic materials should be stripped separately from subsoils, segregated, and stockpiled for later use in backfilling, contouring and rehabilitation. When soils are backfilled, they are to be replaced in the same order from which they were removed.
PA-10.05	Stockpiled materials from stripping will not block natural drainage patterns.
PA-10.06	Stripping in northern Manitoba will normally be carried out under frozen ground conditions during established timing windows to minimize rutting and erosion.
PA-10.07	Stripping will not be permitted within established buffer zones and setback distances from waterbodies except where approved in work permits, authorizations or contract specifications.
PA-10.08	The contractor will stabilize construction areas requiring extensive stripping as soon as possible to minimize erosion.

Transmission towers and conductors (PC-10)	
ID	Mitigation
PC-10.01	Areas where soil was disturbed will be stabilized and re-vegetated with low growth vegetation as soon as practical.
PC-10.02	During tower foundation excavation organic material/topsoil that was stripped and stockpiled will be spread back evenly over the surface of the disturbed area to encourage site re-vegetation.
PC-10.03	Excavations required for tower installations will be restricted to the minimum required footprint.

Transmission towers and conductors (PC-10)	
PC-10.04	The contract administrator will issue a stop work order if extreme wet weather conditions result in soil damage from rutting and erosion is resulting in sedimentation of adjacent waterbodies.
PC-10.05	Transmission towers will not be located within established buffer zones and setback distances from waterbodies, wetlands, and riparian areas, where possible. The practicality and feasibility of the works will be at the determination of the Resident Engineer/Manager.
PC-10.06	Transmission tower construction will not be permitted within established buffer zones for bird nesting and rearing during established timing windows.
PC-10.07	Transport of equipment and materials for tower construction will be along pre-defined access corridors.
PC-10.08	Transmission towers will not be located within established buffer zones and setback distances from sensitive sites including protected areas and heritage resources whenever feasible.

Treated Wood (EI-8)	
ID	Mitigation
EI-8.01	Salvage and disposal of treated wood products will be in accordance with Manitoba Hydro guidelines.
EI-8.02	Small quantities of surplus or unwanted treated wood products may be disposed of as domestic waste products at licensed or approved waste management facility sites.
EI-8.03	Treated wood products will not be used indoors and will not be burned.

Treated Wood (EI-8)	
EI-8.04	Treated wood will be delivered to project locations or construction sites on an as required basis to reduce storage time in the field.

Vehicle and equipment maintenance (EI-9)	
ID	Mitigation
EI-9.01	An Emergency Preparedness and Response Plan and spill control and clean-up equipment will be provided at all designated vehicle, equipment, and machinery maintenance areas.
EI-9.02	Vehicle, equipment, and machinery maintenance repair procedures will include containing waste fluids and will use preventative measures such as spill trays and tarps where required.
EI-9.03	Unnecessary idling of vehicles, equipment and machinery will be avoided to the extent practical.
EI-9.04	Vehicle, equipment, and machinery maintenance, washing and repairs will be carried out in designated areas located at least 100 m from the ordinary high-water mark of a waterbody, riparian area or wetland.
EI-9.05	Vehicle, equipment, and machinery operators will perform a daily inspection for fuel, oil and fluid leaks and will immediately shutdown and repair any leaks found. All machinery working near watercourses will be kept clean and free of leaks.
EI-9.06	Vehicles transporting dangerous goods or hazardous products will display required placards and labeling in accordance with provincial legislation.
EI-9.07	Vehicles, equipment, and machinery must arrive on site in clean condition free of fluid leaks and weed seeds.
EI-9.08	Vehicles, equipment, and machinery that carry fuel, hydraulic oil and other petroleum products will also carry spill control and clean-up equipment and materials.

Waste management (EI-10)	
ID	Mitigation
EI-10.01	A Waste and Recycling Management Plan will be developed, prior to construction and updated annually.
EI-10.02	Animal-proof garbage containers with regular removal of food waste to approved waste management facility grounds will be used to manage food waste.
EI-10.03	Construction sites will be always kept tidy, and bins will be provided wherever solid wastes are generated and in accordance with the Litter Regulation (MR 92/88R).
EI-10.04	Indiscriminate burning, dumping, littering or abandonment is not permitted.
EI-10.05	Kitchen wastes will be stored in closed containers to minimize wildlife interactions.
EI-10.06	Waste materials will be collected and transported to a licensed or approved waste management facility in accordance with the Waste and Recycling Management Plan.
EI-10.07	Waste materials remaining at snow disposal sites after melting will be disposed of at a licensed or approved landfill.
EI-10.08	The contractor's environmental representative will make regular inspections of waste collection, storage, and handling at construction sites to ensure that environmental protection measures are implemented and effective.
EI-10.09	The Contractor must demonstrate that sufficient capacity exists at waste disposal grounds by obtaining approval from the operator prior to use of that facility.

Wastewater (EI-12)	
ID	Mitigation
EI-12.01	All sewage haulers will be registered with provincial environmental regulator. A copy of the hauler registration will be provided to MH environmental officer / inspector upon request.
EI-12.02	Wastewater holding tanks will be installed as per provincial legislation and regulation and a minimum of 100 m from the ordinary high-water mark of any waterbody.
EI-12.03	Wastewater will be removed from holding tanks when they are no more than 90% full by a registered sewage hauler and disposed of at a licensed wastewater treatment facility.
EI-12.04	Sewage and grey water will be collected in holding tanks and chemical toilets.

Wetlands (EC-8)	
ID	Mitigation
EC-8.01	Clearing wastes and other construction debris or waste will not be placed in wetland areas. Existing logs, snags and wood debris will be left in place.
EC-8.02	Wetland areas will be prescribed riparian buffers in site specific mitigation tables in which understory low-growth vegetation will be maintained where possible. Environmental protection measures for working in and around wetlands will be reviewed with the contractor and employees prior to commencement of any construction activities.
EC-8.03	Natural vegetated buffer areas of 30 m will be established around wetlands and riparian zones will be maintained to the extent possible.
EC-8.04	Disturbance of wetlands will only be carried out under frozen ground conditions. If frozen ground conditions do not exist alternate mitigation measures such as construction matting may be used to minimize surface damage, rutting and erosion if approved by MH environmental officer / inspector.
EC-8.05	Cleared trees and woody debris will not be pushed into (or adjacent) to standing timber, or within the high-water mark of wetlands or waterbodies

Wildlife protection (EC-9)	
ID	Mitigation
EC-9.01	Any injured or killed wildlife encountered on the project site and associated access roads/trails (e.g., vehicle collision) will be reported to Manitoba Hydro and/or the provincial environmental regulator, if required.
EC-9.02	Bird Diverters or aerial markers may be installed in high bird traffic areas.
EC-9.03	Boundaries of important wildlife habitats (e.g., mineral licks and stick nests) will be identified in mapsheets and flagged prior to clearing.
EC-9.04	Clearing and construction activities that involve the removal of vegetation (e.g., tree clearing, grubbing, brushing, and mowing) will be avoided during bird breeding season (in Manitoba generally April 1-August 31) to the extent possible. These dates (see Appendix C) are a general guide as bird breeding season dates vary throughout the Manitoba. If clearing within the sensitive time period, further mitigation and approvals will be required.
EC-9.06	Animal-proof garbage containers with regular removal of food waste to approved waste management facility will be used to manage food waste.
EC-9.07	Hunting and harvesting of wildlife by project staff will not be permitted while working on the project sites.
EC-9.09	If animal traps or bait sites are encountered within the project footprint they are to be removed for the safety of workers and construction equipment. If found on private land, the landowner will be contacted and have the materials returned to them. If found on Crown land the materials will be released to the provincial environmental regulator.
EC-9.10	Prior to seeking authorization for removal of a Muskrat house, Beaver Dam or Lodge from the provincial environmental regulator documentation of reasonable attempts to trap resident beavers/muskrat

Wildlife protection (EC-9)	
	must be provided. Attempts to trap resident Beavers/muskrats must be undertaken by a licensed trapper or person with a valid Wild Animal Kill Permit.
EC-9.11	No firearms will be permitted at construction sites.
EC-9.12	Orientation for contractor and Manitoba Hydro employees will include awareness of environmental protection measures for wildlife and wildlife habitat.
EC-9.13	Problem wildlife will be reported immediately to the provincial environmental regulator.
EC-9.15	Trees containing large nests of sticks and areas where active animal dens or burrows are encountered will be left undisturbed until unoccupied. Artificial structures for nesting may be provided if unoccupied nests must be removed.
EC-9.16	Vehicles will not exceed posted speed limits and wildlife warning signs may be installed in high density areas and at known crossings because of wildlife monitoring.
EC-9.18	Wildlife and wildlife habitat will be protected in accordance with provincial and federal legislation and provincial and federal guidelines.
EC-9.19	Wildlife will not be fed, befriended, or harassed.
EC-9.22	New by-pass trails and access routes will be sited where possible to utilize existing natural terrain features and existing vegetation to minimize line of site.
EC-9.23	New occurrences of any listed rare, threatened, or endangered species will be documented and provided to the provincial environmental regulator.

Wildlife protection (EC-9)	
EC-9.24	In watercourses where mussel species of conservation concern are known to occur, watercourse crossings may occur by boat or barge, or during winter (i.e., under frozen conditions) to prevent mortality of the mussels.
EC-9.25	Muskrat house, Beaver Dam or Lodge removal requires consultation with and the Department of Fisheries and Oceans who may require additional authorizations. House, Dam or Lodge removal may require heavy equipment or explosives which would require an additional Work Permit from the provincial environmental regulator when located on Crown Land.
EC-9.26	The contractor requires approval from a Manitoba Hydro Environmental Officer prior to withdrawing water from any waterbody. The withdrawal of water from a waterbody will not reduce water levels to the point of exceeding that waterbody's ability to sustain an active beaver lodge
EC-9.27	Outside the bird breeding season (generally between September 1 and March 31), if a large stick nest or large woodpecker nest cavity is found during construction or maintenance activities (e.g., clearing, pole replacement), the nest must not be disturbed, and Manitoba Hydro must be contacted immediately for further guidance on how to proceed. Some nests such as large stick nests (raptors and herons) and pileated woodpecker nests are protected year-round.

6.0 References

DFO. 1995. Freshwater intake end-of-pipe fish screen guidelines. Department of Fisheries and Oceans. Published by: Communications Directorate, Department of Fisheries and Oceans, Ottawa, Ontario.

DFO and MNR. 1996. Manitoba stream crossing guidelines for the protection of fish and fish habitat. Fisheries and Oceans Canada and Manitoba Natural Resources.

MWS. 2011. Manitoba water quality standards, objectives, and guidelines. Manitoba Water Stewardship Report 2011-01. Water Science and Management Branch, Manitoba Water Stewardship.

PART 2

Construction environmental protection plan

Mapbook

Manitoba Hydro

R44H Transmission Project
Construction Environmental Protection Mapbook

Version: Draft

Date: December 20, 2023

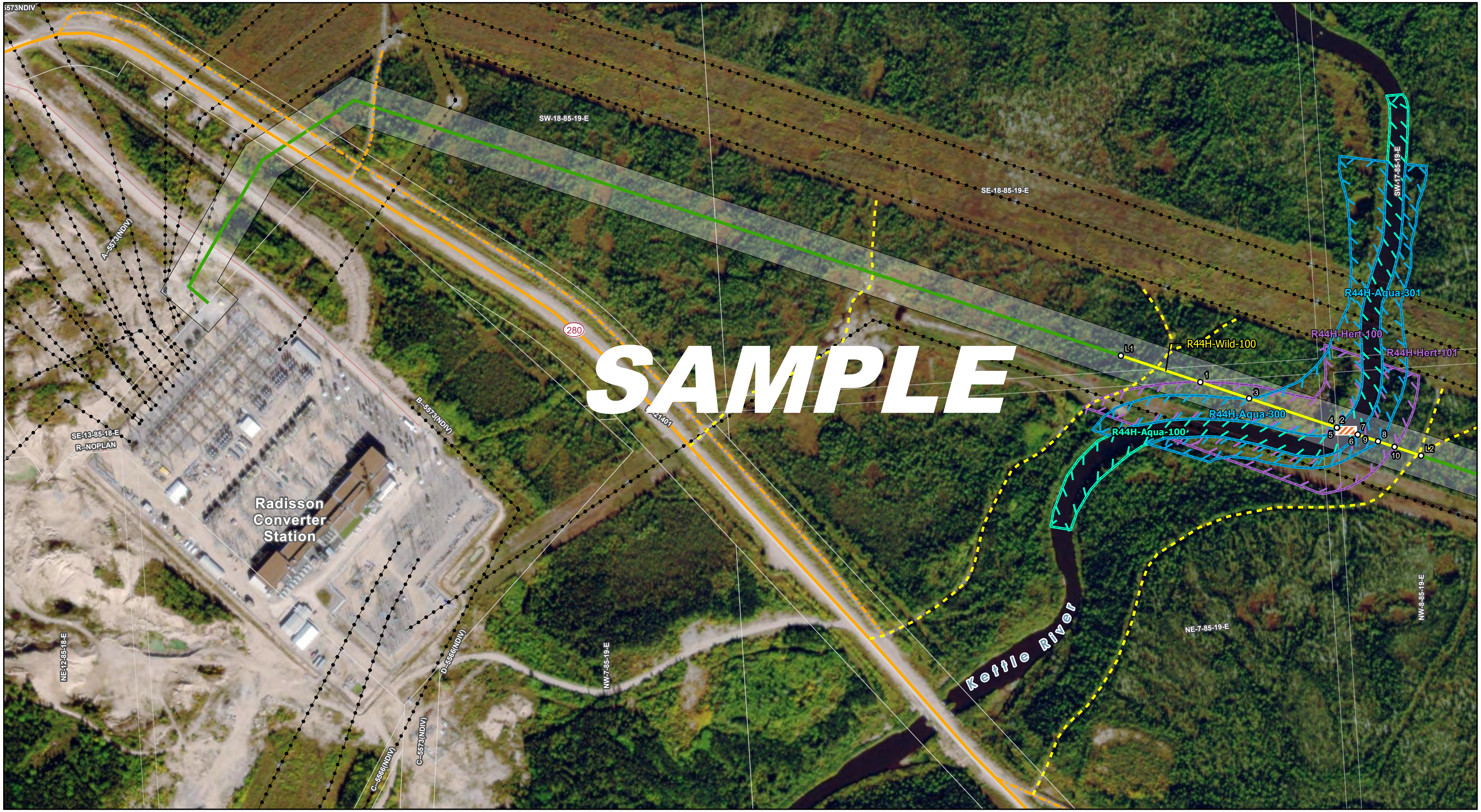
NOTICE: Access routes are approximate. Please refer to Access Management Plan for latest approved access routes.

Manitoba Hydro

Document Owner:
Licensing and Environmental Assessment Department
Transmission Planning and Design Division
Transmission Business Unit
Manitoba Hydro

Version Draft
List of Revisions - R44H Construction Environmental Protection Plan Mapbook

Number	Nature of Revision	Map/Table #	Revised By	Date
Draft	Added ESS points, lines and polygons	Maps 1-25	Manitoba Hydro	20231221



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Manitoba Hydro

Coordinate System: UTM Zone 14N NAD83
Data Source: MB Hydro, ProvMB, NRCAN
Date Created: December 20 2023
Version: Draft

0 62.5 125 250
Metres
1:5,000

Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features
Wildlife
- Birds and Habitat

Heritage
- Archaeological

Water
- Water Crossing
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 1

SAMPLE MITIGATION TABLE (See KEY below for additional Information)

ESS Group: Wetlands 1

**Features represented as polygons* 2

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
Aqua-301	Wetland	21 to 22	E-671537 N-5525458	E-671580 N-5525456	43

3

Potential Effects: 4
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID #205): 5

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction matting will be used to protect the area from rutting and exposure to mineral soil during
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Remove trees by low-disturbance methods
- The application of herbicides is prohibited
- Maintain shrub and herbaceous vegetation to the extent possible

KEY to Sample Mitigation Table

1 ESS Group classification of Environmentally Sensitive Sites (ESS) which are shown on the map
2 Notation indicates the geometry type of the ESS feature
3 ESS location summary; includes the following fields:
- ESS ID - Site specific ID assigned to each ESS according to naming convention **(See ESS naming convention table)**
- ESS Name - Brief name/description of ESS
- Site - identification numbers for the start and stop site points of ESS intersection with the ROW (lines and polygons only)
- Easting/Northing - UTM Zone 14 coordinates of ESS location (for points only)
- Start/Stop - UTM Zone 14 coordinates of the start/stop identification numbers listed in the "Location" field (lines and polygons only)
- Distance – length of ESS feature in meters

4 Potential effects identified for ESS listed in the ESS Location Summary table
5 Mitigation measures identified for a specific site. The ID number indicates a specific combination of mitigation measures
6 Map on which ESS listed in the ESS Location Summary tables are illustrated

ESS NAMING CONVENTION

CATEGORY	GROUP (Number Series Representing Group)	ESS ID (Category-Group Number)
Access	Recreation Trail (100)	RecUse-100
Ecosystem	Habitat (100)	Eco-100
	Research (200)	Eco-200
	Species of Concern (300)	Eco-300
	Invasive Species (400)	Eco-400
	Traditional Use (500)	Eco-500
Heritage	Archaeological (100)	Hert-100
	Cultural (200)	Hert-200
	Historic (300)	Hert-300
Land Use	Conservation (100)	LUse-100
	Crown Land Encumbrance (200)	LUse-200
	Recreation (300)	LUse-300
	Residential (400)	LUse-400
	Community (500)	LUse-500
	Infrastructure (600)	LUse-600
Resource Use	Agriculture (100)	RUse-100
	Food/Medicinal (200)	RUse-200
	Forestry (300)	RUse-300
	Hunting/Fishing (400)	RUse-400
	Trapping (500)	RUse-500
Soils and Terrain	Permafrost (100-200)	Soils-100
	Erosion (300)	Soils-300
	Terrain (400)	Soils-400
Water	Water Crossing (100)	Aqua-100
	Groundwater (200)	Aqua-200
	Wetlands (300)	Aqua-300
	Aquatic Invasive Species (400)	Aqua-400
Wildlife	Birds and Habitat (100)	Wild-100
	Mammal and Habitat (200)	Wild-200
	Reptiles/Amphibians and Habitat (300)	Wild-300
	Line of Sight Buffer (400)	Wild-400

6 Map Number: 7

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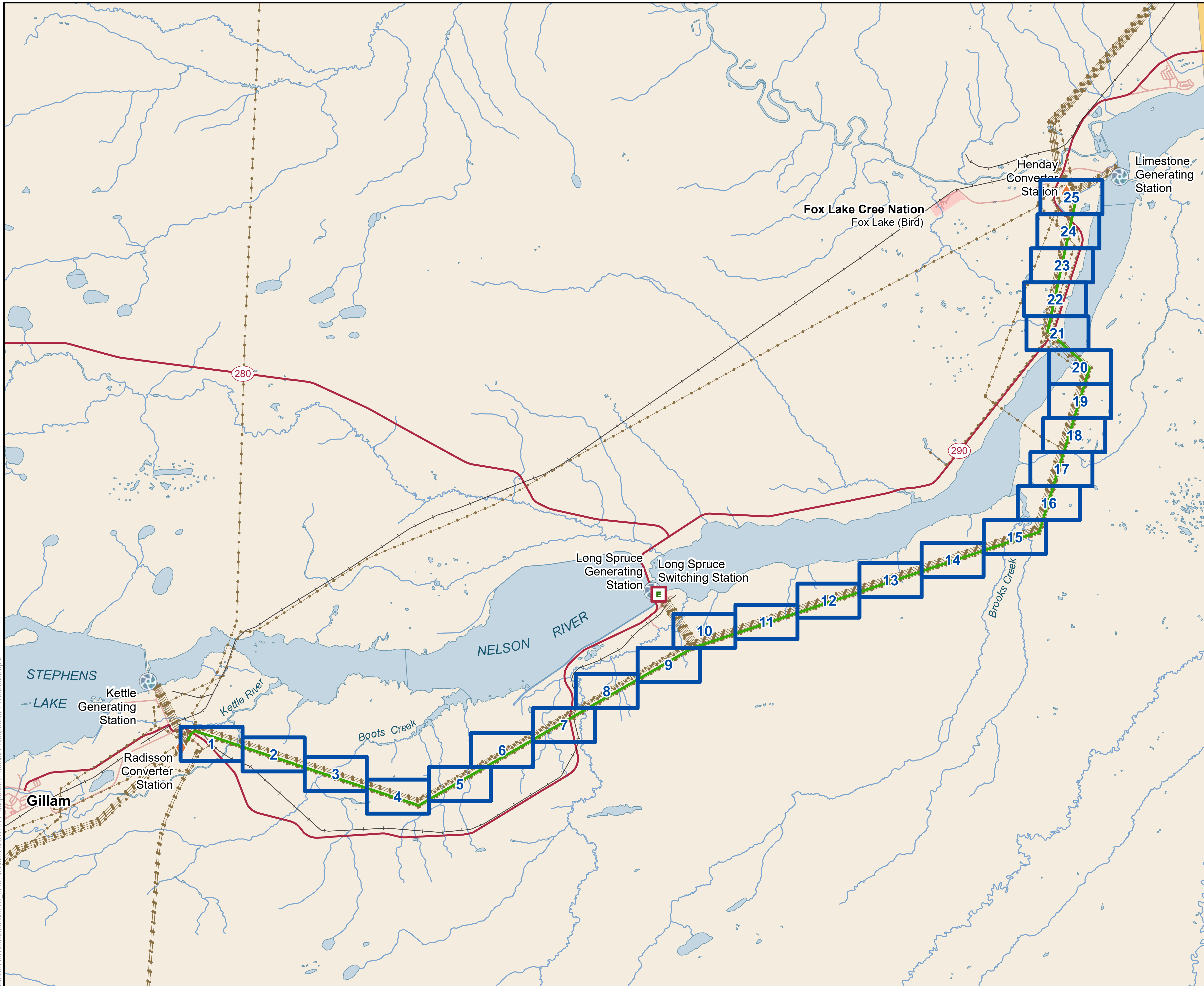

Manitoba Hydro

Bipole Modernization Project
R44H Transmission Line

Project Infrastructure

Final Preferred Route

Map Tile Index - 1:5,000

Map Series Tile

Existing Infrastructure

Converter Station

Electric Station

Generating Station

Existing ≥69kV Transmission Line

Landbase

Community

Railway

Provincial Highway

Provincial Road

Local Road

First Nation Lands

Ecological Reserve

Wildlife Management Area

Provincial Park

Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: November 14, 2023

N

0 1 2 3 4 Kilometres

0 0.5 1 2 Miles

1:120,000

Index of Map Series
Environmental Protection Plan

Draft: For Discussion Purposes Only

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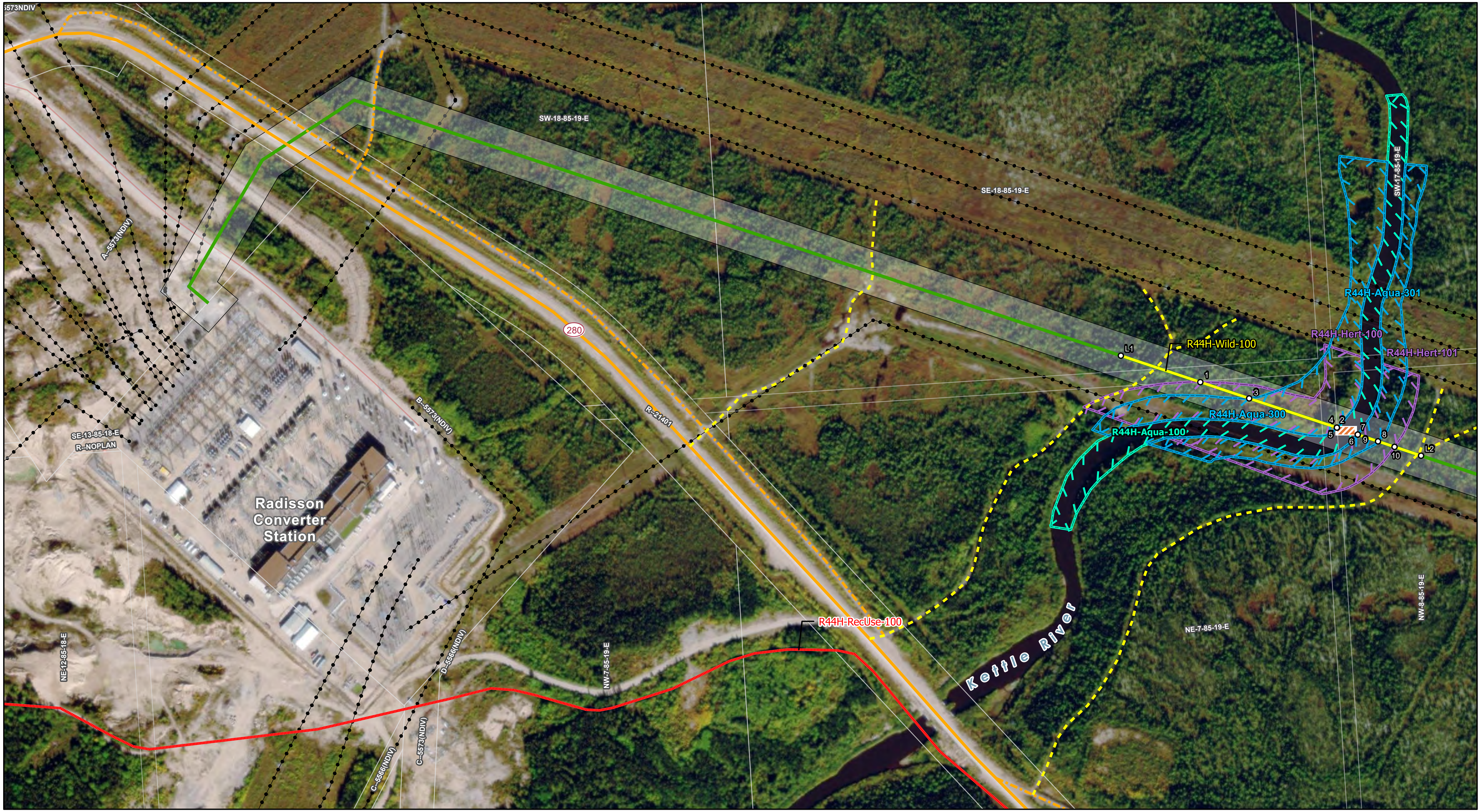

Coordinate System: UTM Zone 14N NAD83
Data Source: MB Hydro, ProvMB, NRCAN
Date Created: December 21, 2023
Version: Draft

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Metres
1:5,000

Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

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- Transmission Line

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- Bypass Trail

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ESS Features

Access
- Recreation Trail

Wildlife
- Birds and Habitat

Heritage
- Archaeological

Water
- Water Crossing
- Wetland

Manitoba Hydro

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 1

ESS Group: Archaeological

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Hert-100	Kettle River Crossing	1 to 2	E-772126 N-6255092	E-772311 N-6255031	195
R44H-Hert-101	Kettle River Crossing	9 to 10	E-772340 N-6255021	E-772390 N-6255004	52

Potential Effects:
Higher potential for disturbance of cultural and heritage resources in this area

Specific Mitigation (ID# 302):

- Workers to be made aware of increased potential for discovery of cultural heritage resources
- Carry out construction activities using methods that minimize surface damage, rutting and erosion. Construction matting may be required to protect the area from rutting and exposure to soil
- In the event of a cultural heritage resource discovery, immediately stop work in the area, establish appropriately sized buffer (min 30m), and notify Manitoba Hydro to arrange for further assessment of the site by the project archaeologist

ESS Group: Birds and Habitat

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Wild-100	Bird diverter installation area	L1 to L2	E-772018 N-6255128	E-772426 N-6254993	429

Potential Effects:
Higher risk of wire collision, Risk of wire collision is localized to the right-of-way

Specific Mitigation (ID# 827):

- Bird diverters will be installed in a manner to maximize visibility
- Install bird diverter with spacing as per Transmission Line Design specifications for these spans
- Install bird diverters in a timely manner after conductor stringing.

ESS Group: Water Crossing

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-100	Kettle River Crossing	5 to 6	E-772311 N-6255031	E-772340 N-6255021	29

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Wetland

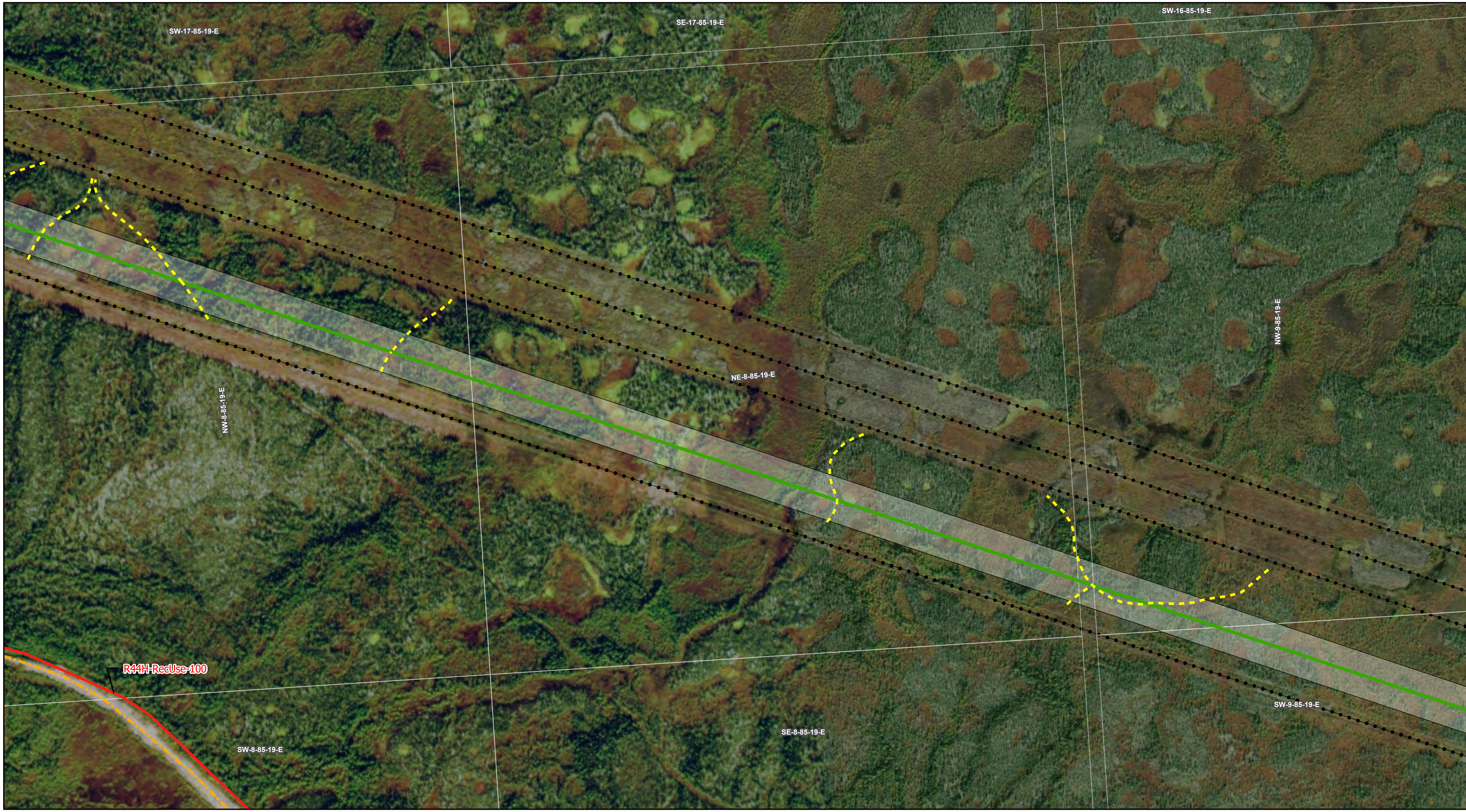
**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-300	Wetland	3 to 4	E-772192 N-6255070	E-772311 N-6255031	125
R44H-Aqua-301	Wetland	7 to 8	E-772340 N-6255021	E-772367 N-6255012	29

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.



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Manitoba Hydro

Coordinate System: UTM Zone 14N NAD83
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Version: Draft

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Metres
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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features
Access
- Recreation Trail

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 2

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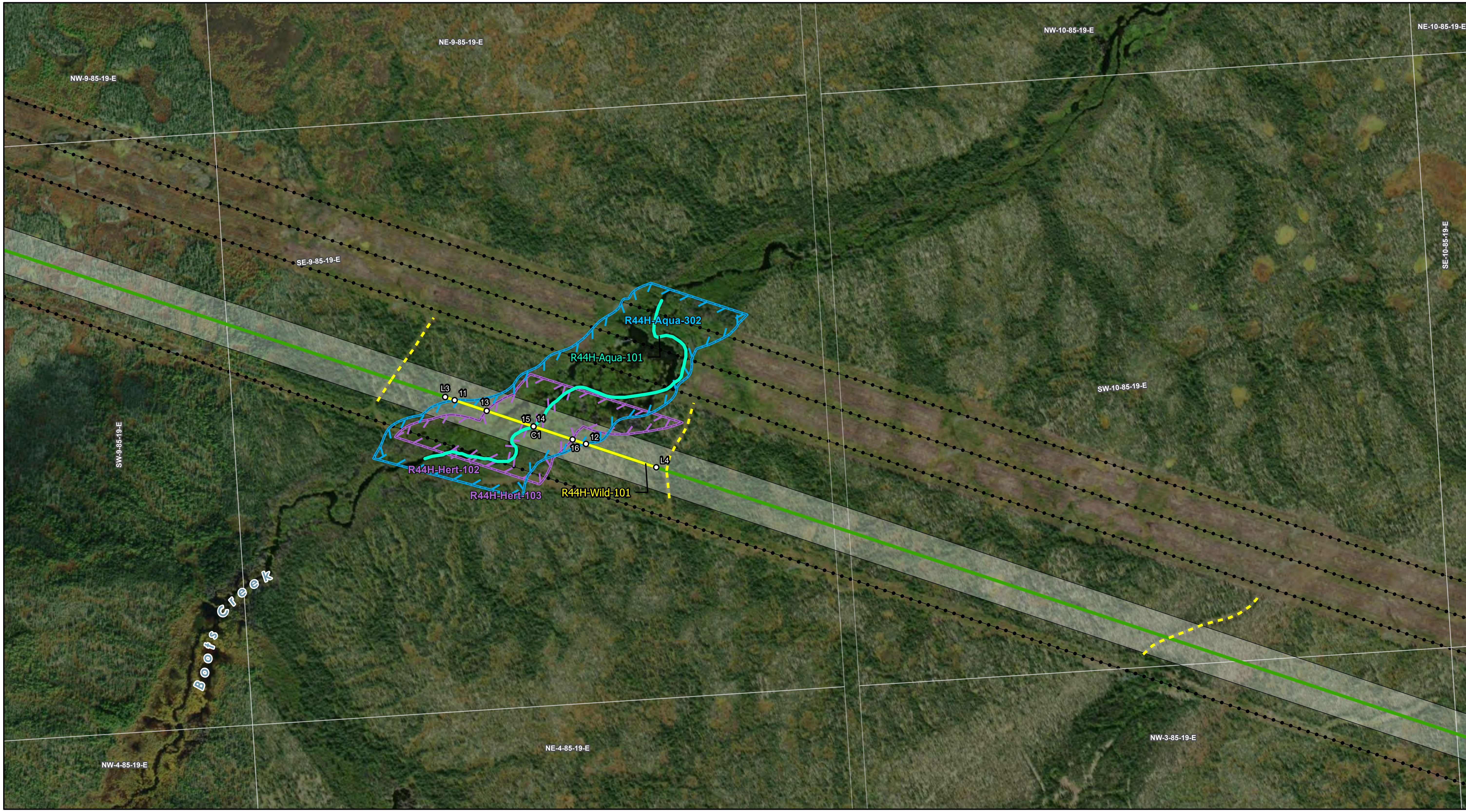

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Metres
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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features
Wildlife
- Birds and Habitat

Water
- Water Crossing

Heritage
- Archaeological

Water
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 3

ESS Group: Archaeological

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Hert-102	Boots Creek Crossing	13 to 14	E-775157 N-6254082	E-775221 N-6254061	66
R44H-Hert-103	Boots Creek Crossing	15 to 16	E-775221 N-6254061	E-775274 N-6254044	55

Potential Effects:
Higher potential for disturbance of cultural and heritage resources in this area

Specific Mitigation (ID# 302):

- Workers to be made aware of increased potential for discovery of cultural heritage resources
- Carry out construction activities using methods that minimize surface damage, rutting and erosion. Construction matting may be required to protect the area from rutting and exposure to soil
- In the event of a cultural heritage resource discovery, immediately stop work in the area, establish appropriately sized buffer (min 30m), and notify Manitoba Hydro to arrange for further assessment of the site by the project archaeologist

ESS Group: Birds and Habitat

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Wild-101	Bird diverter installation area	L3 to L4	E-775101 N-6254101	E-775387 N-6254006	301

Potential Effects:
Higher risk of wire collision, Risk of wire collision is localized to the right-of-way

Specific Mitigation (ID# 827):

- Bird diverters will be installed in a manner to maximize visibility
- Install bird diverter with spacing as per Transmission Line Design specifications for these spans
- Install bird diverters in a timely manner after conductor stringing.

ESS Group: Water Crossing

**Features represented as lines*

ESS ID	ESS Name	Site	Location
R44H-Aqua-101	Boots Creek Crossing	C1	E-775221 N-6254061

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Wetland

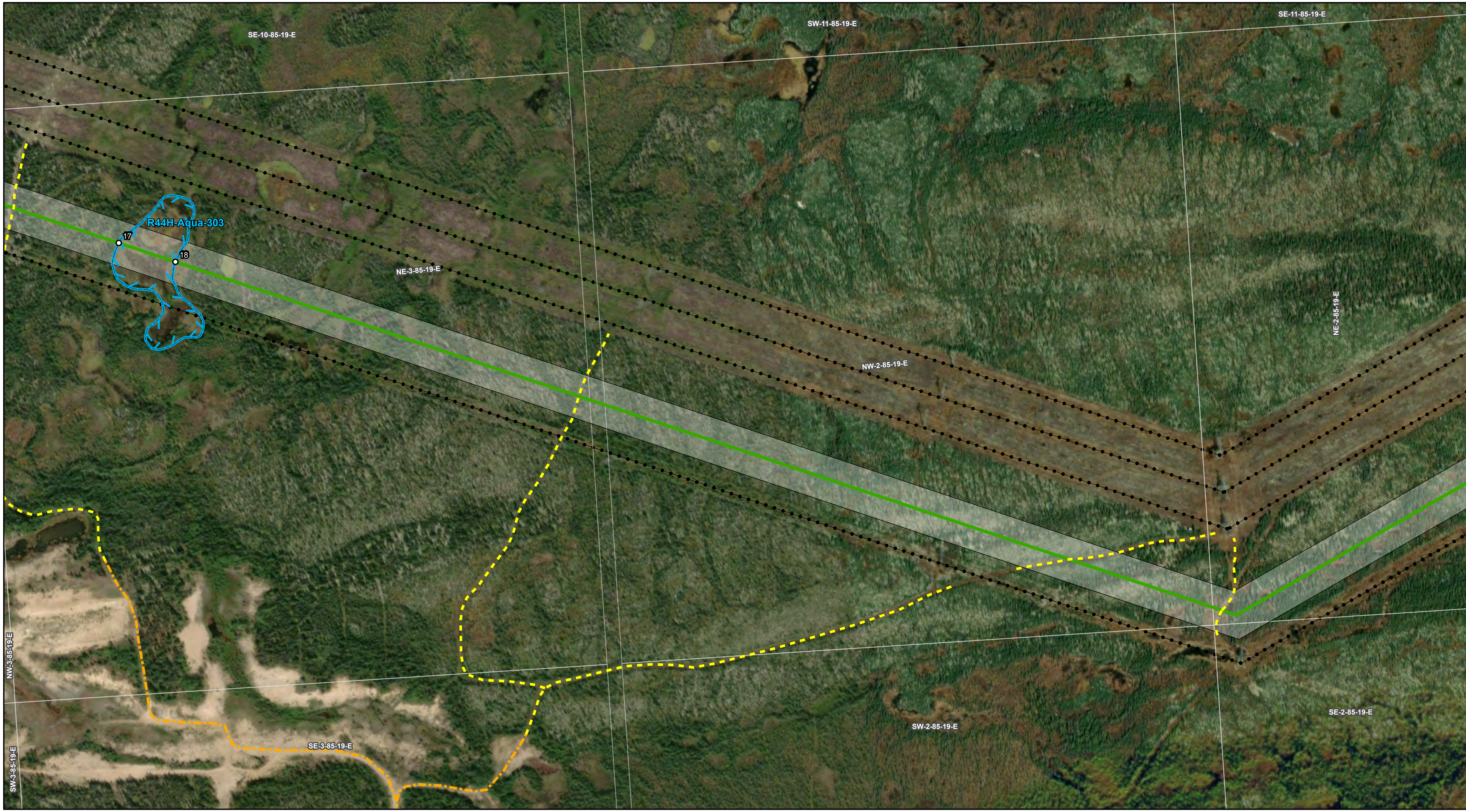
**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-302	Wetland	11 to 12	E-775114 N-6254097	E-775292 N-6254037	187

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.



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Manitoba Hydro

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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features
Water
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 4

ESS Group: Wetland

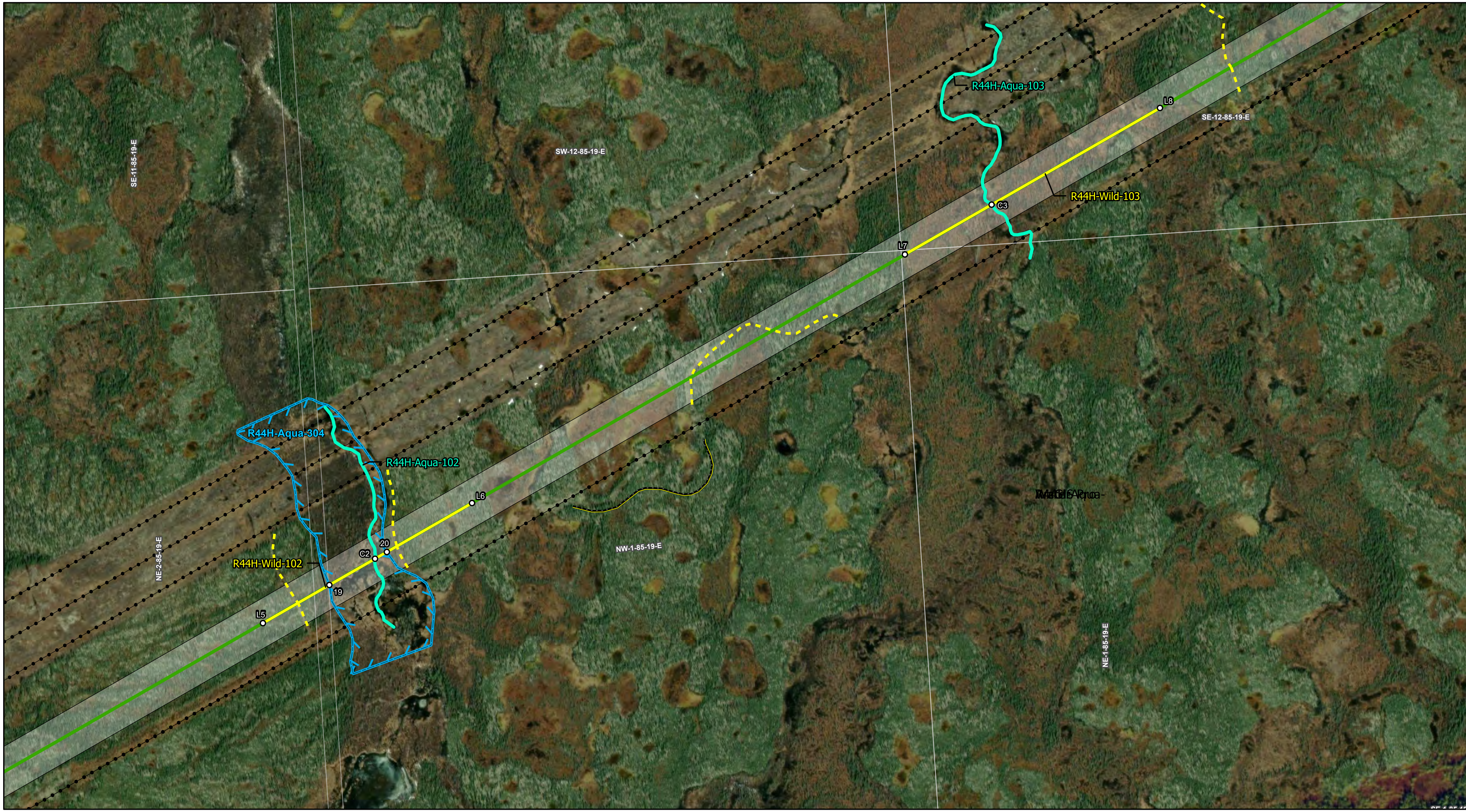
**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-303	Wetland	17 to 18	E-776659 N-6253582	E-776736 N-6253556	81

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.



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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features
Wildlife
- Birds and Habitat

Water
- Water Crossing

Water
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 5

ESS Group: Birds and Habitat

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Wild-103	Bird diverter installation area	L7 to L8	E-779724 N-6253966	E-780070 N-6254165	399
R44H-Wild-102	Bird diverter installation area	L5 to L6	E-778853 N-6253466	E-779136 N-6253629	327

Potential Effects:
Higher risk of wire collision, Risk of wire collision is localized to the right-of-way

Specific Mitigation (ID# 827):

- Bird diverters will be installed in a manner to maximize visibility
- Install bird diverter with spacing as per Transmission Line Design specifications for these spans
- Install bird diverters in a timely manner after conductor stringing.

ESS Group: Water Crossing

**Features represented as lines*

ESS ID	ESS Name	Site	Location
R44H-Aqua-103	Unnamed Tributary of Nelson River	C3	E-779841 N-6254034
R44H-Aqua-102	Unnamed Tributary of Nelson River	C2	E-779005 N-6253553

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Wetland

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-304	Wetland	19 to 20	E-778943 N-6253518	E-779021 N-6253562	89

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.

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Manitoba Hydro

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Metres
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Land Base
Highway
Major Road
Local Road
Railway (Operational)
Railway (Discontinued)
First Nation
Parcel Fabric
Rural Municipality

Existing Infrastructure
Transmission Line

Project Infrastructure
Final Preferred Route
New Right of Way

Sensitive Sites
Point Features
Linear Features
Area Features

Points of Access
No Crossing
Existing Gravel Road
Existing Gravel/Dirt Road
Field Access
New Trail
Restricted Access
Load Restriction
Bypass Trail
*Some road names have not been verified

ESS Features

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 6

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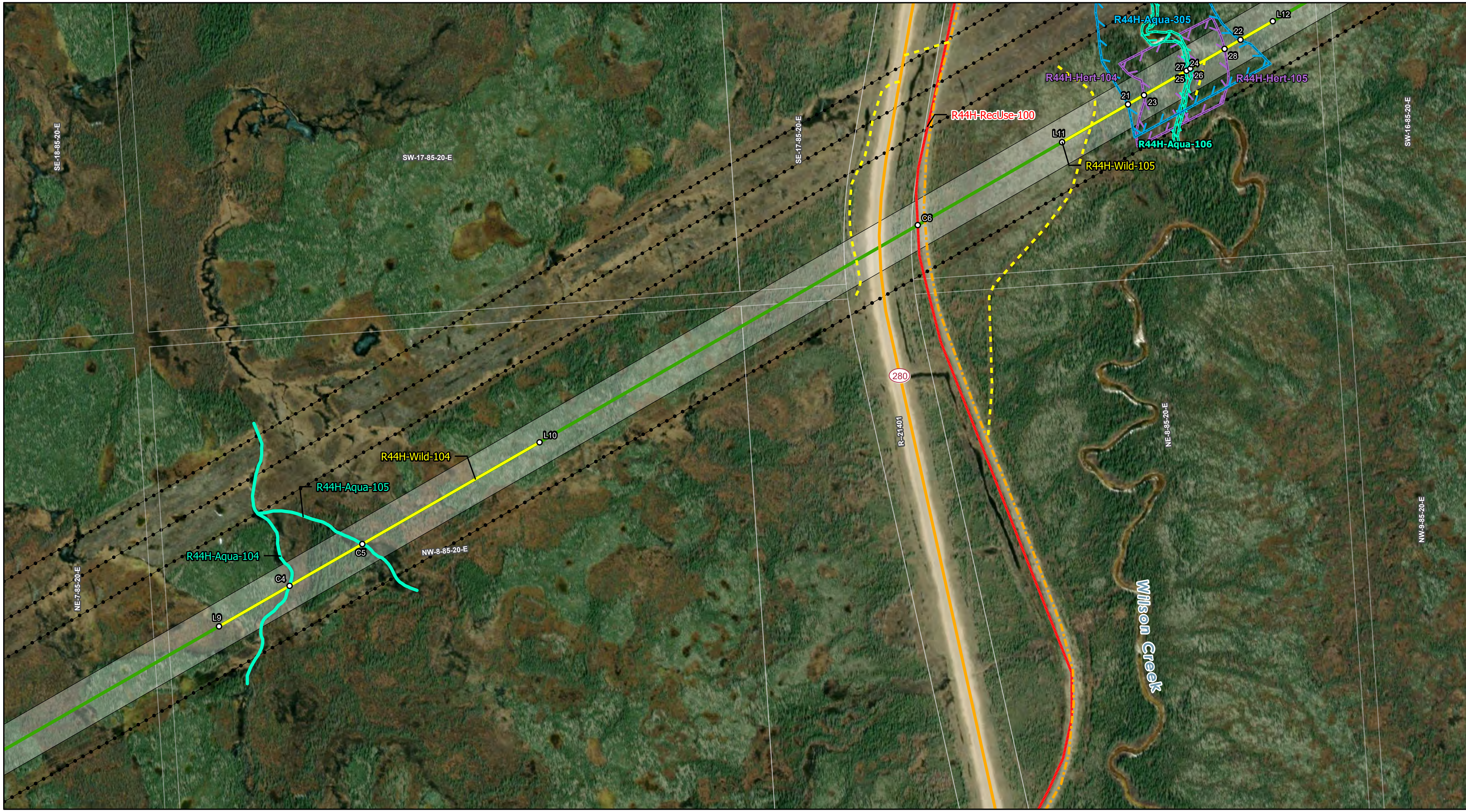

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Metres
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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features

Access
- Recreation Trail

Wildlife
- Birds and Habitat

Water
- Water Crossing

Heritage
- Archaeological

Water
- Water Crossing
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 7

ESS Group: Archaeological

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Hert-105	Wilson Creek Crossing	27 to 28	E-783474 N-6256122	E-783520 N-6256148	53
R44H-Hert-104	Wilson Creek Crossing	23 to 24	E-783411 N-6256086	E-783469 N-6256119	66

Potential Effects:
Higher potential for disturbance of cultural and heritage resources in this area

Specific Mitigation (ID# 302):

- Workers to be made aware of increased potential for discovery of cultural heritage resources
- Carry out construction activities using methods that minimize surface damage, rutting and erosion. Construction matting may be required to protect the area from rutting and exposure to soil
- In the event of a cultural heritage resource discovery, immediately stop work in the area, establish appropriately sized buffer (min 30m), and notify Manitoba Hydro to arrange for further assessment of the site by the project archaeologist

ESS Group: Birds and Habitat

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Wild-105	Bird diverter installation area	L11 to L12	E-783300 N-6256022	E-783586 N-6256186	329
R44H-Wild-104	Bird diverter installation area	L9 to L10	E-782591 N-6255614	E-782156 N-6255364	501

Potential Effects:
Higher risk of wire collision, Risk of wire collision is localized to the right-of-way

Specific Mitigation (ID# 827):

- Bird diverters will be installed in a manner to maximize visibility
- Install bird diverter with spacing as per Transmission Line Design specifications for these spans
- Install bird diverters in a timely manner after conductor stringing.

ESS Group: Intersection

**Features represented as lines*

ESS ID	ESS Name	Site	Location
R44H-RecUse-100	Snoman Trail	C6	E-783104 N-6255909

Potential Effects:
Potential interference with trail users; safety issues

Specific Mitigation (ID# 103):

- Trail closures are anticipated during construction phase but will be planned and avoided to the extent possible
- Communication about trail closures and planned impacts and mitigations will occur prior and during construction with local trail users (ie. Snoman, etc)
- Existing vegetation will be retained to the extent possible and disturbed areas will be rehabilitated &/or revegetated in a timely manner to the pre-existing or improved condition
- If damages occur, repairs must be completed to a pre-existing or improved condition in a timely manner

ESS Group: Water Crossing

**Features represented as lines*

ESS ID	ESS Name	Site	Location
R44H-Aqua-105	Unnamed Tributary of Nelson River	C5	E-782351 N-6255476
R44H-Aqua-104	Unnamed Tributary of Nelson River	C4	E-782252 N-6255419

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Water Crossing

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-106	Wilson Creek Crossing	25 to 26	E-783469 N-6256119	E-783474 N-6256122	6

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Wetland

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-305	Wetland	21 to 22	E-783389 N-6256073	E-783542 N-6256161	176

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.

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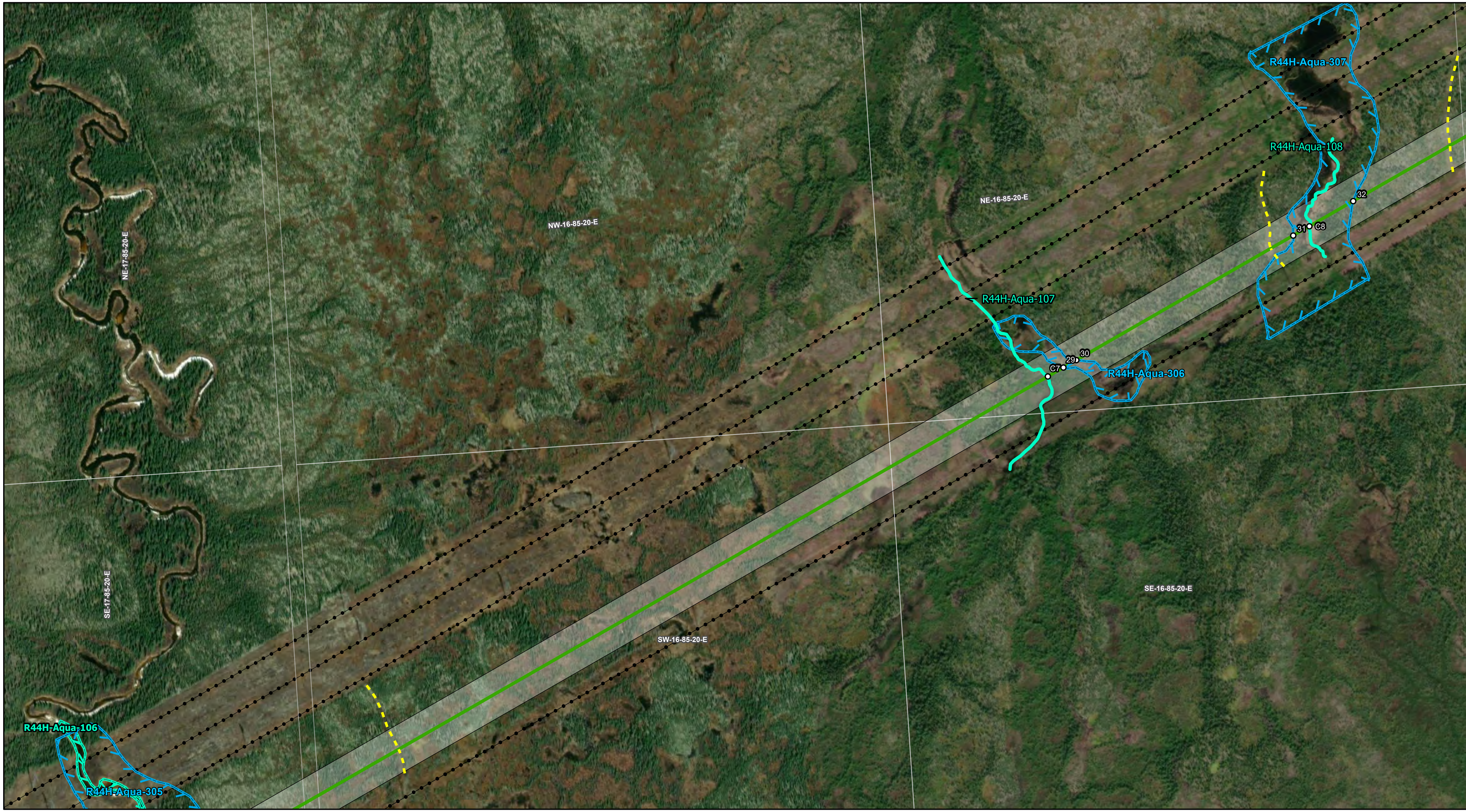

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Manitoba Hydro

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Metres
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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features
Water
- Water Crossing

Water
- Water Crossing
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 8

ESS Group: Water Crossing

**Features represented as lines*

ESS ID	ESS Name	Site	Location
R44H-Aqua-108	Unnamed Tributary of Nelson River	C8	E-785007 N-6257002
R44H-Aqua-107	Unnamed Tributary of Nelson River	C7	E-784652 N-6256799

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Wetland

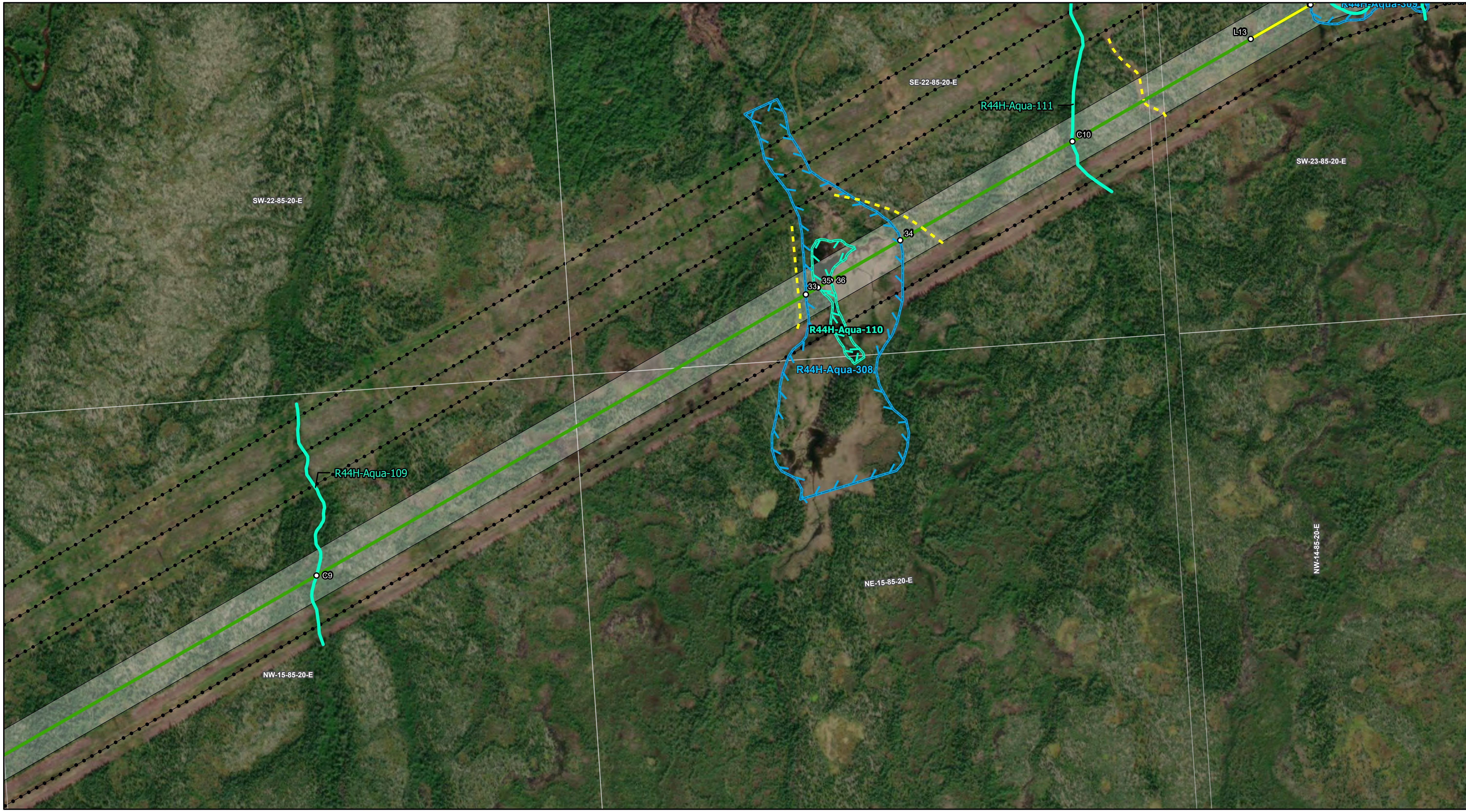
**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-307	Wetland	31 to 32	E-784985 N-6256990	E-785066 N-6257037	93
R44H-Aqua-306	Wetland	29 to 30	E-784673 N-6256811	E-784691 N-6256821	20

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.



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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features

Wildlife
- Birds and Habitat

Water
- Water Crossing

Water
- Water Crossing
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 9

ESS Group: Birds and Habitat

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Wild-106	Bird diverter installation area	L13 to L14	E-786927 N-6258106	E-787447 N-6258300	557

Potential Effects:
Higher risk of wire collision, Risk of wire collision is localized to the right-of-way

Specific Mitigation (ID# 827):

- Bird diverters will be installed in a manner to maximize visibility
- Install bird diverter with spacing as per Transmission Line Design specifications for these spans
- Install bird diverters in a timely manner after conductor stringing.

ESS Group: Water Crossing

**Features represented as lines*

ESS ID	ESS Name	Site	Location
R44H-Aqua-111	Unnamed Tributary of Nelson River	C10	E-786685 N-6257967
R44H-Aqua-109	Unnamed Tributary of Nelson River	C9	E-785659 N-6257377

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Water Crossing

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-110	Unnamed Tributary of Nelson River	35 to 36	E-786340 N-6257768	E-786357 N-6257778	20

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Wetland

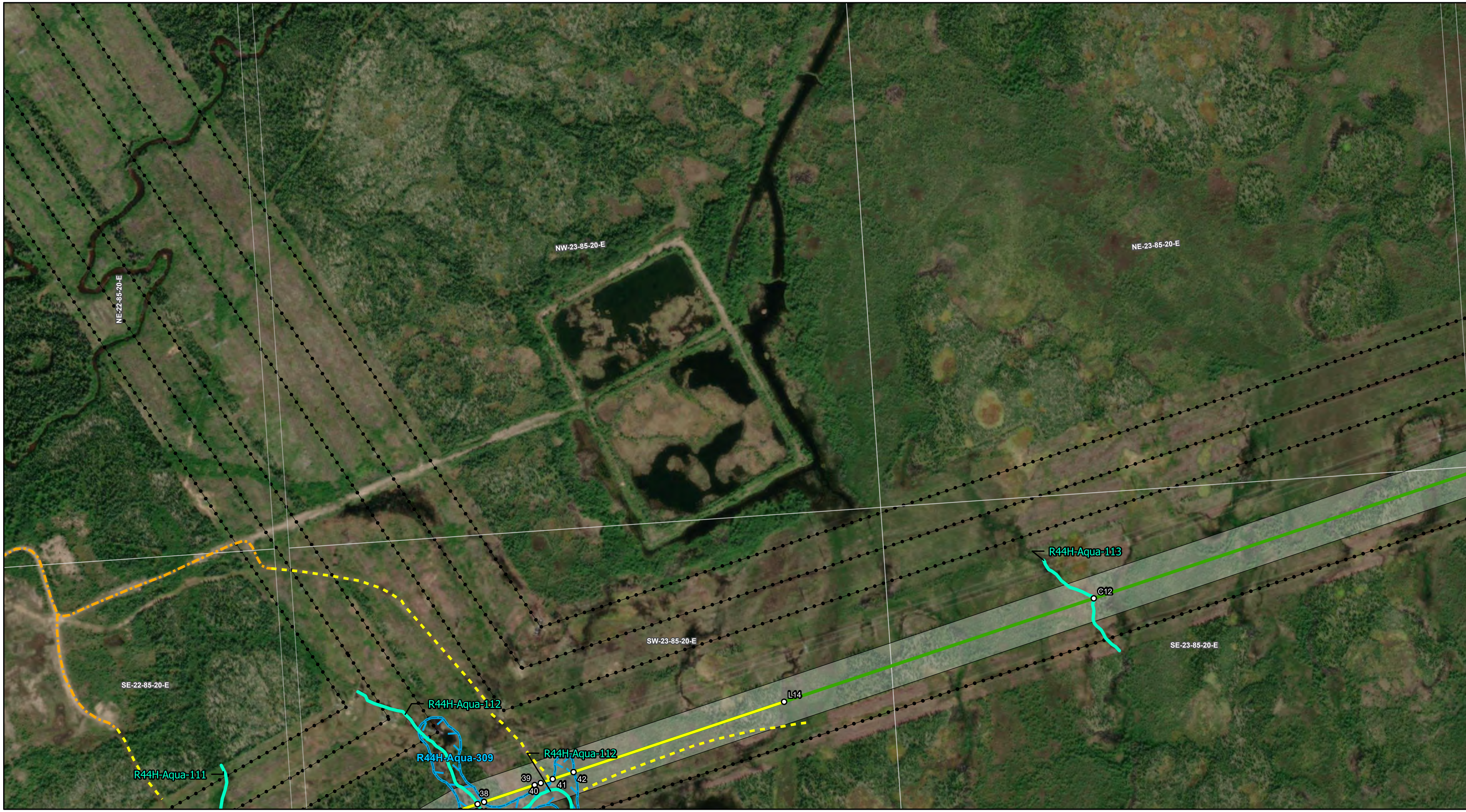
**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-309	Wetland	37 to 38	E-787008 N-6258152	E-787040 N-6258164	34
R44H-Aqua-308	Wetland	33 to 34	E-786323 N-6257759	E-786451 N-6257832	147

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.



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Manitoba Hydro

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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features

Wildlife
- Birds and Habitat

Water
- Water Crossing

Water
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 10

ESS Group: Birds and Habitat

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Wild-106	Bird diverter installation area	L13 to L14	E-786927 N-6258106	E-787447 N-6258300	557

Potential Effects:
Higher risk of wire collision, Risk of wire collision is localized to the right-of-way

Specific Mitigation (ID# 827):

- Bird diverters will be installed in a manner to maximize visibility
- Install bird diverter with spacing as per Transmission Line Design specifications for these spans
- Install bird diverters in a timely manner after conductor stringing.

ESS Group: Water Crossing

**Features represented as lines*

ESS ID	ESS Name	Site	Location
R44H-Aqua-113	Unnamed Tributary of Nelson River	C12	E-787867 N-6258441
R44H-Aqua-112	Unnamed Tributary of Nelson River	C11	E-787031 N-6258161

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Wetland

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-309	Wetland	41 to 42	E-787133 N-6258196	E-787162 N-6258205	29
R44H-Aqua-309	Wetland	39 to 40	E-787109 N-6258187	E-787117 N-6258190	8
R44H-Aqua-309	Wetland	37 to 38	E-787008 N-6258152	E-787040 N-6258164	34

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.

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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features
Water
- Water Crossing

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 11

ESS Group: Water Crossing

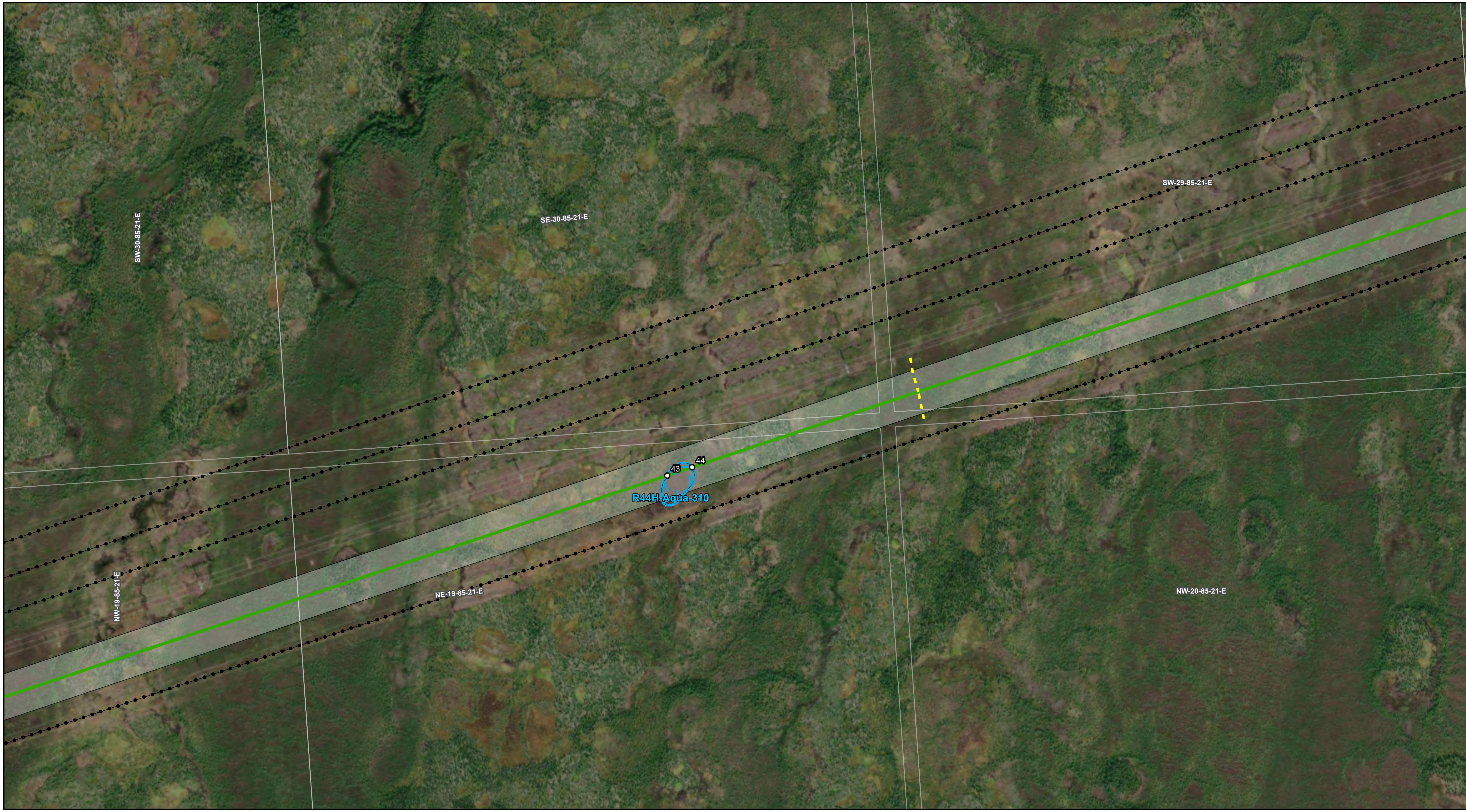
**Features represented as lines*

ESS ID	ESS Name	Site	Location
R44H-Aqua-114	Unnamed Tributary of Nelson River	C13	E-790027 N-6259163

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.



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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features
Water
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 12

ESS Group: Wetland

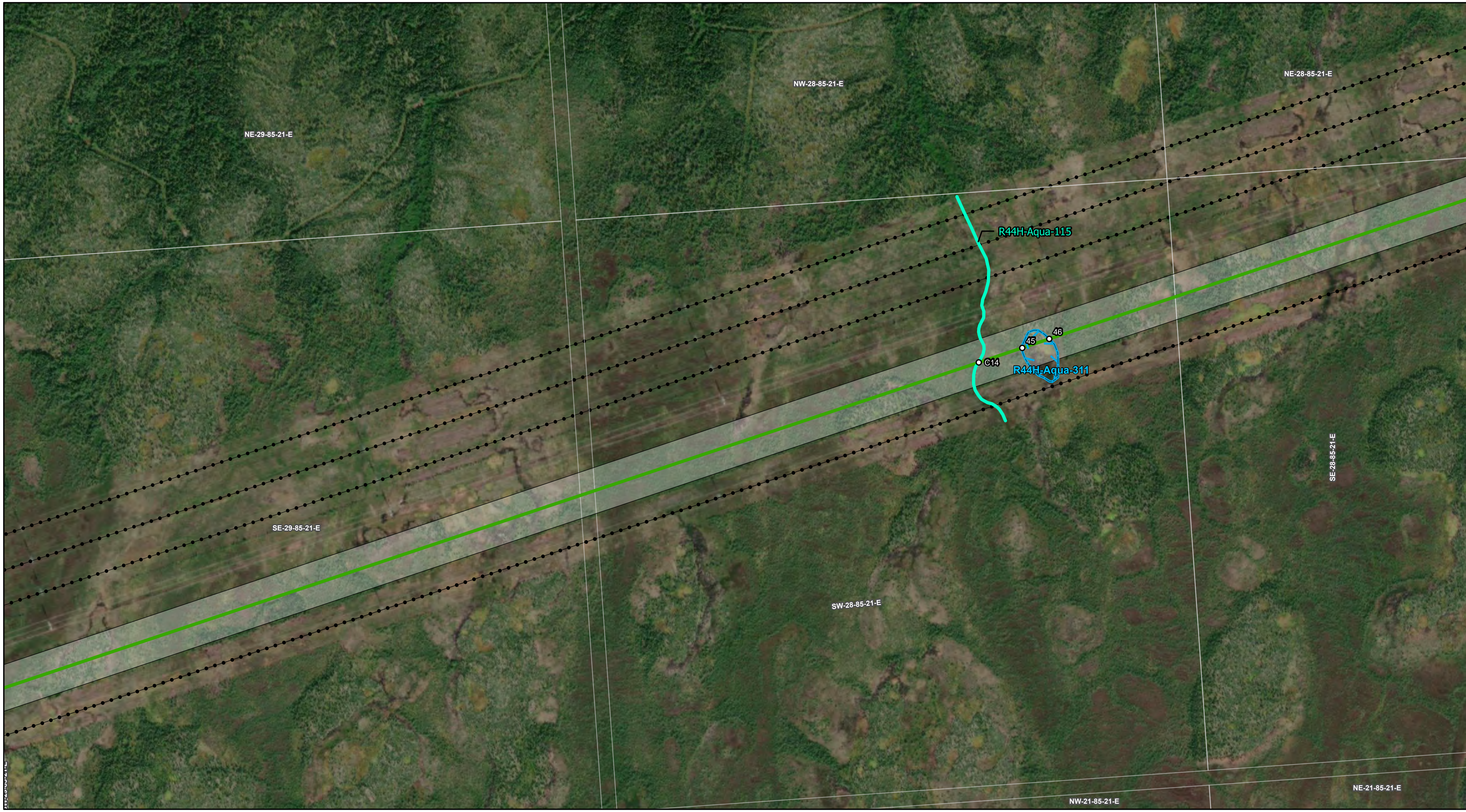
**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-310	Wetland	43 to 44	E-791286 N-6259583	E-791319 N-6259594	35

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.



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Metres

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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features

Water
- Water Crossing

Water
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 13

ESS Group: Water Crossing

**Features represented as lines*

ESS ID	ESS Name	Site	Location
R44H-Aqua-115	Unnamed Tributary of Nelson River	C14	E-793709 N-6260393

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Wetland

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-311	Wetland	45 to 46	E-793768 N-6260412	E-793804 N-6260425	38

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.

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Metres
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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features
Water
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 14

ESS Group: Wetland

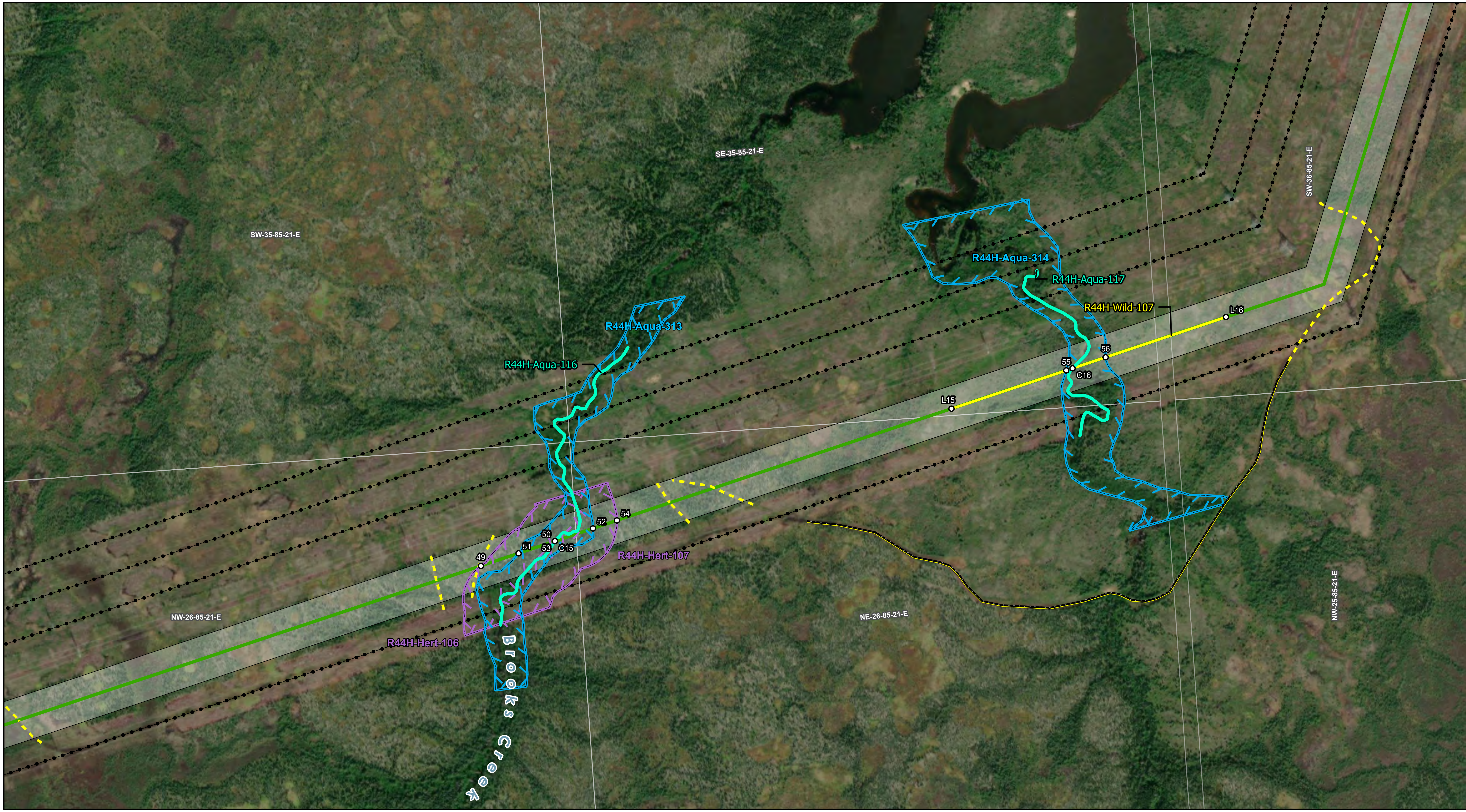
**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-312	Wetland	47 to 48	E-795327 N-6260933	E-795384 N-6260952	60

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.



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Metres
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Land Base
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- Railway (Discontinued)
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Existing Infrastructure
- Transmission Line

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Sensitive Sites
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- Linear Features
- Area Features

Points of Access
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- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features
Wildlife
- Birds and Habitat

Water
- Water Crossing

Heritage
- Archaeological

Water
- Wetland

Manitoba Hydro

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 15

ESS Group: Archaeological

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Hert-107	Brooks Creek	53 to 54	E-797135 N-6261537	E-797219 N-6261566	88
R44H-Hert-106	Brooks Creek	49 to 50	E-797035 N-6261504	E-797135 N-6261537	105

Potential Effects:
Higher potential for disturbance of cultural and heritage resources in this area

Specific Mitigation (ID# 302):

- Workers to be made aware of increased potential for discovery of cultural heritage resources
- Carry out construction activities using methods that minimize surface damage, rutting and erosion. Construction matting may be required to protect the area from rutting and exposure to soil
- In the event of a cultural heritage resource discovery, immediately stop work in the area, establish appropriately sized buffer (min 30m), and notify Manitoba Hydro to arrange for further assessment of the site by the project archaeologist

ESS Group: Birds and Habitat

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Wild-107	Bird diverter installation area	L15 to L16	E-797673 N-6261717	E-798046 N-6261842	392

Potential Effects:
Higher risk of wire collision, Risk of wire collision is localized to the right-of-way

Specific Mitigation (ID# 827):

- Bird diverters will be installed in a manner to maximize visibility
- Install bird diverter with spacing as per Transmission Line Design specifications for these spans
- Install bird diverters in a timely manner after conductor stringing.

ESS Group: Water Crossing

**Features represented as lines*

ESS ID	ESS Name	Site	Location
R44H-Aqua-117	Unnamed Tributary of Nelson River	C16	E-797837 N-6261772
R44H-Aqua-116	Brooks Creek	C15	E-797135 N-6261537

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Wetland

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-314	Wetland	55 to 56	E-797829 N-6261769	E-797882 N-6261787	56
R44H-Aqua-313	Wetland	51 to 52	E-797086 N-6261521	E-797187 N-6261555	106

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.

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Manitoba Hydro

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Version: Draft

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Metres
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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 16

No specific mitigation measures for this map, page intentionally left blank

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- Transmission Line

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- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features
Water
- Water Crossing

Water
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 17

ESS Group: Wetland

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-317	Wetland	61 to 62	E-798966 N-6264444	E-798985 N-6264504	62
R44H-Aqua-316	Wetland	59 to 60	E-798827 N-6263990	E-798834 N-6264014	25
R44H-Aqua-315	Wetland	57 to 58	E-798765 N-6263789	E-798770 N-6263806	17

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.

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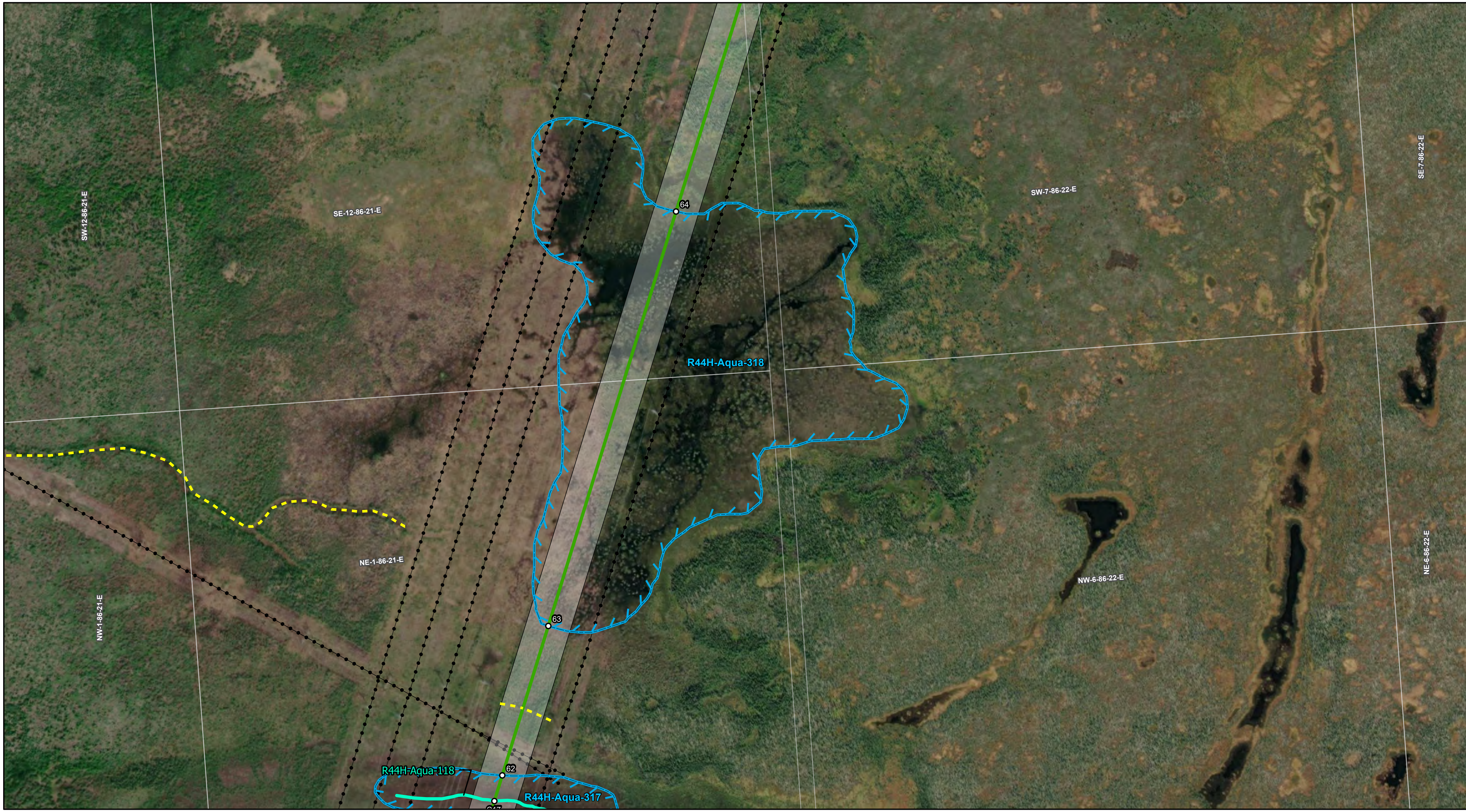

Service Layer Credits: World Imagery: Maxar

Manitoba Hydro

Coordinate System: UTM Zone 14N NAD83
Data Source: MB Hydro, ProvMB, NRCAN
Date Created: December 21, 2023
Version: Draft

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Metres

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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features
Water
- Water Crossing

Water
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 18

ESS Group: Water Crossing

**Features represented as lines*

ESS ID	ESS Name	Site	Location
R44H-Aqua-118	Unnamed Tributary of Nelson River	C17	E-798974 N-6264469

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Wetland

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-318	Wetland	63 to 64	E-799047 N-6264707	E-799221 N-6265270	588
R44H-Aqua-317	Wetland	61 to 62	E-798966 N-6264444	E-798985 N-6264504	62

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.

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Manitoba Hydro

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Version: Draft

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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features
Water
- Water Crossing

Water
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 19

ESS Group: Water Crossing

**Features represented as lines*

ESS ID	ESS Name	Site	Location
R44H-Aqua-119	Unnamed Tributary of Nelson River	C18	E-799323 N-6265603

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Wetland

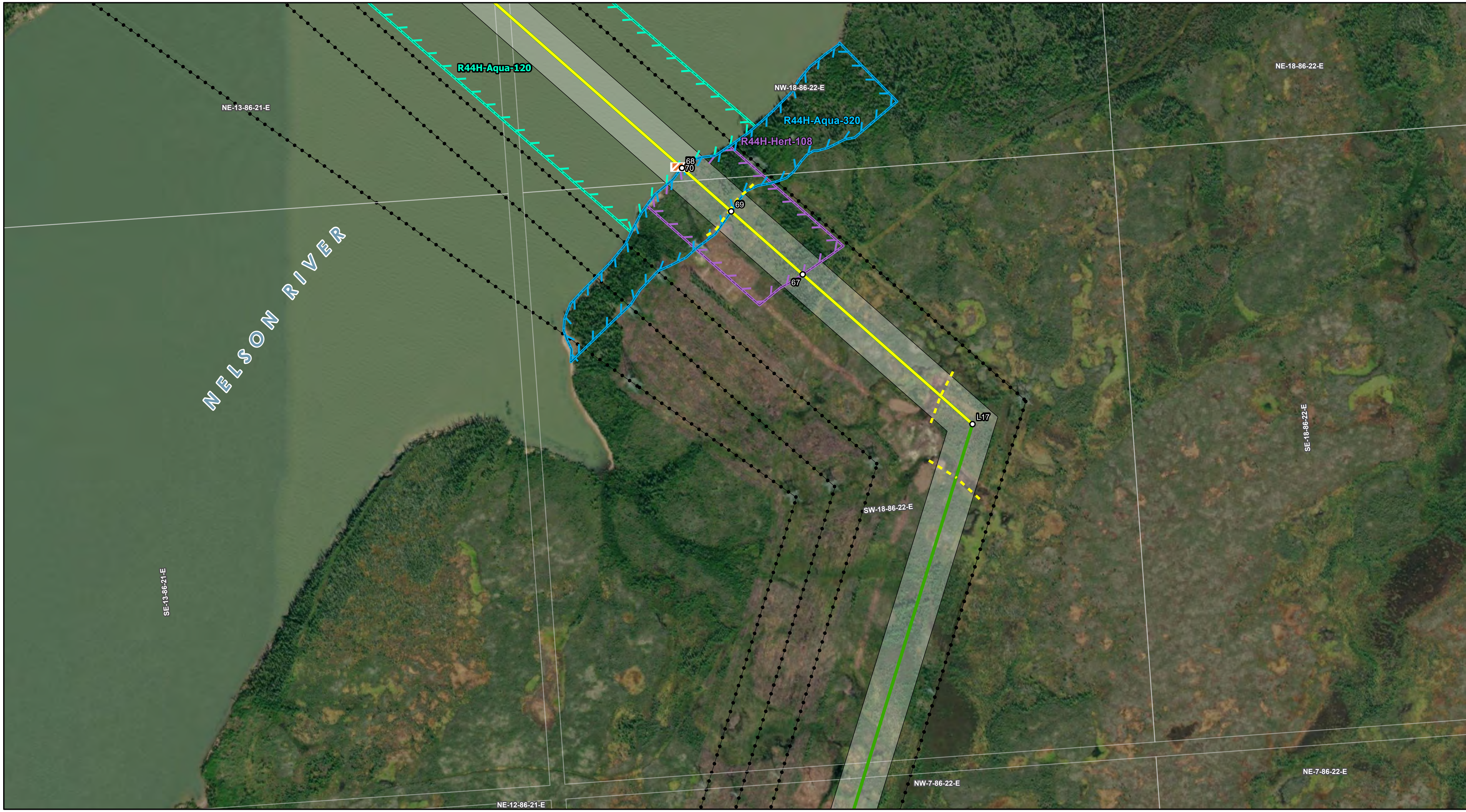
**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-319	Wetland	65 to 66	E-799524 N-6266253	E-799534 N-6266288	36

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.



Service Layer Credits: World Imagery: Maxar

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Manitoba Hydro

Coordinate System: UTM Zone 14N NAD83
Data Source: MB Hydro, ProvMB, NRCAN
Date Created: December 21, 2023
Version: Draft

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Metres
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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features
Wildlife
- Birds and Habitat

Heritage
- Archaeological

Water
- Water Crossing
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 20

ESS Group: Archaeological

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Hert-108	Nelson River Crossing	67 to 68	E-799576 N-6267373	E-799412 N-6267518	218

Potential Effects:
Higher potential for disturbance of cultural and heritage resources in this area

Specific Mitigation (ID# 302):

- Workers to be made aware of increased potential for discovery of cultural heritage resources
- Carry out construction activities using methods that minimize surface damage, rutting and erosion. Construction matting may be required to protect the area from rutting and exposure to soil
- In the event of a cultural heritage resource discovery, immediately stop work in the area, establish appropriately sized buffer (min 30m), and notify Manitoba Hydro to arrange for further assessment of the site by the project archaeologist

ESS Group: Birds and Habitat

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Wild-108	Bird diverter installation area	L17 to L18	E-799806 N-6267170	E-798452 N-6268365	1805

Potential Effects:
Higher risk of wire collision, Risk of wire collision is localized to the right-of-way

Specific Mitigation (ID# 827):

- Bird diverters will be installed in a manner to maximize visibility
- Install bird diverter with spacing as per Transmission Line Design specifications for these spans
- Install bird diverters in a timely manner after conductor stringing.

ESS Group: Water Crossing

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-120	Nelson River Crossing	71 to 72	E-799412 N-6267518	E-798849 N-6268015	750

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Wetland

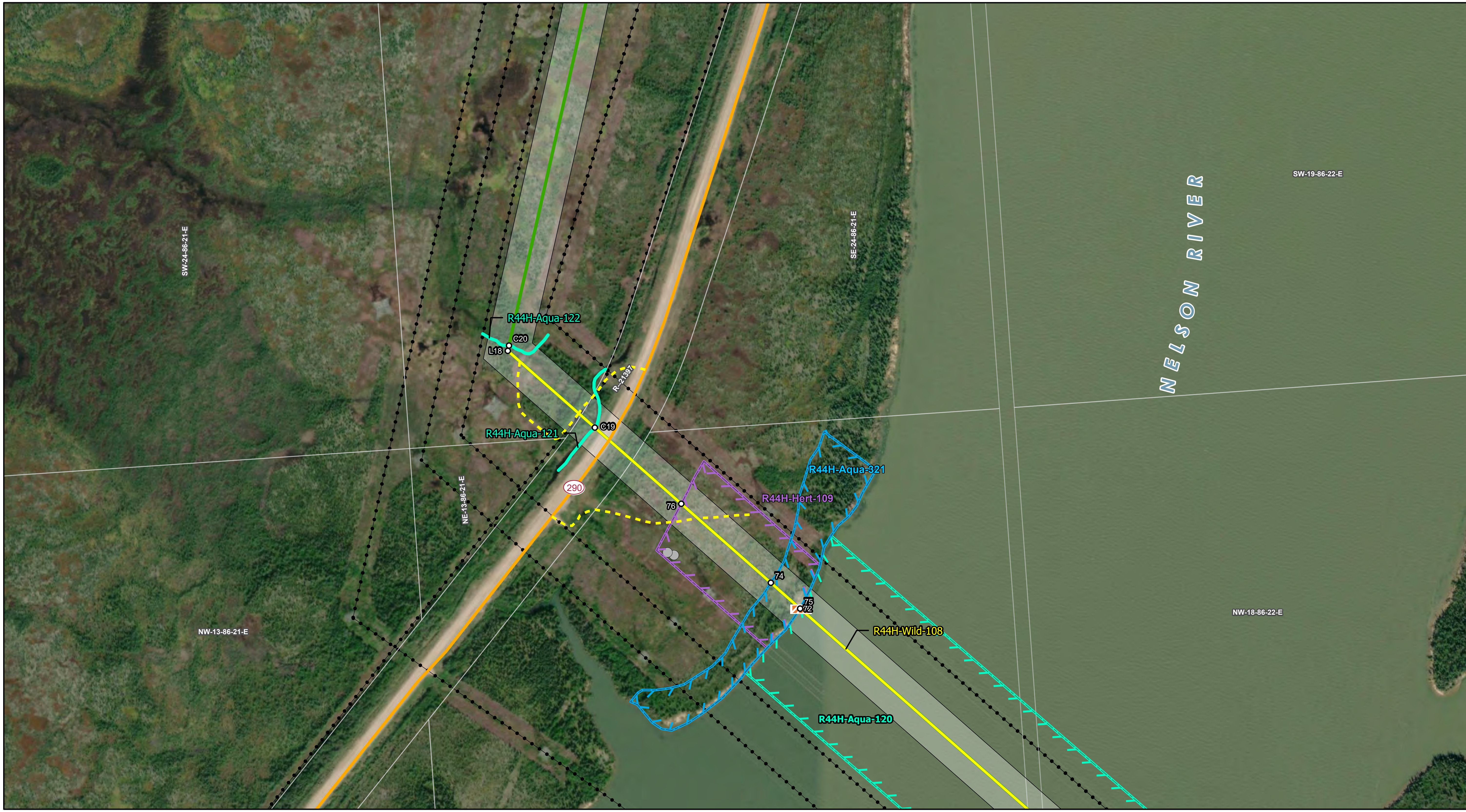
**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-320	Wetland	69 to 70	E-799479 N-6267459	E-799412 N-6267518	89

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.



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Manitoba Hydro

Coordinate System: UTM Zone 14N NAD83
Data Source: MB Hydro, ProvMB, NRCAN
Date Created: December 21, 2023
Version: Draft

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Metres
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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features

Wildlife
- Birds and Habitat

Water
- Water Crossing

Heritage
- Archaeological

Water
- Water Crossing
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 21

ESS Group: Archaeological

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Hert-109	Nelson River Crossing	75 to 76	E-798849 N-6268015	E-798687 N-6268157	215

Potential Effects:
Higher potential for disturbance of cultural and heritage resources in this area

Specific Mitigation (ID# 302):

- Workers to be made aware of increased potential for discovery of cultural heritage resources
- Carry out construction activities using methods that minimize surface damage, rutting and erosion. Construction matting may be required to protect the area from rutting and exposure to soil
- In the event of a cultural heritage resource discovery, immediately stop work in the area, establish appropriately sized buffer (min 30m), and notify Manitoba Hydro to arrange for further assessment of the site by the project archaeologist

ESS Group: Birds and Habitat

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Wild-108	Bird diverter installation area	L17 to L18	E-799806 N-6267170	E-798452 N-6268365	1805

Potential Effects:
Higher risk of wire collision, Risk of wire collision is localized to the right-of-way

Specific Mitigation (ID# 827):

- Bird diverters will be installed in a manner to maximize visibility
- Install bird diverter with spacing as per Transmission Line Design specifications for these spans
- Install bird diverters in a timely manner after conductor stringing.

ESS Group: Water Crossing

**Features represented as lines*

ESS ID	ESS Name	Site	Location
R44H-Aqua-122	Unnamed Tributary of Nelson River	C20	E-798454 N-6268372
R44H-Aqua-121	Unnamed Drain	C19	E-798570 N-6268260

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Water Crossing

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-120	Nelson River Crossing	71 to 72	E-799412 N-6267518	E-798849 N-6268015	750

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Wetland

**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-321	Wetland	73 to 74	E-798849 N-6268015	E-798809 N-6268050	53

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.

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Manitoba Hydro

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Version: Draft

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Metres
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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features
Water
- Water Crossing

Water
- Wetland

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 22

ESS Group: Water Crossing

**Features represented as lines*

ESS ID	ESS Name	Site	Location
R44H-Aqua-123	Unnamed Tributary of Nelson River	C21	E-798705 N-6269524

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

ESS Group: Wetland

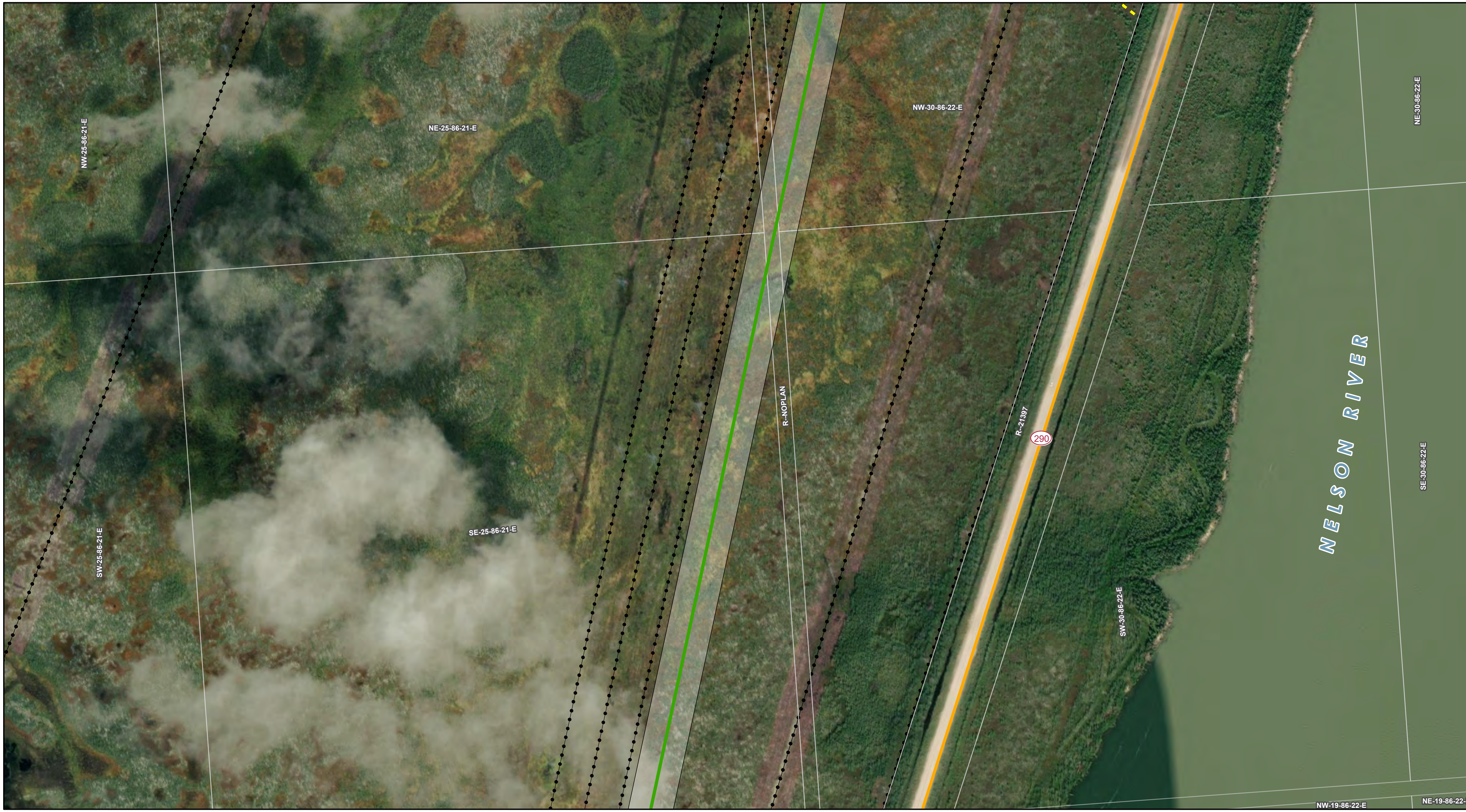
**Features represented as polygons*

ESS ID	ESS Name	Site	Start	Stop	Distance (m)
R44H-Aqua-322	Wetland	77 to 78	E-798703 N-6269515	E-798730 N-6269637	124

Potential Effects:
Increased erosion and sedimentation; rutting of floodplains; loss of riparian vegetation; potential impact to reptile and amphibian habitat

Specific Mitigation (ID# 205):

- Carry out construction activities on frozen or dry ground to minimize surface damage, rutting and erosion. Construction activities occurring during non-frozen ground conditions may require that additional mitigation be implemented (ie. use of construction matting, etc)
- Identify and flag a 30 m vegetated (shrub and herbaceous) buffer around site
- Retain understory and ground vegetation less than 2 meters in height to the extent possible.



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Manitoba Hydro

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Metres
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Land Base
- Highway
- Major Road
- Local Road
- Railway (Operational)
- Railway (Discontinued)
- First Nation
- Parcel Fabric
- Rural Municipality

Existing Infrastructure
- Transmission Line

Project Infrastructure
- Final Preferred Route
- New Right of Way

Sensitive Sites
- Point Features
- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 23

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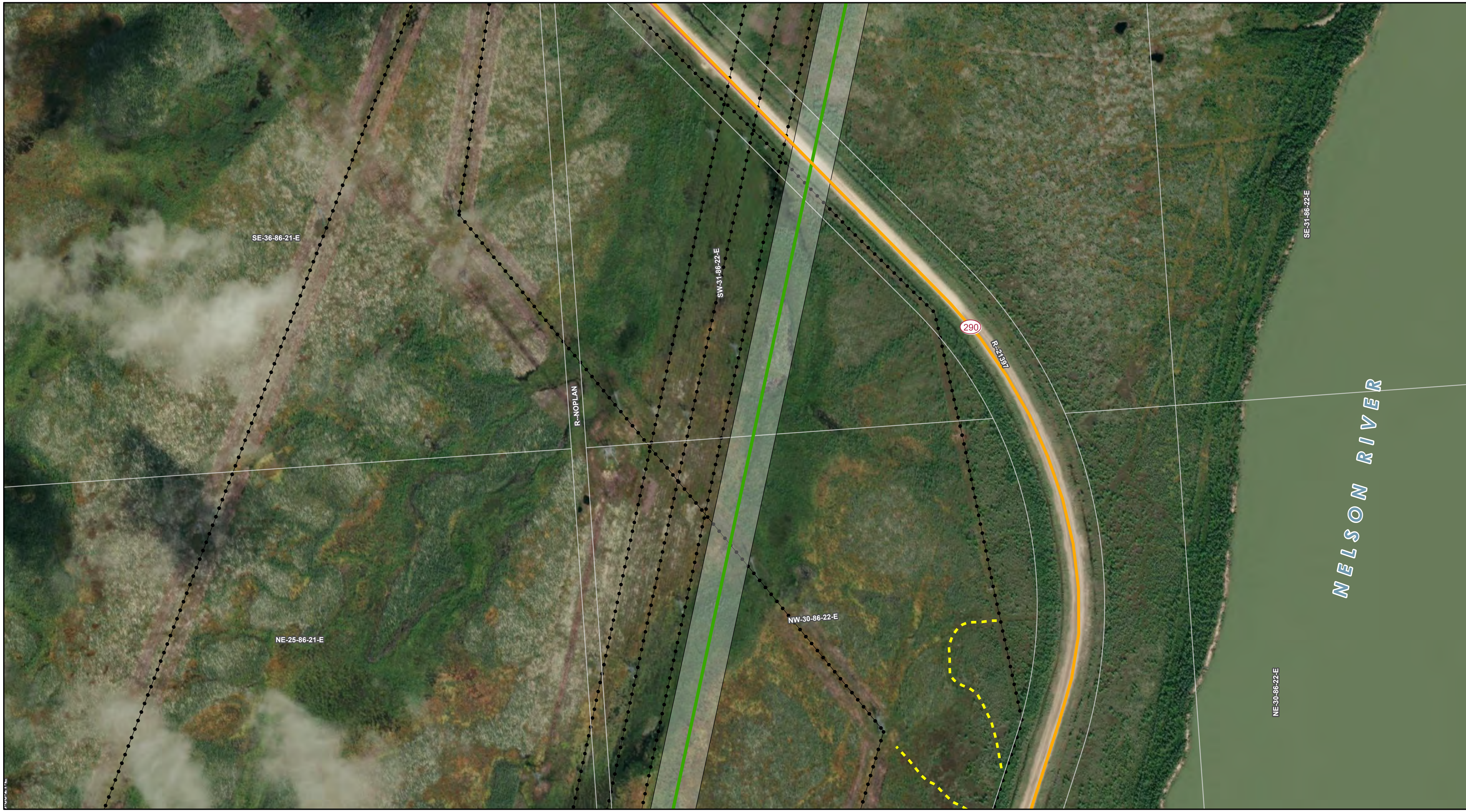

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- New Right of Way

Sensitive Sites
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- Linear Features
- Area Features

Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 24

No specific mitigation measures for this map, page intentionally left blank

Manitoba Hydro

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Version: Draft

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Metres
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Land Base
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- Linear Features
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Points of Access
- No Crossing
- Existing Gravel Road
- Existing Gravel/Dirt Road
- Field Access
- New Trail
- Restricted Access
- Load Restriction
- Bypass Trail

*Some road names have not been verified

ESS Features
Water
- Water Crossing

R44H Transmission Project
Construction Environmental Protection Plan
Environmentally Sensitive Site Locations

Map 25

ESS Group: Water Crossing

**Features represented as lines*

ESS ID	ESS Name	Site	Location
R44H-Aqua-124	Unnamed Tributary of Nelson River	C22	E-799396 N-6272745

Potential Effects:
Habitat loss and contamination from structure foundations & installations; increased erosion & sedimentation of streams; Damage to stream banks; Loss of riparian vegetation; Fish habitat disturbances and impeded fish movement; Rutting of floodplain

Specific Mitigation (ID# 715):

- Use existing trails, roads or cut lines whenever possible as access routes
- Identify and flag the riparian buffer area prior to construction activities in proximity to this ESS
- Carry out construction activities within riparian area on dry or frozen ground to minimize surface damage, rutting and erosion
- A minimum 7m no machine zone will restrict equipment in close proximity to the waterbody (except if travelling on an approved access route/crossing)
- Riparian Buffers shall be a minimum of 30m and increase in size based on slope of land entering waterway. Retain understory and ground vegetation less than 2 meters in height to the extent possible
- Ground disturbance in riparian areas must be stabilized as soon as practical to prevent erosion and/or sedimentation (active revegetation may be required)
- Avoid refueling or vehicle/equipment maintenance within 100m of a water crossing. If refueling or vehicle/equipment maintenance is required within 100m of a water crossing, contractor must obtain approval from MH Environmental Officer and adhere to additional mitigation measures.

Appendices

Appendix A

Contact List

Contact list

Contact	Name	Phone Number(s)
Construction contractor		
Contractor project manager		
Contractor field lead		
Contractor safety		
Environmental representative		
Manitoba Hydro		
Project engineer		
Contract administrator		
Line contracts business partner		
environmental officer / inspector		
FSO: field safety officer		
Hazardous materials officer		
Area spill response coordinator		
Emergency response services		
Project archaeologist (Primary contact)		
Manitoba Environment and Climate contacts		
24 hr environmental emergency response reporting line		1-204-944-4888 or Toll free at 1-855-944-4888

APPENDIX B

Environmental licences, approvals and permits

List of Potential Approvals required for Construction

Approval required (Applicable Legislation / Regulation)	**Type of Approval needed**	**Responsibility**
Environment Act Licence (Class 2)	Licence	T&DEE
Crown Lands Act (General Permit)	Permit	Property Dept.
Storage and Handling of Gasoline and Associated Products Regulation, Generator Registration and Carrier Licencing Regulation (Dangerous Goods Handling and Transportation Act)	Permit	Contractor
Highways Protection Act	Permit	LC
The Heritage Resources Act (when required)	Permit	T&DEE
A permit from Manitoba Transportation and Infrastructure is required for any construction above or below ground level that falls within 250 ft. of a Provincial Trunk Highway right-of-way edge or within 150 ft. of a Provincial Road right-of-way edge.	Permit	Property Dept.

Note: Permits, Licences and Approvals are the sole responsibility of those groups indicated in this table

T&DEE – Manitoba Hydro Transmission & Distribution Environment and Engagement Department

LC – Line Contracts Department

Appendix C

Timing Windows

Manitoba Hydro

Timing Windows

Project Wildlife Reduced Risk Timing Windows

Species	Sensitivity	January	February	March	April	May	June	July	August	Septembe	October	Novembe	Decembe
Mammals	Denning Sites												
Amphibians/Reptiles	Amphibian Bearing Wetland												
Snakes	Hibernaculum												
Bats	Hibernaculum												
Birds	Breeding and Nesting												
Fish	Spawning Areas												

Reduced Risk to Wildlife

Sensitive Time Period for Wildlife (Where construction activities occur during this period, mitigations measures will be prescribed on a site-by-site basis)

Examples of Mitigations that may be approved by T&DEE Department during Sensitive Time Period for Birds or Amphibians/Reptiles are found in Appendix E and F, respectively.

APPENDIX D

Buffers and Setbacks

Buffers and setbacks

Feature	Activity	Non-Frozen Ground Setback Distance[1]	Frozen Ground Setback Distance[1]	Vegetated Buffer Distance[2]
Vegetation				
Plant Species at Risk	Tower Foundation Siting	100m	100m	
	Clearing And Construction	30m		30m
	Maintenance	30m		30m
	Access Trail	30m	30m	
Anthropogenic				
Heritage and Cultural	All	Varies	Varies	Varies
Amphibians				
Northern Leopard Frog (Known breeding pond, watering site)	Tower Foundation Siting	30m	30m	
	Clearing And Construction	30m		30m
	Maintenance	30m		
	Access Trail	30m	30m	
Reptiles				
Garter Snake Hibernaculum	Tower Foundation Siting	200m	200m	
Landforms				
Wetlands	Clearing And Construction			30m
	Maintenance			30m
	Access Trail			30m
	Hazardous Material Handling/Storage	100m	100m	
	Soil Stockpiles	30m		30m
Mammals				
Mineral Licks	All	120m		120m
Occupied Mammal Dens[3] (Red fox, Gray fox, Coyote, Wolf, Bobcat, American badger, American marten, Fisher, Least weasel and Raccoon)	All	50m	50m	
Occupied Bear Den	All	150m	150m	150m

NOTE: All measurements are from edge of feature

[1]No Work Allowed without Manitoba Hydro Licensing and Environmental Assessment Department review and approval, which may be subject to regulatory approval.

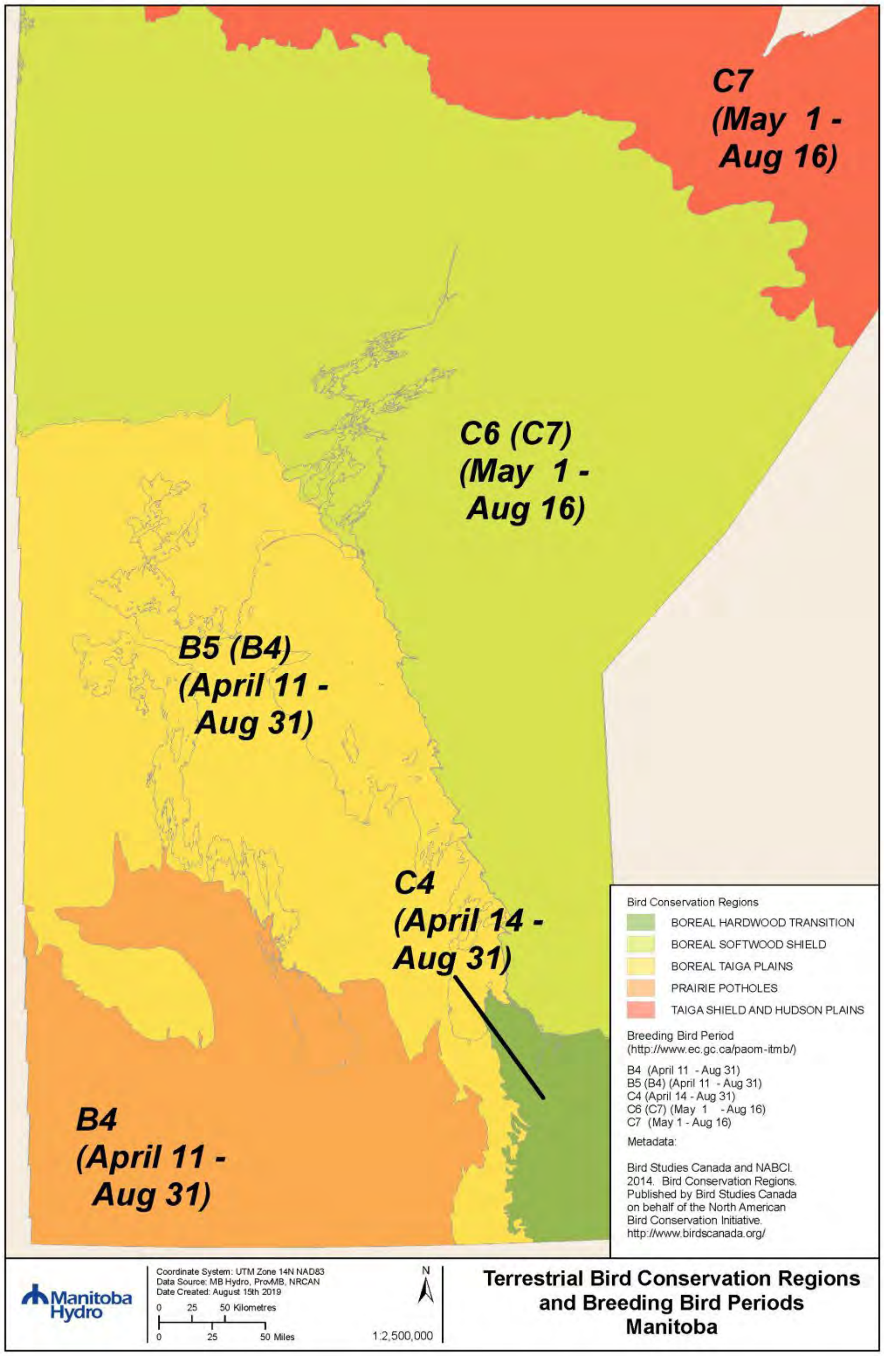
[2]Shrub and Herbaceous Vegetation Retained)

[3]Bear/Mammal den sites are highly variable and may be found in caves, crevasses, overturned trees, open ground nests, and low-sweeping branches of a coniferous tree.

APPENDIX E

Avian Protection Documents

Appendix E-1: Terrestrial Bird Conservation Regions and Breeding Bird Seasons for Manitoba*



* Adapted from Environment and Climate Change. Dates should be considered as guidelines.

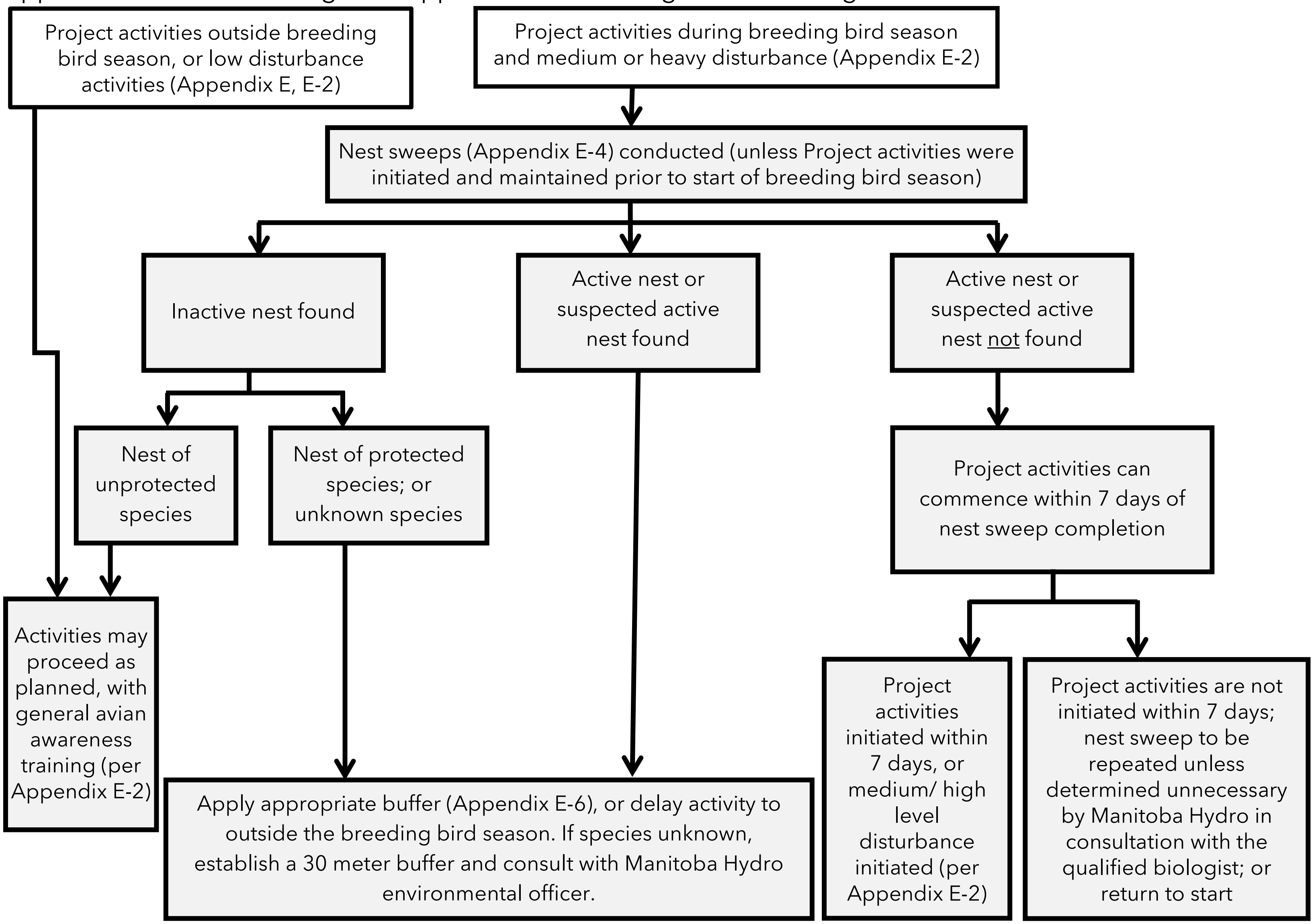
Appendix E-2: Determining Disturbance Level for Nesting Birds during Breeding Bird Season

Activity (examples provided for guidance)	Disturbance Level	Training Required	General Mitigation
1 vehicle/equipment round trip (two passes) per 0.5 hour; Foot traffic, surveying; Spacer damper installation; Medium helicopter work at top of tower; Stringing (helicopter, pulling conductor); Inspection activities	Low	General Avian Awareness Training*	Operators and workers remain vigilant for any bird nesting activity, provide 5 m berth
2-5 vehicle/equipment round trip (two passes) per 0.5 hour; Any sustained activity for >1-4 hours over a 12 hour period within 100m of work site; Plumbing and tensioning guys; Tower hooking; Anchor pull testing; Clipping in conductor	Moderate	General Avian Awareness Training* and Consult a Manitoba Hydro Environmental Officer	General Mitigation Approach for Reducing Risk to Nesting Birds as per Appendix E-3 Nest sweep protocol as per Appendix E-4
>5 vehicle/equipment round trip (two passes) per 0.5 hour; Any sustained activity for >4 hours within 100m of work site; Vegetation clearing; Foundation installation; Stringing (implode sites, tensioner/puller sites); Tower assembly or installation; Road/trail construction	High		

*General Avian Awareness Training

General avian awareness training is to be provided by the Contractor to all crews and contractors conducting field work during the sensitive time for birds identified in Timing Windows appendix. General avian awareness training involves basic introduction to bird biology, nesting characteristics, government regulations, and instruction on how to contact Manitoba Hydro Environmental officers, when specific questions arise.

Appendix E-3: General Mitigation Approach for Reducing Risk to Nesting Birds



Appendix E-4: Nest Sweep Protocol

Birds may nest on the ground, others nest in shrubs and/or trees, while other nest along the edges of water bodies. Nest sweeps are too be conducted on lands having potential to support bird nesting. Qualified[1] biologists employed / retained by the contractor are to complete nest sweeps no more than 7 days before disturbance activities. To complete a nest, sweep the qualified biologist must:

1. Nest sweeps are to be done on foot and can be completed from sunrise until 1800 hours, however birds are most active from sunrise until one thousand hours. Nest sweeps will be discontinued during high winds or precipitation as birds are less active.
2. In advance of any medium or heavy disturbance activity (Appendix E-2) walk the entire area, ensuring full coverage. Recommended spacing between parallel transects is approximately 10 m, but surveyors may reduce this spacing, as necessary.
3. Walk slowly, observing from ground-level, to the tops of the trees.
4. If a nest is suspected to be nearby based on bird behavior (e.g., acting strange/aggressive or agitated vocalizations), try to locate the nest location.
5. If the nest is found, mark the location with flagging tape (tie the flagging tape to a tree or other landmark several meters away). Record the following information on the flagging tape: location of the nest including UTM coordinates, type of bird (songbird, waterfowl) and the date.
6. If the bird species and the corresponding necessary buffer size cannot be readily determined, establish a temporary minimum thirty meter “no disturbance” buffer around the nest site.
7. Once the bird species has been determined, an appropriately sized “no disturbance” buffer must be setup around the nest location. Consult Appendix E-6 and select the most appropriate buffer or contact a Manitoba Hydro Environmental Officer.
8. Use flagging tape or appropriate signage to mark the required buffer around the nest location.

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[1] Qualified Biolgist is someone who has at least one field season of demonstrated experience in nest sweeps or avian surveys with references, and a post-secondary degree/diploma in wildlife biology, resume to be supplied to Manitoba Hydro for review and approval 15 days prior to construction activities occurring within Sensitive time period for birds.

9. Enter each nest observation into the nesting bird collection form (Appendix E-5- MH will provide digital version in Excel format for submission) and include what actions were taken or what actions are recommended*.
10. Continue nest sweep until the entire area scheduled for construction activity has been adequately searched.
11. Submit to MH an Excel spreadsheet that is continuously updated throughout the sensitive timing window with structures and/or areas that have had nest sweeps conducted and the expiration date for those sweeps.
12. If a nest was found, there are two options:
    a. Defer disturbance within the required buffer as outlined in Appendix E-6. Activity can recommence after breeding bird nesting season, as described in Appendix E-1; or
    b. Check the nest again seven (7) days from the day it was found to see if eggs have hatched, and birds have left. If there is no sign of activity, complete another nest sweep of the buffer area. If no nests are found, proceed with activity. If after (7) days, the nest is still occupied, continue checking at seven (7) day intervals.

Nest Sweep Extension

As per Appendix E-3 nest sweeps may be extended from the original expiry date for an additional day if a medium or high-level disturbance is initiated on the expiry date or extended continuously if medium or high-level disturbances are sustained un-interrupted.

Scenarios for nest sweep extension or expiration

Day 01	Day 02	Day 03	Day 04	Day 05	Day 06	Day 07	Day 08	Day 09 – August 31
Original Sweep – clear of nesting activity						Medium or high level disturbance initiated at site	Sweep expiry date extended based on initiation of Medium or high level disturbance at site the previous day	Expiry Date continuously extended based on sustained Medium or high level disturbance at site the previous day

Day 01	Day 02	Day 03	Day 04	Day 05	Day 06	Day 07	Day 08
Original Sweep – Clear of nesting activity		Medium or high level disturbance initiated at site	Medium or high level disturbance sustained at site	Medium or high level disturbance sustained at site	No Medium or high level disturbance at site	Original Sweep Expiry No Medium or high level disturbance at site	Second sweep required due to un-sustained medium or high level activities

Appendix E-5: Bird nesting collection form

Bird Nesting Collection Form (start sheet(s) for each new Location)

Name(s):	**Date:**

Location and general description of ROW area to be surveyed (i.e. S1 between towers 1234-1280 near Holland, MB):

Habitat (photo # and description):	**Temperature:**	**Wind**	**Noise**	**Precipitation**	**Cloud Cover**	**Weather (description):**
		Calm Light Air Light Breeze Gentle Breeze	None Low Moderate High	None Haze/Fog Drizzle Rain	0 - 25% 25 - 50% 50 - 75% 75 - 100%	

GPS Tracks should be recorded by each member on the survey and submitted with the daily reports.

Observation	Time	UTM Zone	Easting	Northing	Species	Status of Nest/Parents	Mitigation Applied	GPS Photo	Comments
(Nest/Territory)	(HH:MM:SS)	(14/15)	635401	5568325	(if not able to identify provide written description of nest site and surroundings)	Status (under const/# eggs /# hatchlings) Parents (/incubating/feeding)	(flagging an appropriate buffer, alerting appropriate Environmental Supervisor)	(Photo #)	Any Comments regarding the site

Appendix E-6 Manitoba Hydro Breeding Bird Buffer Guidelines

Key	
(red)	Manitoba Conservation Data Centre specified
(green)	100-200 m Buffer
(orange)	50 m Buffer
(white)	25 m Buffer

Species	Scientific Name	SARA (schedule & status)	COSEWIC (status & date assessed)	Habitat	Minimum Suggested Buffer (Meters)	Incubation Time (days)	Estimated Time to Leaving Nest or Fledging after hatching (Days)	Jurisdiction for Birds (F=Federal migratory, P=Provincial year-round resident), Nests = Provincial legislation for Herons, Eagles, and others
Alder Flycatcher	*Empidonax alnorum*				25	12-14	12-15	F
American Bittern	*Botaurus lentiginosus*			Emergent-dominated wetlands	25	24-28	1-4	F
American Coot	*Fulica americana*			Emergent-dominated wetlands	25	21-25	1-4	F
American Crow	*Corvus brachyrhynchos*				25	15-18	28-35	None
American Dipper	*Cinclus mexicanus*				25	13-18	12-14	F
American Goldfinch	*Spinus tristis*				25	10-12	12-14	F
Green-winged Teal	*Anas c. carolinensis*				25	20-24	1-4	F
American Kestrel	*Falco sparverius*			Forest clearings, grassland, or pasture	25	29-30	30	F
American Pipit	*Anthus rubescens*				25	13-15	12-14	F
American Redstart	*Setophaga ruticilla*				25	12-14	12-14	F
American Robin	*Turdus migratorius*				25	12-14	12-14	F
American Three-toed Woodpecker	*Picoides dorsalis*				25	12-14	18-23	P
American Tree Sparrow	Spizella arborea				25	12-14	12-14	F
American white pelican	Pelecanus erythrorhynchos			isolated islands	1000	30		F
Arctic Warbler	Phylloscopus borealis				25	12-14	12-14	F
Bald Eagle	*Haliaeetus leucocephalus*			forests near water	1000	28-35	35-49	P
Baltimore Oriole	*Icterus galbula*			Forest, deciduous	25	12-14	12-14	F
Band-tailed pigeon	*Patagioenas fasciata*	Special Concern -1	Special Concern	Riparian Forest; Pasture/Old Field;Cultivated Field;Deciduous/Broadleaf Forest;Conifer	25			
Bank Swallow	*Riparia riparia*		Threatened (Apr 2013)	Rivers	300	14-16	17-18	F
Baird's Sparrow	*Ammodramus bairdii*	Special Concern -1	Special Concern	Native grass prairie	500	11-12	8-11	F
Barn Swallow	*Hirundo rustica*		Threatened (May 2011)	Forest clearings, grassland, or pasture	150	13-17	17-18	F
Barred Owl	*Strix varia*			mature forest	1000	28-33	28-35	P
Barrow's Goldeneye	*Bucephala islandica*			Open water wetlands or riparian	25	28-44	1-4	F

Appendix E-6 Manitoba Hydro Breeding Bird Buffer Guidelines

Key

- Manitoba Conservation Data Centre specified
- 100-200 m Buffer
- 50 m Buffer
- 25 m Buffer

Species	Scientific Name	SARA (schedule & status)	COSEWIC (status & date assessed)	Habitat	Minimum Suggested Buffer (Meters)	Incubation Time (days)	Estimated Time to Leaving Nest or Fledging after hatching (Days)	**Jurisdiction for Birds** (F=Federal migratory, P=Provincial year-round resident), Nests = Provincial legislation for Herons, Eagles, and others
Bay-breasted Warbler	*Setophaga castanea*			Forest, coniferous	50	12-14	12-14	F
Belted Kingfisher	*Megaceryle alcyon*			Open water wetlands or riparian	25	22-24	27-29	F
Black Swift	*Cypseloides niger*			Riparian areas and forest; streams	25	24-27	12-14	F
Black Tern	*Chlidonias niger*			Open water wetlands or riparian	25	17-22	12-14	F
Black-and-white Warbler	*Mniotilta varia*				50	10-12	12-14	F
Black-backed Woodpecker	*Picoides arcticus*				25	12-14	21	P
Black-billed Magpie	*Pica hudsonia*				25	16-21	12-14	P
Black-capped Chickadee	*Poecile atricapillus*				25	11-13	12-14	P
Blackpoll Warbler	*Setophaga striata*					11-13	12-14	F
Black-throated Green Warbler	*Setophaga virens*			Forest, mixed wood; riparian	50	11-13	12-14	F
Blue Jay	*Cyanocitta cristata*				25	16-18	17-21	P
Blue-headed Vireo	*Vireo solitarius*				25	12-14	12-14	F
Blue-winged Teal	*Anas discors*			Open water wetlands or riparian	25	22-27	1-4	F
Bobolink	*Dolichonyx oryzivorus*		Threatened	forage crops	400	12	11-12	F
Bohemian Waxwing	*Bombycilla garrulus*				25	13-15	17-21	P
Boreal Chickadee	*Poecile hudsonicus*				25	14-18	12-14	P
Boreal Owl	*Aegolius funereus*			Forest, coniferous	1000	28-30	28-35	P
Brewers Blackbird	*Euphagus cyanocephalus*				5	11-17	12-16	None
Brewer's Sparrow	Spizella breweri				25	12-14	12-16	F
Broad-winged Hawk	*Buteo platypterus*			Forest, deciduous	200	28-31	28-35	F
Brown Creeper	*Certhia americana*			Forest, coniferous	25	14-18	12-16	P
Brown-headed Cowbird	*Molothrus ater*				25	10-13	12-16	F
Buff-brested Sandpiper	*Calidris subruficollis*	Special Concern-1	Special Concern (2012)	Stop-over sites, short grass	200	23-25	18-20	F
Bufflehead	*Bucephala albeola*				25	28-33	12-14	F
Burrowing owl	*Athene cunicularia*	Endangered-1	Endangered	pasture	500	28	21	F
Calliope Hummingbird	*Stellula calliope*				25	15-16	12-14	F
Canada Goose	*Branta canadensis*				25	25-30	1-2	F
Canada Warbler	*Cardellina canadensis*	1-Threatened (Feb 2010)	Threatened (Mar 2008)	Forest, mixed wood	450	11-13	12-14	F

Appendix E-6 Manitoba Hydro Breeding Bird Buffer Guidelines

Key	
(red)	Manitoba Conservation Data Centre specified
(green)	100-200 m Buffer
(orange)	50 m Buffer
(white)	25 m Buffer

Species	Scientific Name	SARA (schedule & status)	COSEWIC (status & date assessed)	Habitat	Minimum Suggested Buffer (Meters)	Incubation Time (days)	Estimated Time to Leaving Nest or Fledging after hatching (Days)	Jurisdiction for Birds (F=Federal migratory, P=Provincial year-round resident), Nests = Provincial legislation for Herons, Eagles, and others
Canvasback	*Aythya valisineria*			Open water wetlands or riparian	25	23-29	1-4	F
Cape May Warbler	*Setophaga tigrina*			Forest, coniferous	50	11-13	12-14	F
Cassin's Finch	*Carpodacus cassinii*				25	12-14	12-14	F
Cedar Waxwing	*Bombycilla cedrorum*				25	12-16	12-14	F
Chestnut-collared longspur	*Calcarius ornatus*	1-Threatened	Threatened	mixed grass prairie	650	11		F
Chestnut-sided Warbler	*Setophaga pensylvanica*				25	11-14	12-14	F
Chimney swift	*Chaetura pelagica*	1-Threatened	Threatened	anthropogenic	300			F
Chipping Sparrow	*Spizella passerina*				25	11-14	12-14	F
Clay-colored Sparrow	*Spizella pallida*				25	10-12	12-14	F
Cliff Swallow	*Petrochelidon pyrrhonota*			Open water wetlands or riparian	25	14-16	12-14	F
Common Goldeneye	*Bucephala clangula*			Open water wetlands or riparian	25	28-33	1-2	F
Common Grackle	*Quiscalus quiscula*				5	12-14	12-14	None
Common Loon	*Gavia immer*				50	26-31	1-2	F
Common Merganser	*Mergus merganser*				25	28-35	1-2	F
Common Nighthawk	*Chordeiles minor*	1-Threatened (Feb 2010)	Threatened (Apr 2007)	Forest clearings, grassland, or pasture	300	19-20	17-18	F
Common Raven	*Corvus corax*				25	18-21	12-14	P
Common Redpoll	*Acanthis flammea*				25	10-11	9-14	P
Common Yellowthroat	*Geothlypis trichas*				25	11-14	12-14	F
Connecticut Warbler	*Oporornis agilis*			Forest, deciduous	50	11-14	12-14	F
Dark-eyed Junco	*Junco hyemalis*				25	11-14	12-14	P
Double-crested cormorant	*Phalocrocorax auritus*			aquatic	750			F
Downey Woodpecker	*Picoides pubescens*				25	11-14	12-14	P
Dusky Flycatcher	*Empidonax oberholseri*			Forest, coniferous	25	12-16	12-14	F
Dusky Grouse	*Dendragapus obscurus*			Shrubland or young forest	25	25-26	1-4	P
Eastern Kingbird	*Tyrannus tyrannus*			Open water wetlands or riparian	25	16-18	12-14	F
Eastern screech owl	*Megascops asio*			tree cover	500	26-30		P
Eastern whip-poor-will	*Antrostomus vociferus*	1-Threatened	Threatened	open woodland	300	19-21		F
Eastern wood-pewee	*Contopus virens*		Special Concern	clearings, forest edges	300	12-13		F
European Starling	*Sturnus vulgaris*				0	N/A	N/A	P
Evening Grosbeak	*Coccothraustes vespertinus*			Forest, mixed wood	25	12-16	12-14	P
Ferruginous hawk	*Buteo regalis*	1-Threatened	Threatened	open country	1000	32-33		P
Flammulated owl	*Psiloscops flammeolus*	1- Special Concern	Special Concern		50			
Fox Sparrow	*Passerella iliaca*				25	12-14	12-14	P

Appendix E-6 Manitoba Hydro Breeding Bird Buffer Guidelines

Key	
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(green)	100-200 m Buffer
(orange)	50 m Buffer
(white)	25 m Buffer

Species	Scientific Name	SARA (schedule & status)	COSEWIC (status & date assessed)	Habitat	Minimum Suggested Buffer (Meters)	Incubation Time (days)	Estimated Time to Leaving Nest or Fledging after hatching (Days)	Jurisdiction for Birds (F=Federal migratory, P=Provincial year-round resident), Nests = Provincial legislation for Herons, Eagles, and others
Golden Eagle	*Aquila chrysaetos*			Cliffs	1000	41-45	45-81	F
Golden-crowned Kinglet	*Regulus satrapa*				25	14-15	12-14	P
Golden-crowned Sparrow	*Zonotrichia atricapilla*				25	11-14	12-14	F
Golden-winged warbler	*Vermivora chrysoptera*	1-Threatened	Threatened	open woodland	450	10-11		F
Grasshopper sparrow	*Ammodramus savannarum*			open grassland, prairie	400	11-13		F
Gray Jay	*Perisoreus canadensis*				25	16-18	22-24	P
Great Blue Heron	*Ardea herodias*			Forest, mixed wood	750	25-30	49-81	P
Great Gray Owl	*Strix nebulosa*			Forest, mixed wood	1000	28-30	28-35	P
Great Horned Owl	*Bubo virginianus*			Forest, mixed wood	100	28-35	28-35	P
Greater Scaup	*Aythya marila*			Open water wetlands or riparian	25	24-28	1-4	F
Greater Yellowlegs	*Tringa melanoleuca*			Open water wetlands or riparian	25	20-24	1-4	F
Grebes				Colonial nesting sites	200			F
Green-winged Teal	*Anas crecca*				25	20-24	1-4	F
Gulls/Terns				Colonial nesting sites	500			F
Hairy Woodpecker	*Picoides villosus*				25	11-15	28-30	P
Hammond's Flycatcher	*Empidonax hammondii*				25	12-16	12-14	F
Harlequin Duck	*Histrionicus histrionicus*			Open water wetlands or riparian	100	27-30	1-2	F
Hermit Thrush	*Catharus guttatus*				25	12-14	12-14	F
Herons spp.				Nesting Colony	500			F
Hoary Redpoll	*Acanthis hornemanni*				25	9-12	12-14	P
Hooded Merganser	*Lophodytes cucullatus*				25	32-33	1-4	F
Horned Grebe	*Podiceps auritus*		Special Concern (Apr 2009)	Open water wetlands or riparian	400	22-25	1-4	F
Horned Lark	*Eremophila alpestris*			Alpine, subalpine	25	11-12	12-14	F
House Finch	*Carpodacus mexicanus*				25	12-14	12-14	F
House Sparrow	*Passer domesticus*				0	N/A	N/A	P
House Wren	*Troglodytes aedon*				25	12-16	12-14	F
Killdeer	*Charadrius vociferus*			Forest clearings, grassland, or pasture	25	22-28	1-2	F
Le Conte's Sparrow	*Ammodramus leconteii*			Emergent-dominated wetlands	25	12-14	12-14	F
Least Flycatcher	*Empidonax minimus*				25	12-17	12-14	F
Least Bittern	*Ixobrychus exilis*	Threatened-1	Threatened		200			F
Lesser Scaup	*Aythya affinis*			Open water wetlands or riparian	25	21-28	1-2	F
Lesser Yellowlegs	*Tringa flavipes*				25	22-23	1-2	F
Lincoln's Sparrow	*Melospiza lincolnii*				25	12-14	12-14	F
Loggerhead shrike prairie subspecies	*Lanius ludovicianus*	1-Threatened	Threatened	open woodland	500	16		F
Long-eared Owl	*Asio otus*				200	26-28	28-35	P
MacGillivray's Warbler	*Geothlypis tolmiei*				25	11-12	12-14	F
Magnolia Warbler	*Setophaga magnolia*				25	11-14	12-14	F
Mallard	*Anas platyrhynchos*				25	26-30	1-2	F
Marsh Wren	*Cistothorus palustris*				25	12-16	12-14	F

Appendix E-6 Manitoba Hydro Breeding Bird Buffer Guidelines

Key	
(red)	Manitoba Conservation Data Centre specified
(green)	100-200 m Buffer
(orange)	50 m Buffer
(white)	25 m Buffer

Species	Scientific Name	SARA (schedule & status)	COSEWIC (status & date assessed)	Habitat	Minimum Suggested Buffer (Meters)	Incubation Time (days)	Estimated Time to Leaving Nest or Fledging after hatching (Days)	Jurisdiction for Birds (F=Federal migratory, P=Provincial year-round resident), Nests = Provincial legislation for Herons, Eagles, and others
Merlin	*Falco columbarius*				25	28-32	29	F
Mountain Bluebird	*Sialia currucoides*				25	12-14	12-14	F
Mountain Chickadee	*Poecile gambeli*				25	11-12	12-14	P
Mountain White-crowned Sparrow	*Zonotrichia l. oriantha*				25	11-14	12-14	F
Mourning Warbler	*Geothlypis philadelphia*			Forest, mixed wood	25	12-14	12-14	F
Nashville Warbler	*Oreothlypis ruficapilla*				25	11-12	12-14	F
Nelson's Sparrow	*Ammodramus nelsoni*			Open water wetlands or riparian	50	11-12	12-14	F
Northern Flicker	*Colaptes auratus*				25	11-16	24-27	F
Northern Goshawk	*Accipiter gentilis*				200	36-41	12-14	P
Northern Harrier	*Circus cyaneus*			Forest clearings, grassland, or pasture	100	28-36	12-14	F
Northern Hawk Owl	*Surnia ulula*			coniferous or mix forest near open areas	1000	25-30	25-30	P
Northern Pintail	*Anas acuta*			Open water wetlands or riparian	25	22-25	1-2	F
Northern Pygmy-owl	*Glaucidium gnoma*			Forest, coniferous; forest, mixedwood	200	29-30	28-35	P
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*			Open water wetlands or riparian	25	11-14	18-21	F
Northern Saw-whet Owl	*Aegolius acadicus*				100	26-28	28-35	P
Northern Shoveler	*Anas clypeata*				25	21-27	1-2	F
Northern Shrike	*Lanius excubitor*				25	15-16	20-21	F
Northern Waterthrush	*Parkesia noveboracensis*				25	11-14	12-14	F
Olive-sided Flycatcher	*Contopus cooperi*	1-Threatened (Feb 2010)	Threatened (Nov 2007)	Forest, coniferous	300	14-17	12-14	F
Osprey	*Pandion haliaetus*				200	35-40	36-42	P
Ovenbird	*Seiurus aurocapilla*				25	11-14	12-14	F
Pacific Wren	*Troglodytes pacificus*					12-16	12-14	F
Pacific-slope Flycatcher	*Empidonax difficilis*			Forest, coniferous	25	14-16	12-14	F
Peregrine Falcon	*Falco peregrinus*	1-Threatened (May 2003)	Special Concern (Apr 2007)		1000	28-32	35-42	P
Philadelphia Vireo	*Vireo philadelphicus*			Shrubland or young forest	25	11-14	12-14	F
Pied-billed Grebe	*Podilymbus podiceps*			Open water wetlands or riparian	25	23-27	1-2	F
Pileated Woodpecker	*Dryocopus pileatus*			Forest, deciduous	25	15-18	24-28	P
Pine Grosbeak	*Pinicola enucleator*			Forest, deciduous	25	10-12	12-14	P
Pine Siskin	*Spinus pinus*			Forest, coniferous	25	11-14	12-14	P
Piping plover	*Charadrius melodus melodus*	E-1	Endangered		400	25-27	Jan-00	F
Purple Finch	*Carpodacus purpureus*			Forest, coniferous	25	11-14	12-14	F

Appendix E-6 Manitoba Hydro Breeding Bird Buffer Guidelines

Key	
(red)	Manitoba Conservation Data Centre specified
(green)	100-200 m Buffer
(orange)	50 m Buffer
(white)	25 m Buffer

Species	Scientific Name	SARA (schedule & status)	COSEWIC (status & date assessed)	Habitat	Minimum Suggested Buffer (Meters)	Incubation Time (days)	Estimated Time to Leaving Nest or Fledging after hatching (Days)	Jurisdiction for Birds (F=Federal migratory, P=Provincial year-round resident), Nests = Provincial legislation for Herons, Eagles, and others
Red Crossbill	*Loxia curvirostra*			Forest, coniferous	25	12-18	12-14	P
Red-breasted Merganser	*Mergus serrator*			Open water wetlands or riparian	25	29-35	1-2	F
Red-breasted Nuthatch	*Sitta canadensis*			Forest, coniferous	25	11-14	12-14	P
Red-breasted Sapsucker	*Sphyrapicus ruber*			Forest, deciduous	25	12-14	24-27	F
Red-eyed Vireo	*Vireo olivaceus*			Forest, deciduous	25	11-14	12-14	F
Redhead	*Aythya americana*			Open water wetlands or riparian	25	23-29	1-2	F
Red-headed woodpecker	*Melanerpes erythrocephalus*	1-Threatened	Threatened	open woodland	200	12-14		F
Red Knot	*Calidris canutus rufa*	E-1	Endangered	Stop-over sites	200	20-22	1-Feb	F
Red-naped Sapsucker	*Sphyrapicus nuchalis*			Forest, deciduous	25	12-14	24-27	F
Red-necked Grebe	*Podiceps grisegena*			Open water wetlands or riparian	25	20-23	1-2	F
Red-necked Phalarope	*Phalaropus lobatus*		Special Concern	Open water wetlands or riparian	25	17-21	1-2	F
Red-tailed Hawk	*Buteo jamaicensis*				100	30-35	42-46	F
Red-winged Blackbird	*Agelaius phoeniceus*			Open water wetlands or riparian	5	11-14	12-14	P
Ring-necked Duck	*Aythya collaris*			Open water wetlands or riparian	25	23-29	1-2	F
Rose-breasted Grosbeak	*Pheucticus ludovicianus*			Forest, deciduous	25	12-14	12-14	F
Ross's Gull	*Rhodostethia rosea*	Threatened-1	Threatened		1000	19-22	19-22	F
Rough-legged Hawk	*Buteo lagopus*			Alpine, subalpine, grassland, pasture	200	30-35	42-46	F
Ruby-crowned Kinglet	*Regulus calendula*				25	12-14	12-14	F
Ruby-throated Hummingbird	*Archilochus colubris*				25	11-16	12-14	F
Ruffed Grouse	*Bonasa umbellus*			Forest, mixed wood	25	21-28	1-4	P
Rufous Hummingbird	*Selasphorus rufus*			Forest, coniferous; Riparian areas and forest	25	12-14	12-14	F
Rusty Blackbird	*Euphagus carolinus*	1-Special Concern (Mar 2009)	Special Concern (Apr 2006)	Open water wetlands or riparian	300	12-18	12-14	F
Sandhill Crane	*Grus canadensis*				100	28-32	1-4	F
Savannah Sparrow	*Passerculus sandwichensis*				25	11-14	12-14	F
Say's Phoebe	*Sayornis saya*				25	12-14	12-14	F
Sharp-shinned Hawk					100	34-35	21-28	F
Sharp-tailed Grouse	*Tympanuchus phasianellus*			Forest clearings, grassland, or pasture (25m for a nest and 1000m for a lek)	25	21-28	1-4	P
Short-eared Owl	*Asio flammeus*	1-Special Concern (Jul 2012)	Special Concern (Mar 2008)	Alpine, subalpine, grassland, pasture	500	25-29	28-35	F
Snow Bunting	*Plectrophenax nivalis*				25	10-16	12-14	P
Snowy Owl	*Bubo scandiacus*			Forest clearings, grassland, or pasture	N/A	N/A	N/A	F

Appendix E-6 Manitoba Hydro Breeding Bird Buffer Guidelines

Key	
(red)	Manitoba Conservation Data Centre specified
(green)	100-200 m Buffer
(orange)	50 m Buffer
(white)	25 m Buffer

Species	Scientific Name	SARA (schedule & status)	COSEWIC (status & date assessed)	Habitat	Minimum Suggested Buffer (Meters)	Incubation Time (days)	Estimated Time to Leaving Nest or Fledging after hatching (Days)	**Jurisdiction for Birds** (F=Federal migratory, P=Provincial year-round resident), Nests = Provincial legislation for Herons, Eagles, and others
Solitary Sandpiper	*Tringa solitaria*				25	23-24	17-20	F
Song Sparrow	*Melospiza melodia*				25	12-14	12-14	F
Sora	*Porzana carolina*				25	18-20	1-4	F
Spotted Sandpiper	*Actitis macularius*				25	20-24	1-4	F
Sprague's Pipit	*Anthus spragueii*	1-Threatened	Threatened	open grassland	650	12-14	12-14	F
Spruce Grouse	*Falcipennis canadensis*				25	21-24	1-4	P
Steller's Jay	*Cyanocitta stelleri*				25	16-18	16	P
Surf Scoter	*Melanitta perspicillata*			Open water wetlands or riparian	25	25-30	1-4	F
Swainson's Hawk	*Buteo swainsoni*				200	28-32	21-28	F
Swainson's Thrush	*Catharus ustulatus*			Forest, mixed wood	25	12-14	12-14	F
Swamp Sparrow	*Melospiza georgiana*				25	12-15	12-14	F
Tennessee Warbler	*Oreothlypis peregrina*				25	11-14	12-14	F
Townsend's Solitaire	*Myadestes townsendi*			Alpine, subalpine	25	12-14	12-14	F
Townsend's Warbler	*Setophaga townsendi*				25	12-14	12-14	F
Tree Swallow	*Tachycineta bicolor*			Open water wetlands or riparian	25	12-16	12-14	F
Trumpeter Swan	*Cygnus buccinator*				1000	32-37	1-4	F
Tundra Swan	*Cygnus columbianus*			Open water wetlands or riparian	100	31-40	1-4	F
Turkey Vulture	*Cathartes aura*				100	38-41	60-84	F
Upland Sandpiper	*Bartramia longicauda*			Forest clearings, grassland, or pasture	50	21-27	30-31	F
Varied Thrush	*Ixoreus naevius*				25	12-14	12-14	F
Vaux's Swift	*Chaetura vauxi*			Forest, coniferous; Forest, deciduous	25	18-20	12-14	F
Vesper Sparrow	*Pooecetes gramineus*			Forest clearings, grassland, or pasture	25	11-14	12-14	F
Violet-green Swallow	*Tachycineta thalassina*			Meadows; open woodlands; wooded canyons	25	12-14	12-14	F
Warbling Vireo	*Vireo gilvus*				25	12-14	12-14	F
Western Bluebird	*Sialia mexicana*				25	12-14	12-14	F
Western Grebe	*Aechmophorus occidentalis*			Open water wetlands or riparian	50	23-24	1-4	F
Western Kingbird	*Tyrannus verticalis*				25	18-20	12-14	F
Western Meadowlark	*Sturnella neglecta*				25	12-16	12-14	F
Western Palm Warbler	*Setophaga palmarum*				25	12-14	12-14	F
Western Tanager	*Piranga ludoviciana*				25	12-14	12-14	F
Western Wood-Pewee	*Contopus sordidulus*			Forest, coniferous;	25	12-14	12-14	F
White-breasted Nuthatch	*Sitta carolinensis*				25	12-14	12-14	P
White-crowned Sparrow	*Zonotrichia leucophrys*				25	11-14	12-14	F
White-throated Sparrow	*Zonotrichia albicollis*				25	11-14	12-14	F
White-winged Crossbill	*Loxia leucoptera*				25	12-14	12-14	P
Whooping Crane	*Grus americana*	Endangered-1	Endangered	Staging Area	750			F
Willow Ptarmigan	*Lagopus lagopus*				25	21-22	1-4	P

Appendix E-6 Manitoba Hydro Breeding Bird Buffer Guidelines

Key	
(red)	Manitoba Conservation Data Centre specified
(green)	100-200 m Buffer
(orange)	50 m Buffer
(white)	25 m Buffer

Species	Scientific Name	SARA (schedule & status)	COSEWIC (status & date assessed)	Habitat	Minimum Suggested Buffer (Meters)	Incubation Time (days)	Estimated Time to Leaving Nest or Fledging after hatching (Days)	Jurisdiction for Birds (F=Federal migratory, P=Provincial year-round resident), Nests = Provincial legislation for Herons, Eagles, and others
Wilson's Phalarope	*Phalaropus tricolor*			Open water wetlands or riparian	25	18-21	1-4	F
Wilson's Snipe	*Gallinago delicata*			Emergent-dominated wetlands; riparian areas and forest	25	18-21	1-4	F
Wilson's Warbler	*Cardellina pusilla*			Shrubland or young forest	25	11-14	12-14	F
Winter Wren	*Troglodytes hiemalis*				25	12-16	12-14	F
Yellow Rail	*Coturnicops noveboracensis*	1-Special Concern (Jun 2003)	Special Concern (Nov 2009)	Emergent-dominated wetlands	350	16-18	1-4	F
Yellow Warbler	*Setophaga petechia*			Forest, deciduous; young/disturbed; riparian; willow	25	11-14	12-14	F
Yellow-bellied Flycatcher	*Empidonax flaviventris*				25	12-16	12-14	F
Yellow-bellied Sapsucker	*Sphyrapicus varius*				25	11-14	25-29	F
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*			Open water wetlands or riparian	25	11-14	12-14	F
Any other federal or provincially bird species not listed					25			

APPENDIX F

Reptile and Amphibian Protection Document

Reptile and Amphibian protection document

Habitat identification

Amphibians should be assumed to be present in all wetland or shallow water areas supporting emergent vegetation (cattails, bulrushes, lily pads) during the amphibian emergence and breeding period (April 1st to August 15th).

When sampling the habitat, a qualified biologist, contractor, or consultant should investigate the shallow water zone (to rubber - boot depth), the waterline and the shore zone (within three meters of the waterline) when possible. In this way, other age classes of leopard frogs may be observed, such as egg masses and larvae (depending on the time of year). Both flowing and standing water can be surveyed in this fashion.

Visual encounter survey

Visual Encounter Surveys, to be completed by the contractor, are an effective method of locating frogs and egg masses during the breeding season (See excerpt from Kendell, 2002 below for survey procedure). Egg masses are easily detected when walking the shorelines and other shallow sections of a pond. Also, adult frogs are active in the breeding season and are often found near egg masses, so that many can be located during visual searches. As a rule, surveys conducted at various times of day are the single most effective method for removing frogs of all life stages during the active seasons.

Survey protocol should follow the steps outlined in Kendell (2002), which outlines:

- The habitat should be walked at a constant speed that is conducive to observing frogs under the given habitat characteristics at the site. For example, open habitats with sparse and low vegetation can be walked at a greater speed because the observer is less likely to overlook frogs obscured by vegetation. In contrast, a slower walking speed is required if the habitat possess - thicker and taller vegetation. In either case, the observer should walk in a systematic fashion to cover all favorable habitats both thoroughly and equally.
- A good self-test, to ensure that the proper speed and diligence is being used while surveying a habitat, is as follows: The individual conducting the survey should be able to spot less obvious animal life underfoot and within peripheral vision. For example, the individual may observe or hear a mouse scurrying through the grass, a young garter snake basking on a rock, other amphibian

species and large insects on the ground, vegetation, water or below the surface of the water.
- Report survey results to Manitoba Hydro environment officer.

Kendell, K. 2002. Survey protocol for the northern leopard frog. Alberta Sustainable Resources Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 43. Edmonton, Alberta. 30 pp.

Mitigation measures

- Restrict access to shallow water areas to protect breeding ponds and their vegetation from trampling and other disturbances. In areas directly impacted by construction, and in which amphibians occur, all life stages of frogs should be captured and removed to areas outside of the construction area.
- Erect exclusion fencing (e.g., sedimentation fence) prior to activities occurring in areas of breeding habitat (e.g., wetland features, low-lying ephemeral ponds) to minimize the risk of frogs entering the work area: Exclusion fencing height should be a minimum of 50 cm and the bottom of the fabric must be buried 10-20 cm down with an additional fabric lip extending outwards 90 degrees another 15 cm, the fabric lip must be backfilled and compacted to ensure it does not become exposed. Bury support stakes for exclusion fencing a minimum of 30 cm into the ground on the activity side of the fence; leave an overhang or lip on the exterior to prevent frogs from jumping into the fenced off area.

APPENDIX G

Species of Concern Contingency Measures

Species of Concern contingency measures

The following procedures provide contingency measures for the discovery of species of concern prior to and during a construction project. Species of concern can include rare vascular plants, rare non-vascular plants, and rare wildlife species.

Plant Species of Concern Discovery Prior to Construction

If rare plants are discovered during future vegetation studies along the transmission line, the plant or plant community will be assessed by a Manitoba Hydro vegetation specialist and appropriate mitigation measures will be determined prior to construction within the area of plant discovery. Mitigation measures will be determined following an assessment, which will include the following:

- the position of the plant or plant community on the construction right-of-way
- the relative rarity of the plant or plant community (regionally, nationally, etc.)
- the local abundance of the plant or plant community

Mitigation options to be implemented by the Contractor or Manitoba Hydro may include, however, are not limited to the following:

- narrowing down the proposed area of disturbance and protecting the site using fencing or clearly marking the site using flagging and signage (Contractor)
- informing project staff of access restrictions within in the vicinity of flagged or fenced sites (Contractor)
- temporarily covering the site with geotextile pads, flex net, mats or equivalent (Contractor)
- adjusting centerline access trail to avoid or limit potential effects on the plant or plant community (Contractor)
- adjusting tower location to avoid the plant or plant community (Manitoba Hydro);
- salvaging and transplanting portions of sod and surrounding vegetation Transplanted materials may be moved to a suitable location off right-of-way (Manitoba Hydro)
- other site-specific procedures to avoid disturbance to rare plants or plant communities, as recommended by the vegetation specialist (Contractor/Manitoba Hydro)

The Manitoba Hydro environmental officer will be responsible for making the final decision on mitigation measures to be applied, in consultation with a qualified biologist, project engineer and when uncertainty exists, the appropriate provincial or federal regulatory authorities. All mitigation measures for sites within the project development area will be described in the Construction Environmental Protection Plan.

Wildlife Species of Concern Discovery Prior to Construction

If wildlife species of concern or their site-specific habitat are discovered within the project area, the discovery will be assessed, and appropriate mitigation measures will be determined by Manitoba Hydro. The wildlife or habitat will be assessed based on the following criteria:

- the location of the wildlife or habitat feature with respect to the project development area
- the presence of topographic features or vegetation to effectively screen the wildlife or habitat from construction activities
- the existing level of disturbance and ongoing sensory disturbance at the site
- the timing of construction versus the critical timing constraints for the species; and
- the potential for an alteration of construction activities to reduce or avoid sensory and/or physical disturbance
- the wildlife species, its conservation status and specific habitat needs relative to the area of development

The mitigation measures to be implemented by the Contractor or Manitoba Hydro may include, but are not limited to, the following:

- abide by reduced risk timing windows within the recommended setback/buffer distances (Contractor)
- narrow down the proposed area of disturbance and protect the site using fencing or clearly mark the site using flagging (Contractor)
- alter or delay construction activities to avoid sensory disturbance (e.g., no burning) Contractor)
- inform project staff of access restrictions in the vicinity of flagged or fenced sites (Contractor)
- adjust tower locations to avoid the site (Manitoba Hydro)
- install nest boxes or platforms, or otherwise replace or enhance habitat during reclamation or restoration
- with the appropriate approval, relocate species (i.e., amphibians) or features (i.e., unoccupied stick nests)(Contractor), if practical

The Manitoba Hydro environmental officer will be responsible for making the final decision on mitigation measures to be applied, in consultation with a qualified biologist, project engineer and when uncertainty exists, the appropriate provincial or

Federal regulatory authorities. All sites and associated mitigation measures within the Project development area will be added to the Construction Environmental Protection Plan.

Species of concern discovery during project construction

If rare plants or wildlife species are identified or suspected along the construction right-of-way during construction (e.g., during survey activities, prior to clearing and construction), contractor staff are to follow the measures outlined below:

- Suspend work immediately in the vicinity of any newly discovered species of concern. Work at that location may not resume until the measures below are conducted
- Notify Manitoba Hydro environmental officer / inspector
- Flag or fence the area until the plant, wildlife species or community can be confirmed. MH environmental officer / inspector may enlist a qualified biologist to assist with confirmation

Implement protection measures based on specific site conditions and criteria found in reference ii - CEnvPP Appendix D (buffers and setbacks) and or Appendix E (avian protection).

The Manitoba Hydro environmental officer will be responsible for making the final decision on mitigation measures to be applied, in consultation with a qualified biologist, Project Engineer and when uncertainty exists, the appropriate Provincial or Federal regulatory authorities. Mitigation measures fall into categories previously identified above.

Appendix H

Erosion and Sediment Control Plan

Radisson to Henday (R44H)

230 kV Transmission Project

Erosion and sediment control management plan

Prepared by Manitoba Hydro

Transmission & Distribution Environment
and Engagement Department

Project Management Division

December 2023

Preface

This document presents the Erosion and Sediment Control Plan (ESCP; the plan) for the construction of the Radisson to Henday 230 kV transmission project (the project). It is intended to provide information and instruction to contractors and Manitoba Hydro employees as well as information to regulators and members of the public. The plan provides general considerations and guidance pertinent to erosion and sediment control during the development of the project. More importantly it presents a project-specific implementation plan and actions required to prevent and mitigate erosion and sedimentation because of construction of the project. Inspection and compliance along with monitoring programs are described to confirm adherence to required actions including documentation and record-keeping. Environmental management practices guidance sheets are provided for the installation and maintenance of erosion and sedimentation control measures in the appendices.

Manitoba Hydro employees and contractors are encouraged to contact the onsite Manitoba Hydro environmental inspector/officer if they require information, clarification, or support. Regulators and the public are to direct any inquiries about this plan to:

Manitoba Hydro
Transmission & Distribution Environment and Engagement
360 Portage Avenue
Winnipeg, MB
Canada R3C 0G8
1-877-343-1631

Projects@hydro.mb.ca

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Definitions

Erosion - occurs when energy (wind or water) is applied to a soil surface causing the detachment, suspension, and transfer of soil particles from a stable mass.

Sedimentation – The process whereby the energy of wind or water carrying soil particles is reduced to the point that those suspended particles are allowed to settle out and be deposited, creating a build-up of sediment at that location.

Deleterious – The federal *Fisheries Act* defines it as "Any substance that, if added to water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use of by man of fish that frequent that water" (Canadian *Fisheries Act*).

1.0 Introduction

Consistent with its corporate Environmental Management Policy, Manitoba Hydro has committed within the project construction environmental protection plan to developing an erosion and sediment control plan (ESCP) as part of a larger suite of mitigation measures to minimize potential negative environmental and socio-economic effects. This document outlines the procedures to be employed by contractors to mitigate the potential for erosion and sediment transport during the activities related to transmission project construction. With an advance review of the project locations and topography, the contractor can identify areas at risk of erosion during the different construction activities.

This document identifies some of the common erosion and sediment control (ESC) materials and environmental management practices. This document also includes detailed design drawings that indicate correct installation methods for ESC materials to help ensure effectiveness and reduce maintenance.

Note that the methods presented here are not exhaustive and alternative methods may be proposed by the contractor but would require approval from a Manitoba Hydro environmental officer prior to implementation.

Manitoba Hydro's environmental protection program (EPP) provides the framework for the delivery, management and monitoring of environmental and socio-economic protection measures that satisfy corporate policies and commitments, regulatory requirements, environmental protection guidelines and best practices, and input during project engagement. The program describes how Manitoba Hydro is organized and functions to deliver timely, effective, and comprehensive solutions and mitigation measures to address potential environmental effects. This ESCP is a component of the EPP as illustrated in Figure 1.

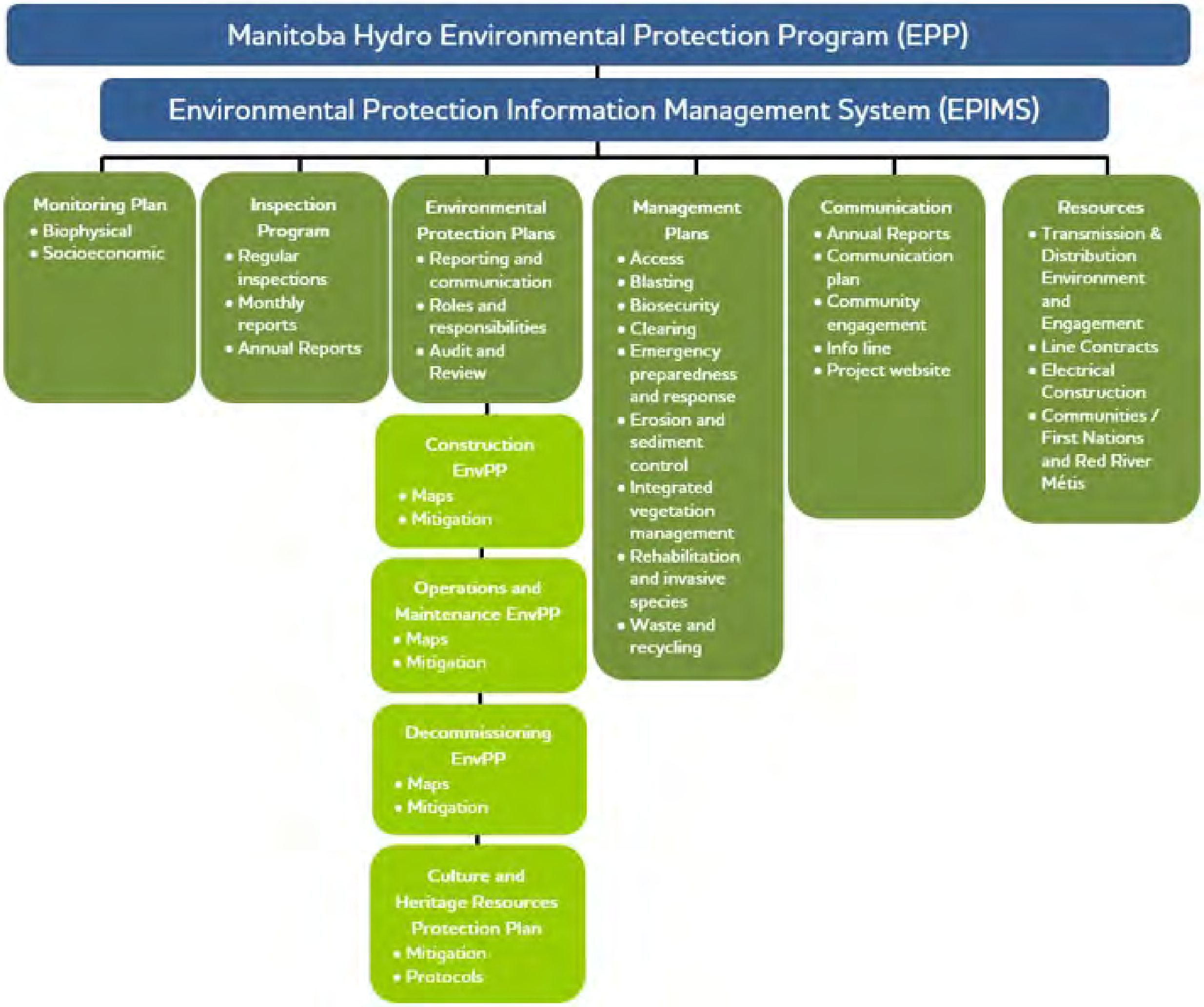

Figure 1: Transmission environmental protection program

1.1 Commitment to environmental protection

Manitoba Hydro integrates environmentally responsible practices in all aspects of our business. Environmental protection can only be achieved with the involvement of Manitoba Hydro employees, consultants, contractors, Indigenous communities and organizations and the public at all stages of the project from planning and design through construction and operational phases.

The use of an ESCP is a practical and direct implementation of Manitoba Hydro's environmental policy and its commitment to responsible environmental and social stewardship. It is a proactive approach to manage potential effects of access related to the construction of a new transmission line.

Manitoba Hydro is committed to implementing this ESCP and requiring contractors to follow the terms of this and other applicable plans within the environmental protection program.

1.2 Purpose and objectives

This Erosion and Sediment Control Plan is intended to be used as a reference document in the field, during construction activities to addresses sediment transport and erosion concerns while ensuring compliance with Manitoba Hydro's construction environmental protection plan requirements, industry best practices, and provincial/federal regulations and legislation. To effectively mitigate the potential effects of erosion and sedimentation due to construction activities, a variety of ESC measures are available for implementation. The appendix outlines standard erosion and sediment control techniques along with a description of the situations where each technique may be employed and directions for correct implementation. Should a contractor wish to deviate from the control techniques or implementation described in this document they must first obtain approval from a Manitoba Hydro environmental officer.

The objectives of this erosion and sediment control plan are as follows:

- To establish a process prior to the start of construction that can be used to identify erosion prone sites and where necessary, implement, monitor, and maintain erosion and sediment controls. This process will meet regulatory requirements, industry standards and best practices with regards to ESC during construction activities.
- To provide guidance on the correct implementation and installation of erosion and sediment control measures.

1.3 Background

Construction activities associated with the project will involve vegetation removal as well as disturbed soil/ground which may alter and increase water runoff in some areas. Excessive runoff has the potential to cause flooding as well as a rapid increase in natural erosion and sedimentation rates that, if left uncontrolled, can irreparably harm the environment and aquatic habitats.

Wind is not considered to be a major contributing factor to erosion on transmission construction projects due to the limited instances of exposed soil and the short-term duration in which they are exposed. For this reason, management practices controlling water erosion are the primary focus of this manual. While several of the water erosion control methods are also effective at reducing wind erosion, specific mitigations are addressed in the erosion and sediment control management practices in Section 3.0.

1.4 Potential effects of erosion and sedimentation

The importance of erosion and sedimentation control is primarily to reduce the potential impact that erosion has on watercourses such as creeks, streams, rivers, and lakes etc. Soil consists of many components, the majority of which are organic material, sand, silt, and clay. It is the silt and clay that are the most damaging to watercourses as they are comprised of small particles that can be carried for long distances while suspended in water. Small silt and clay particles can cloud the water making it difficult for fish to find food, and block sunlight reaching aquatic plants. When small silt and clay particles settle on the bottom, they can smother fish and amphibian eggs. There is an added risk that eroded soil may carry hard metals, traces of petroleum product or other pollutants from land into a watercourse.

The effects of sedimentation in watercourses can be profound enough to be considered deleterious (harmful or damaging) to fish. Failure to prevent erosion and sedimentation of watercourses is considered a reportable offence under section 35 of the *Fisheries Act*.

1.5 Roles and responsibilities

This section outlines the major roles and responsibilities of those involved in the implementation of the plan.

A summary of key roles and responsibilities is found in Table 1.

Table 1: Key roles and responsibilities

Role	Key responsibilities
Manitoba Hydro	• Approves ESC planning, design, implementation, inspection, monitoring, maintenance, operation, and decommissioning. • May delegate this responsibility to other design and construction professionals to construct/implement, maintain and inspect/monitor for the duration of the undertaking. • Signs agreements, approvals, permits and authorizations to which compliance is legally binding. • Ensures ESC measures are installed, maintained, or restored by the contractor. • Appoints an environmental inspector/officer or delegate to confirm that regulatory criteria are being met by the ESCP. • The Manitoba Hydro environmental inspector/officer or delegate will inspect erosion and sediment control measures to confirm effectiveness.
Construction Contractor	• Will communicate erosion and sediment control information/training to all project staff and will ensure a copy of the erosion and sediment control plan is available at the project site. • Responsible for installation, maintenance and decommissioning of erosion and sediment control installations to ensure continued effectiveness. • Confirm with an MH environmental inspector\officer that regulatory criteria are being met by the ESCP. • Respond and act promptly to resolve if any activities are identified as not in compliance with the ESCP or any regulatory requirements. • Responsible for sourcing ESC materials and maintaining a sufficient readily available stockpile onsite. • Responsible for modifying and maintaining erosion and sediment control installations to ensure continued effectiveness through regular monitoring performed by their Environmental Representative. • Responsible to monitor and report to MH on ESC implementation effectiveness including any need for repair and maintenance. • Stabilize and re-vegetate disturbed areas as soon as practicable or where deemed necessary by Manitoba Hydro,

Table 1: Key roles and responsibilities

Role	Key responsibilities
	rehabilitation is not to be deferred until construction is complete

2.0 Regulatory context

Federal and provincial acts and regulations govern activities that have the potential to cause harm to the environment. This erosion and sediment control plan will provide the contractor with a required process to mitigate erosion and sedimentation to comply with provincial/federal regulations and legislation. One of the most pertinent acts involving construction activities and erosion and sedimentation is the federal *Fisheries Act*.

The *Fisheries Act* prohibits any work, undertaking or activity, other than fishing, that results in the death of fish or the harmful alteration, disruption, or destruction of fish habitat.

The purpose of the Fisheries Act is to provide a framework for the proper management and control of fisheries and the conservation and protection of fish and fish habitat, including by preventing pollution.

Sediments are considered to have a deleterious effect on aquatic habitats.

Construction activities are required to take every precaution to prevent deposition of sediments into aquatic habitats and there is a duty to notify and take corrective action on any incidences of incidental deposition.

Manitoba Hydro staff and contractors must comply with all regulatory requirements relating to the construction of a project. Specific regulatory requirements for the Project may also be listed in regulatory work permits and/or Department of Fisheries and Oceans letters of advice/authorizations.

3.0 Implementation

The intent of this section is to provide implementation instructions to the contractor. The key steps to implementing the plan are outlined below:

1) Erosion risk identification

2) Planning
3) General mitigation measures for susceptible construction activities
4) Specific erosion control measures
5) Specific sediment control measures

The implementation of the plan utilizes a stepwise process; however, these steps will be undertaken at various times throughout the pre-construction and construction phases of the project. The plan is founded on a principle of adaptive management meaning if aspects of the plan are found to require modifications for improved effectiveness or if new information becomes available (e.g., more effective control actions, pest outbreaks in the project area) the plan and actions will be updated.

3.1 Erosion risk identification

There are several different methods to be conducted by the contractor including desktop evaluation, pre-construction surveys, and onsite evaluations that will be used to identify areas that are at risk of erosion. Contractors are required to plan and understand what mitigations will be necessary.

3.1.1 Desktop evaluation

A desktop evaluation of aerial/satellite imagery as well available Geographical Information System (GIS) data will provide contractors information on site conditions in the project right of way. Elevation or contour data of an area will help to identify the slope of elevation changes and drainage to determine where erosion risk may be higher. Soil information is also available to help understand where fine textured soil types are as they are at a higher risk from erosion.

3.1.2 On-site evaluation

The initial stage of construction involves clearing vegetation along a centerline down the middle of the transmission right of way. That initial clearing of the centerline allows access to areas prior to the remainder of clearing and construction activities. Ground surveys will be completed by the contractor when access is available that could identify areas that are at a higher risk of erosion or ground disruption.

There are numerous distinct construction activities for the development of a transmission project some of which have a higher susceptibility to cause erosion and sedimentation. These include:

- Vegetation clearing
- Earthworks and stockpiles
- Draining and dewatering
- Watercourse crossing

3.1.3 Weather

The effects of wet weather during construction activities can have a significant impact on ground conditions and can change otherwise stable soils into soils that are affected by erosion and sedimentation. The effects of wet weather during construction activities can have a significant impact on ground conditions and can change otherwise stable soils into soils that are affected by erosion and sedimentation. Freeze thaw cycles during the spring can also expose stable soils to an unstable condition overnight and throughout the day.

3.2 Erosion and sediment control management strategy

The contractor will implement an erosion and sediment control management strategy that will focus on pre-planning, scheduling, and preventing erosion as a result of its construction activities. If erosion is not preventable, mitigation measures that prevent sedimentation will be implemented.

3.2.1 Pre-construction planning

In many cases the need for erosion and sediment control can be avoided by considering erosion mitigation during the planning stages of a project or prior to construction activities. For instance, access routes should be planned to avoid steep grades, unstable soils and avoid areas that could direct run-off to a watercourse. The contractor must continuously review their planned construction activities and evaluate the need for ESC measures, while considering weather, soil conditions, identified environmentally sensitive sites within CEnvPP, and any newly disturbed areas for risk of erosion.

3.2.2 Scheduling

The contractor, when developing schedules for construction activities that have the potential to cause erosion and sedimentation, must consider seasonal climate, identified environmentally sensitive sites within CEnvPP, and any newly disturbed areas.

Including erosion and sedimentation as a consideration in the scheduling of activities, is the first step in preventing effects to the environment. Construction activities in erosion prone areas, such as adjacent to watercourses, can be mitigated by timing those activities during frozen or dry soil conditions.

Where possible, work should be scheduled so that construction activities that remove vegetation or disrupt the soil surface happen in short duration before erosion control measures can be installed so that the amount of time soil surface is exposed is minimized.

3.3 General mitigation measures

General mitigation measures that are particular to preventing erosion and sedimentation during construction activities are found in the Construction Environmental Protection Plan, General mitigation tables:

- EI-3 Erosion protection and sediment control
- PC-1 Access roads and trails
- PC-2 Borrow pits and quarries
- PA-5 Draining
- PA-8 Grubbing
- PA-10 Stripping

3.4 Specific erosion control mitigation measures

Chosen erosion and sediment control measures should not be permanent in nature but designed with long term protection in mind (until re-vegetation takes place). Temporary ESC's are those that are in place during the construction phase, or a portion thereof, when exposed soils are vulnerable to erosion with nearby water courses at risk of sedimentation. Permanent solutions would only be considered under extraordinary circumstances and would require MH and regulatory approval.

Control of erosion and sedimentation is most efficient and cost effective when it can be recognized and prevented early. A basic understanding of the erosion and sedimentation processes will help with this early detection and application of mitigation measures and controls. Due to the varying conditions of the work site, the

Contractor will be responsible for determining which protection measures should be installed in each work area in consultation with Manitoba Hydro. Table 2 below show examples of frequently employed erosion controls that are currently approved by MH for use by the contractor(s).

Table 2: Erosion Controls

EROSION CONTROLS					
Method	Application		Location	Description	BMP
Vegetation retention and replacement	Flat Ground	Y	Any location with potential for exposed soil	Natural regeneration, seeding, planting, sodding	ID-EC_01
	Sloping Ground	Y			
	Stockpiles	Y			
	Ditches	Y			
Surface Cover	Flat Ground	Y	Any location of exposed soil, seeded or not	Organic- Weed free straw, mulch, natural fiber erosion control blankets. Inorganic- geotextile, sheeting, rock	ID-EC_02
	Sloping Ground	Y			
	Stockpiles	Y			
	Ditches	N			
Erosion Control Blankets	Flat Ground	Y	Exposed soil on flat or sloping ground, stockpiles and ditches	Variety of products manufactured into "blankets" placed tight to the ground in a matrix to cover soil and reduce surface erosion	ID-EC_03
	Sloping Ground	Y			
	Stockpiles	Y			
	Ditches	Y			
Impermeable Sheeting	Flat Ground	Y	Large areas of exposed soil, steep terrain, stockpiles	Impermeable sheeting (Polyethylene plastic, or tarps) prevents impact and saturation of soil from rainfall	ID-EC_04
	Sloping Ground	Y			
	Stockpiles	Y			
	Ditches	Y			
Organic Fiber Rolls (Wattles)	Flat Ground	N	Steep slopes, stepped terraces	Rolls of organic material (usually straw) that reduce erosion by reducing slope and the energy of overland flow	ID-EC_05
	Sloping Ground	Y			
	Stockpiles	N			
	Ditches	N			
Ditch Check Dams	Flat Ground	N	For use on drainage ditches or large diversions but not natural watercourses	Decreases the grade and water flow velocities	ID-EC_06
	Sloping Ground	N			
	Stockpiles	N			
	Ditches	Y			
Water Diversion	Flat Ground	N	Areas with large amount of exposed soil, worksite or stock pile	Diversion ditching or berms to direct overland flow around a worksite	ID-EC_07
	Sloping Ground	Y			
	Stockpiles	Y			
	Ditches	Y			
Matting	Flat Ground	Y	Flat ground at risk of erosion or	Diversion ditching or berms to direct overland flow around a worksite	ID-EC_08
	Sloping Ground	N			
	Stockpiles	N			
	Ditches	N			
Wind Erosion	Flat Ground	Y	Any location with exposed soil	Watering the surface, using impermeable sheeting (Polyethylene plastic, or tarps) or any surface cover	ID-EC_09
	Sloping Ground	Y			
	Stockpiles	Y			
	Ditches	Y			

3.5 Specific sediment control mitigation measures

It is important to understand that sedimentation controls themselves are only employed as a second line of defence. Sedimentation controls are designed to provide a place for water to slow down and allow the particles to be deposited that the primary erosion controls were unable to prevent. Sediment fencing does not "filter" the water but rather are meant to slow down the water and allow fine soil particles or other potentially deleterious materials to settle behind it. Even perfectly constructed sediment controls will not be sufficient if a construction site lacks adequate erosion controls. Sediment controls are most effective under low input flow conditions. Listed in Table 3 below are examples of frequently employed sediment controls that are currently approved by MH for use by the contractor(s).

Table 3: Sediment Controls

SEDIMENT CONTROLS					
Method			Application	Description	BMP
Sediment fencing	Flat Ground	Y	Anywhere low flow runoff is a concern and retention of sediment	Geotextile fabric, buried at the bottom and suspended vertically by wooden stakes	ID-SC_01
	Sloping Ground	Y			
	Stockpiles	Y			
	Ditches	Y			
Sediment Retention Berm	Flat Ground	Y	Anywhere low flow runoff is a concern and retention of sediment	Constructed of rock, wood chips, compost, soil and topsoil or similar materials	ID-SC_02
	Sloping Ground	Y			
	Stockpiles	Y			
	Ditches	Y			

3.6 Education and training

Education and training form a critical component of the implementation plan. Manitoba Hydro and the contractor(s) each have responsibility to ensure personnel are appropriately trained to carry out their role in the prevention of erosion and sedimentation, and that proper documentation is being conducted throughout the Project. Manitoba Hydro has prepared erosion and sediment control environmental practices found in appendices which guides the implementation of controls, for use by project field staff.

Manitoba Hydro will hold a contractor environmental pre-construction requirements orientation meeting to review project specifics and key environmental requirements with all contractors at a supervisory level. A summary of this plan, implementation requirements, roles and responsibilities, and Manitoba Hydro's expectations will be presented at that time.

Manitoba Hydro will also hold a separate pre-construction environmental meeting to provide the opportunity for Manitoba Hydro and contractor environmental representatives to discuss project specifics and environmental requirements in more depth.

It is a mandatory requirement that all contractor(s) provide project-specific erosion and sedimentation control orientation training to all personnel involved in construction activities susceptible to erosion and sedimentation or involved in supervision of those personnel (i.e., project manager, supervisors) prior to starting work.

This training will present the objectives of the plan, roles and responsibilities, erosion and sedimentation issues and prevention actions, and documentation requirements. A training attendance record must be maintained by the contractor(s) and submitted to Manitoba Hydro environmental inspector/officer or delegate, for upload to the Environmental Protection Information Management System (EPIMS).

3.7 Monitoring and maintenance

Monitoring, inspection, and adaptive management are necessary to ensure the effectiveness of the plan. It provides confirmation of proper implementation and effectiveness of erosion and sediment control measures. Monitoring will take place until the concern of erosion and sedimentation no longer exists. It is the duty of the contractor to ensure that the erosion and sediment control measures are properly installed, well maintained, and functioning as intended.

The effectiveness of the ESCP depends directly on the frequency of monitoring and what actions are taken to address any failures that may occur. A tracking document will be maintained by the contractor's environmental representative indicating location, timing of construction activities and reason for implementation. This document will be submitted to EPIMS to ensure that all installed ESCP measures can be tracked for continued maintenance, monitoring and decommissioning\removal.

Components of monitoring, maintenance and decommissioning to be conducted by the contractor will include:

- A monitoring schedule will be drawn up to include times, areas, and individual(s) responsible for monitoring. (Will be included in the contractor's environmental inspection reports submitted to MH).
- Inspect and assess effectiveness of ESC control structures regularly and after storms, and repair, replace or upgrade, as required. If shortcomings are identified, the contractor must take immediate action to restore their proper function.
- All employees are required to report any ineffective erosion and sedimentation control measures or those in need of repair.
- Sediment control measures may require accumulated sediment to be removed to function properly or to not overload the structure. It is important to remove sediment from the area completely and take it to landfill or relocated where it is no longer at risk of being washed into a watercourse.

- Any maintenance of ESC should be recorded and reported to MH to help identify failure prone sites or areas requiring reinforced measures.
- Weather forecasts should be monitored as weather events have the potential to play a part in erosion sedimentation risk during construction activities.
- During inactive construction periods, where the site is left alone for 30 days or longer monthly monitoring should be conducted.

3.7.1 ESCP removal

The Contractor will stabilize sites as soon as feasible after construction activities causing surface disruptions are complete. The site will then be assessed and re-vegetated in accordance with the Rehabilitation and Invasive Species Management Plan. Temporary erosion and sediment control measures will remain intact and maintained until:

- The MH environmental inspector/officer determine that there are no longer erosion and sedimentation concerns in an area, or
- Either natural vegetation is established, and stable or permanent measures are established.

Although work may be conducted in the winter months, care must be taken to ensure that materials are not left to degrade the surrounding waterways when the spring thaw arrives. When sediment control systems are removed by the contractor, accumulated sediment must be removed and taken to landfill or relocated where it is no longer at risk of being washed into a watercourse.

3.7.2 Environmental shutdown/ contingency measures

The contractor has a responsibility to recognize and prevent working in adverse weather conditions that would increase erosion potential and overwhelm designed erosion and sediment control systems. Construction activities in areas with high erosion risk should be scheduled to take place during favourable weather conditions. Activities should be stopped in these areas when they have encountered periods of significant melt or prolonged precipitation and surface runoff cannot be sufficiently managed. Conditions that cannot be mitigated through contingency measures in areas of high erosion risk will require a shutdown of activities until conditions improve or there is modification of work practices.

Suitable work conditions will be established and agreed upon between the Contractor and Manitoba Hydro. Work modification or weather shut down to mitigate erosion and sedimentation may be considered if:

- During extended periods of adverse conditions (for rain is considered greater than 5 mm of rain in a 24 hour period)
- more than 50 mm of rain/5 cm of wet snow in the preceding 5 days; or
- the forecast calls for more than 50% certainty of 5 mm of rain/or 5 cm of wet snow in the next 24 hours
- If extreme wet weather conditions result if erosion is resulting in sedimentation of adjacent waterbodies due to compromised erosion control measures.

3.7.3 Environmental shutdown

Should a weather shutdown be deemed necessary it will be communicated to the contractor in writing through the MH Line Contracts representative. Once the shutdown is in place, the contractor may propose work modifications to Manitoba Hydro that prevent further damage or employ mitigation measures. Once conditions improve or changes are approved by Manitoba Hydro the weather shutdown will be released by Manitoba Hydro. Some of the possible work modifications include placement of matting, geotextile installation, or change of work hours (working in the morning with frozen ground conditions).

3.7.4 Contingency measures

Should an extreme weather event result in a breach of existing erosion and sediment controls and sediment laden water is able to flow and reach a watercourse the following contingency measures may be employed by the contractor to mitigate the breach:

- Install additional sediment fencing or construct a containment berm to create a containment area for runoff and prevent it flowing to watercourses and wetlands
- Excavate a cross ditch or diversion berm to divert water away from watercourses and wetlands and into a vegetated area, sump or containment area
- Place sandbags to raise the height of banks, preventing flooding of nearby areas or of run-off into watercourses

4.0 Environmental management practices

Below is a list of environmental management practices used for sediment and erosion control. An appendix is provided for each that provides the description, application, implementation, and installation of each.

4.1 Erosion controls

- EC_01 Vegetation Retention and Replacement
- EC_02 Surface Cover
- EC_03 Erosion Control Blankets
- EC_04 Impermeable Sheeting
- EC_05 Organic Fibre Rolls (Wattles)
- EC_06 Ditch Check Dams
- EC_07 Water Diversion
- EC_08 Timber Matting
- EC_09 Wind Erosion Control

4.2 Sediment controls

- SC_01 Sediment Fencing
- SC_02 Sediment Retention Berm

5.0 References

Manitoba Stream Crossing Guidelines For The Protection of Fish and Fish Habitat (DFO and MNR 1996). Available at: https://www.gov.mb.ca/waterstewardship/fisheries/habitat/sguide.pdf.

Minister of Justice. 1985. *Fisheries Act*. Available at: http://laws-lois.justice.gc.ca/PDF/F-14.pdf.

Appendix A: EC_01 Vegetation Retention and Replacement

Appendix B: EC_02 Surface Cover

Appendix C: EC_03 Erosion Control Blankets

Appendix D: EC_04 Impermeable Sheeting

Appendix E: EC_05 Organic Fibre Rolls (Wattles)

Appendix F: EC_06 Ditch Check Dams

Appendix G: EC_07 Water Diversion

Appendix H: EC_08 Timber Matting

Appendix I: EC_09 Wind Erosion Control

Appendix J: SC_01 Sediment Fencing

Appendix K: SC_02 Sediment Retention Berm

Appendix A

EC_01 Vegetation Retention and Replacement

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Description

Retention- Retain as much vegetation as possible for as long as possible as it naturally reduces erosion potential. Vegetation reduces the energy of wind or water on the soil surface, lessening its impact. Vegetation also extends the amount of time water is in contact with the soil, allowing more time for absorption rather than it flowing across the surface. It also naturally reduces the sediment load of overland flow by reducing the energy of water and wind, providing an opportunity for soil particles to settle out.

Replacement- Areas disturbed by construction activities may have areas of exposed soil. Once assessed these areas will likely require seeding to aid natural re-vegetation (hydro-seeding, broadcast seeding, hand seeding, transplanting). Seeding of disturbed areas should be completed as soon as possible after construction activities or travel has stopped in each work area. Areas that have steeper slopes prone to producing sheet flow run off may require erosion control blankets to help stabilize the soil and protect seed while it establishes. See below for more information on seeding design best practice.

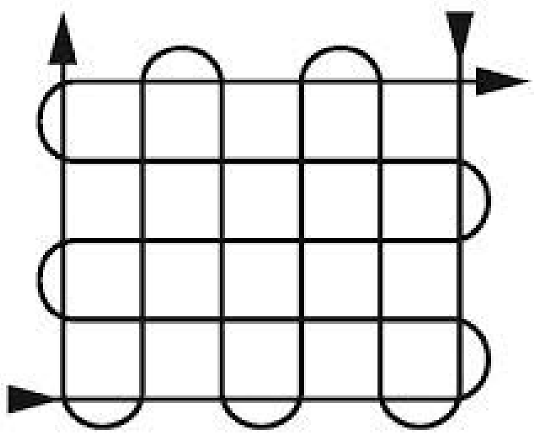
Application

Flat Ground	Y	Any location with potential for exposed soil
Sloping Ground	Y	
Stockpiles	Y	
Ditches	Y	

Implementation

Seeding- Several application methods are acceptable for seeding (Hand Broadcast, Hand-operated rotary seeders, cyclone seeders). Other methods such as drill seeding and Hydraulic seeding may be appropriate. Refer to the "REHABILITATION AND INVASIVE SPECIES MANAGEMENT PLAN for MANITOBA HYDRO TRANSMISSION PROJECTS" for direction on selecting the appropriate seed mix, seeding method and rates and other important considerations for an area. Please refer to installation diagram below for criss-cross seeding pattern used when seeding by hand.

Installation



Criss-cross seeding pattern helps to ensure adequate and even distribution of seed.
Diagram credit: https://www.seedsuperstore.com/how-to-plant-new-lawn/

References

- REHABILITATION AND INVASIVE SPECIES MANAGEMENT PLAN for MANITOBA HYDRO TRANSMISSION PROJECTS March 2016

Also see

- ID-EC_02 Surface Cover
- ID-EC_03 Erosion Control Blankets

Appendix B

EC_02 Surface Cover

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SURFACE COVER ID-EC_02

Photo Credit: https://www.todayshomeowner.com/benefits-of-spreading-straw-or-mulch-over-grass-seed/

Description

The most effective long term erosion control is to establish vegetation, it is often necessary to protect the soil surface while this is occurring. Covering the soil surface controls erosion by buffering the impact rainfall which protects the surface and seeds until vegetation can establish. Biodegradable materials such as weed free straw (not hay), organic mulch can be used for cover on gentle slopes, where natural fibre erosion control blankets can be used on steeper slopes. Inorganic materials such as geotextile, impermeable sheeting can also be used temporarily but will have to be removed prior to re-vegetating.

Application

Flat Ground	Y	Any location with potential for exposed soil, seeded or not
Sloping Ground	Y	
Stockpiles	Y	
Ditches	N	

Installation

Straw: Weed free straw bales can be broken up and spread over the surface to cover it until vegetation is established, or it can be blown on by machine. Weed free straw must be provided by a local source approved by an MH Environmental Officer. The depth of the spread straw is important to its function.

VOI Training Group's Erosion and Sediment Control Practitioner (ESCP) Participant's Manual provides the following recommended specification for spreading straw:

"If site **will be seeded** and straw is a temporary mulch to control soil erosion until a stabilizing vegetation develops:
-Place/apply straw evenly in a 20-40 mm thick layer.
Bulk application rate is 3300 to 4500kg/ha.
Straw should cover 80 to 90% of the soil surface.

If site **will not be seeded** and straw is a temporary mulch to control soil erosion:
-Place/apply straw evenly in a 40-60 mm thick layer.
Bulk application rate is 4500 to 6700kg/ha.
Straw should cover >90% of the soil surface."

Wood chips: Typically sourced through project mulching operations. While wood chips are resistant to movement and is good erosion protection, caution should be used as dense applications can inhibit subsequent vegetation establishment.

Clearing debris: Tree tops, branches and limbs from clearing operations in the area can be manually spread, covering and protecting the soil surface. This method has the additional benefit of potentially providing a seed source to aid in natural regeneration of vegetation.

References

- REHABILITATION AND INVASIVE SPECIES MANAGEMENT PLAN for MANITOBA HYDRO TRANSMISSION PROJECTS March 2016
- VOI Training Group's Erosion and Sediment Control Practitioner (ESCP) Participant's Manual

Also see

- ID-EC_01_VegRetention and Replacement
- ID-EC_03_Erosion Control Blankets
- ID-EC_04_Impermeable Sheeting

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Appendix C

EC_03 Erosion Control Blankets

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Description

Applied to flat or sloping ground, in drainage ditches (not fish bearing) or over stock piles to provide temporary erosion protection allowing permanent vegetation to be established. These products typically consist of a biodegradable material that is sandwiched between a netted material to form a "blanket" and supplied in rolls. These rolls are then installed tight to the ground in a matrix protecting the surface. Produced from a wide range of materials that are either biodegradable, photo-degradable, or designed for permanent long term use. On Manitoba Hydro projects only products that are %100 biodegradable will be accepted for use. Biodegradable products are considered to be temporary as they will naturally decompose and permanent vegetation will be able to establish through it.

Application

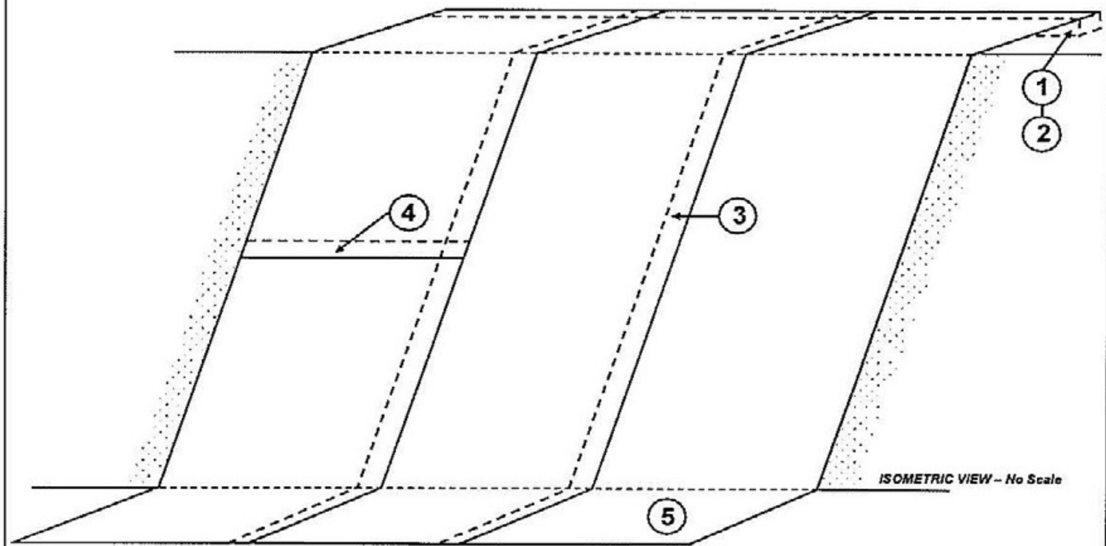
<table>
<tr><td>Flat Ground</td><td>Y</td><td rowspan="4">Exposed soil on flat or sloping ground, stockpiles and ditches</td></tr>
<tr><td>Sloping Ground</td><td>Y</td></tr>
<tr><td>Stockpiles</td><td>Y</td></tr>
<tr><td>Ditches</td><td>Y</td></tr>
</table>

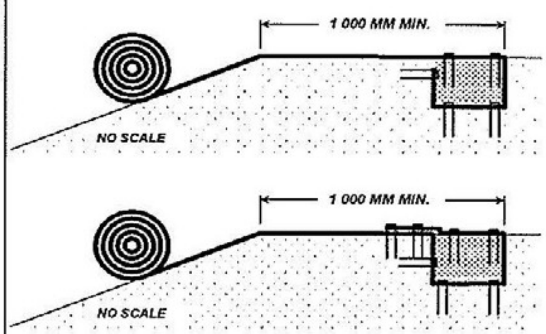
Implementation

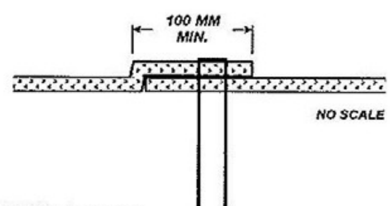
Has shown to be very effective at reducing surface soil erosion if installed correctly. Loose weave blankets should be used to allow for vegetation to regenerate through it while preventing wildlife becoming trapped or entrained in the netting. Can be used for erosion protection on a variety of locations, to protect stockpiles and used in conjunction with other erosion and sediment control products

Installation

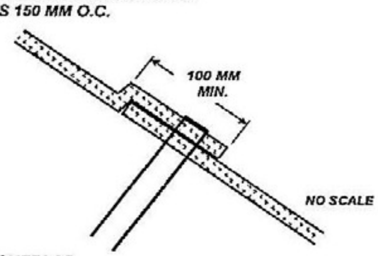
Weight and peg erosion control blankets so that blankets are in full contact with ground; spaces and gaps under blankets will result in increased erosion rendering this measure ineffective.
The following installation instructions should be followed in the absence of manufacturer's installation instructions. VOI Training Group's Erosion and Sediment Control Practitioner (ESCP) Participant's Manual provides the following two diagrams provide recommended specification for installing Erosion control blankets:





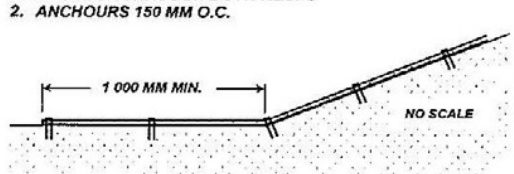


③ SIDE SEAM OVERLAP
1. ANCHOUR THROUGH BOTH RECPS
2. ANCHOURS 150 MM O.C.



① & ② TOP SLOPE ANCHOUR TRENCH
1. EXCAVATE 300 MM X 200 MM TRENCH
2. LAY RECP THROUGH TRENCH
3. STAGGERED ANCHOURS 300 MM O.C. IN TRENCH
4. BACKFILL & LIGHTLY COMPACT FILL
5. SEED / SOIL APPLY AMENDMENTS
6. STAGGERED ANCHOURS 300 MM O.C. AT SURFACE

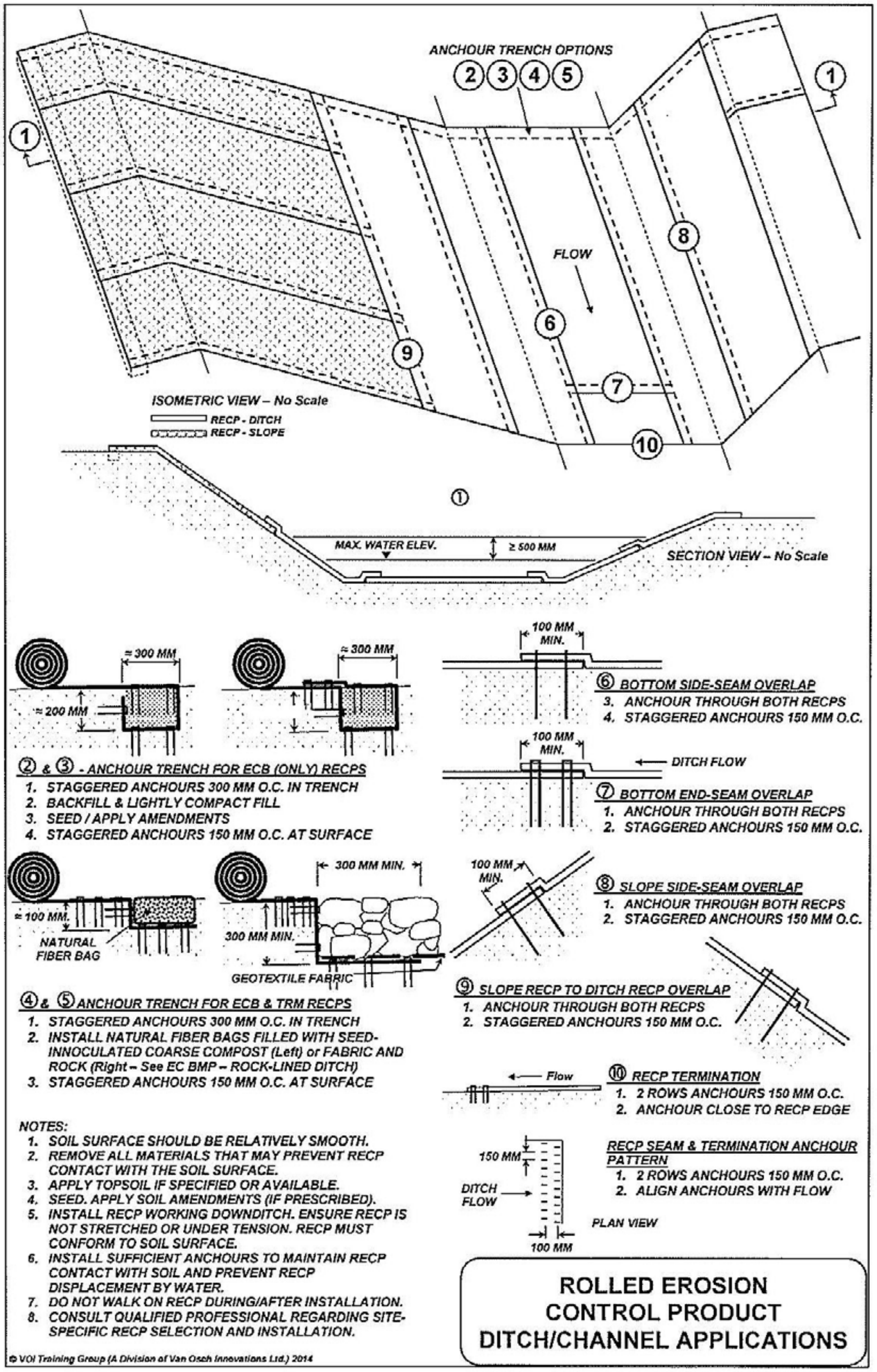
④ END ROLL OVERLAP
1. ANCHOUR THROUGH BOTH RECPS
2. ANCHOURS 150 MM O.C.



⑤ BOTTOM OF SLOPE TERMINATION
1. ANCHOURS 150 MM O.C. AT TERMINAL END OF RECP
2. ANCHOURS 150 MM O.C. AT SLOPE TRANSITION

NOTES:
1. PREPARED SOIL SURFACE SHOULD BE RELATIVELY SMOOTH (NO SHARP DEPRESSIONS OR HUMMOCKS).
2. REMOVE ALL MATERIALS THAT MAY PREVENT RECP CONTACT WITH THE SOIL SURFACE.
3. APPLY TOPSOIL IF SPECIFIED OR AVAILABLE.
4. SEED AREA WITH SPECIFIED SEED MIXTURE AT SPECIFIED SEEDING RATE. APPLY SOIL AMENDMENTS, IF PRESCRIBED.
5. INSTALL RECP WORKING DOWNSLOPE. ENSURE RECP IS NOT STRETCHED OR UNDER TENSION. RECP MUST CONFORM TO SOIL SURFACE.
6. DO NOT WALK ON RECP DURING OR FOLLOWING INSTALLATION.
7. RECP SHOULD NOT BE INSTALLED ACROSS SLOPE.
8. INSTALL SUFFICIENT ANCHOURS TO MAINTAIN RECP CONTACT WITH SOIL AND PREVENT RECP DISPLACEMENT BY WATER / WIND.
9. ANCHOR DENSITY SHOULD BE DETERMINED BY SITE SPECIFIC CONDITIONS. CONSIDER GENERIC ANCHOR DENSITY / SPACING RECOMMENDATIONS TO BE MINIMUM ANCHOURING REQUIREMENT.
10. CONSULT QUALIFIED PROFESSIONAL REGARDING SITE-SPECIFIC RECP SELECTION AND INSTALLATION.

ROLLED EROSION CONTROL PRODUCT OPEN SLOPE APPLICATIONS


ANCHOUR TRENCH OPTIONS
2 3 4 5
1
8
FLOW
6
9
7
10
ISOMETRIC VIEW – No Scale
RECP - DITCH
RECP - SLOPE
1
MAX. WATER ELEV.
≥ 500 MM
SECTION VIEW – No Scale
≈ 300 MM
≈ 200 MM
≈ 300 MM
2 & 3 - ANCHOUR TRENCH FOR ECB (ONLY) RECPS
1. STAGGERED ANCHOURS 300 MM O.C. IN TRENCH
2. BACKFILL & LIGHTLY COMPACT FILL
3. SEED / APPLY AMENDMENTS
4. STAGGERED ANCHOURS 150 MM O.C. AT SURFACE
100 MM MIN.
6 BOTTOM SIDE-SEAM OVERLAP
3. ANCHOUR THROUGH BOTH RECPS
4. STAGGERED ANCHOURS 150 MM O.C.
100 MM MIN.
DITCH FLOW
7 BOTTOM END-SEAM OVERLAP
1. ANCHOUR THROUGH BOTH RECPS
2. STAGGERED ANCHOURS 150 MM O.C.
300 MM MIN.
≈ 100 MM
NATURAL FIBER BAG
300 MM MIN.
GEOTEXTILE FABRIC
100 MM MIN.
8 SLOPE SIDE-SEAM OVERLAP
1. ANCHOUR THROUGH BOTH RECPS
2. STAGGERED ANCHOURS 150 MM O.C.
4 & 5 ANCHOUR TRENCH FOR ECB & TRM RECPS
1. STAGGERED ANCHOURS 300 MM O.C. IN TRENCH
2. INSTALL NATURAL FIBER BAGS FILLED WITH SEED-INNOCULATED COARSE COMPOST (Left) or FABRIC AND ROCK (Right – See EC BMP – ROCK-LINED DITCH)
3. STAGGERED ANCHOURS 150 MM O.C. AT SURFACE
9 SLOPE RECP TO DITCH RECP OVERLAP
1. ANCHOUR THROUGH BOTH RECPS
2. STAGGERED ANCHOURS 150 MM O.C.
Flow
10 RECP TERMINATION
1. 2 ROWS ANCHOURS 150 MM O.C.
2. ANCHOUR CLOSE TO RECP EDGE
150 MM
DITCH FLOW
100 MM
RECP SEAM & TERMINATION ANCHOUR PATTERN
1. 2 ROWS ANCHOURS 150 MM O.C.
2. ALIGN ANCHOURS WITH FLOW
PLAN VIEW
NOTES:
1. SOIL SURFACE SHOULD BE RELATIVELY SMOOTH.
2. REMOVE ALL MATERIALS THAT MAY PREVENT RECP CONTACT WITH THE SOIL SURFACE.
3. APPLY TOPSOIL IF SPECIFIED OR AVAILABLE.
4. SEED. APPLY SOIL AMENDMENTS (IF PRESCRIBED).
5. INSTALL RECP WORKING DOWNDITCH. ENSURE RECP IS NOT STRETCHED OR UNDER TENSION. RECP MUST CONFORM TO SOIL SURFACE.
6. INSTALL SUFFICIENT ANCHOURS TO MAINTAIN RECP CONTACT WITH SOIL AND PREVENT RECP DISPLACEMENT BY WATER.
7. DO NOT WALK ON RECP DURING/AFTER INSTALLATION.
8. CONSULT QUALIFIED PROFESSIONAL REGARDING SITE-SPECIFIC RECP SELECTION AND INSTALLATION.
ROLLED EROSION CONTROL PRODUCT DITCH/CHANNEL APPLICATIONS
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References

- VOI Training Group's Erosion and Sediment Control Practitioner (ESCP) Participant's Manual

Also see

- ID-EC_01_Vegetation Retention And Replacement
  ID-EC_02_Surface Cover

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Appendix D

EC_04 Impermeable Sheeting

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IMPERMEABLE SHEETING ID-EC_04

Photo Credit: VOI Training Group's Erosion and Sediment Control Practitioner (ESCP) Participant's Manual

Description

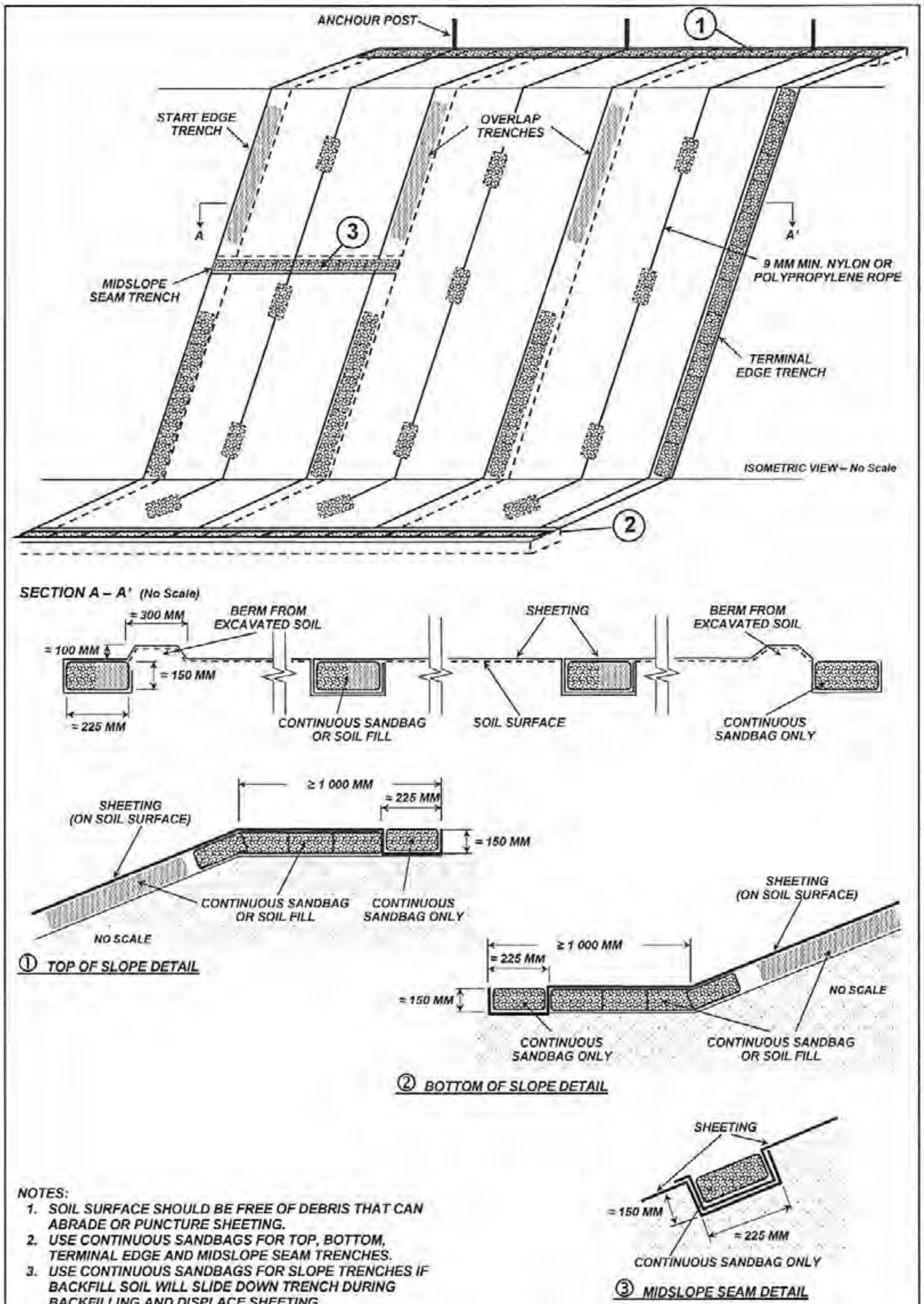
Impermeable sheeting can be used to cover erosion prone areas that require immediate and temporary short term protection, such as a stock pile or erodible soil prior to use or re-vegetation. Typically polyethylene (plastic) sheets or impermeable tarps which will later be removed and reused or recycled after use.

Implementation

Used for short term protection from erosion, and can be applied in most applications. Caution has to be exercised when using this method as the downslope side of the impermeable sheeting can receive high velocity and concentrated flows resulting in erosion. Precautions may have to be taken to prevent undercutting or increased erosion at the downslope extent of the sheeting.

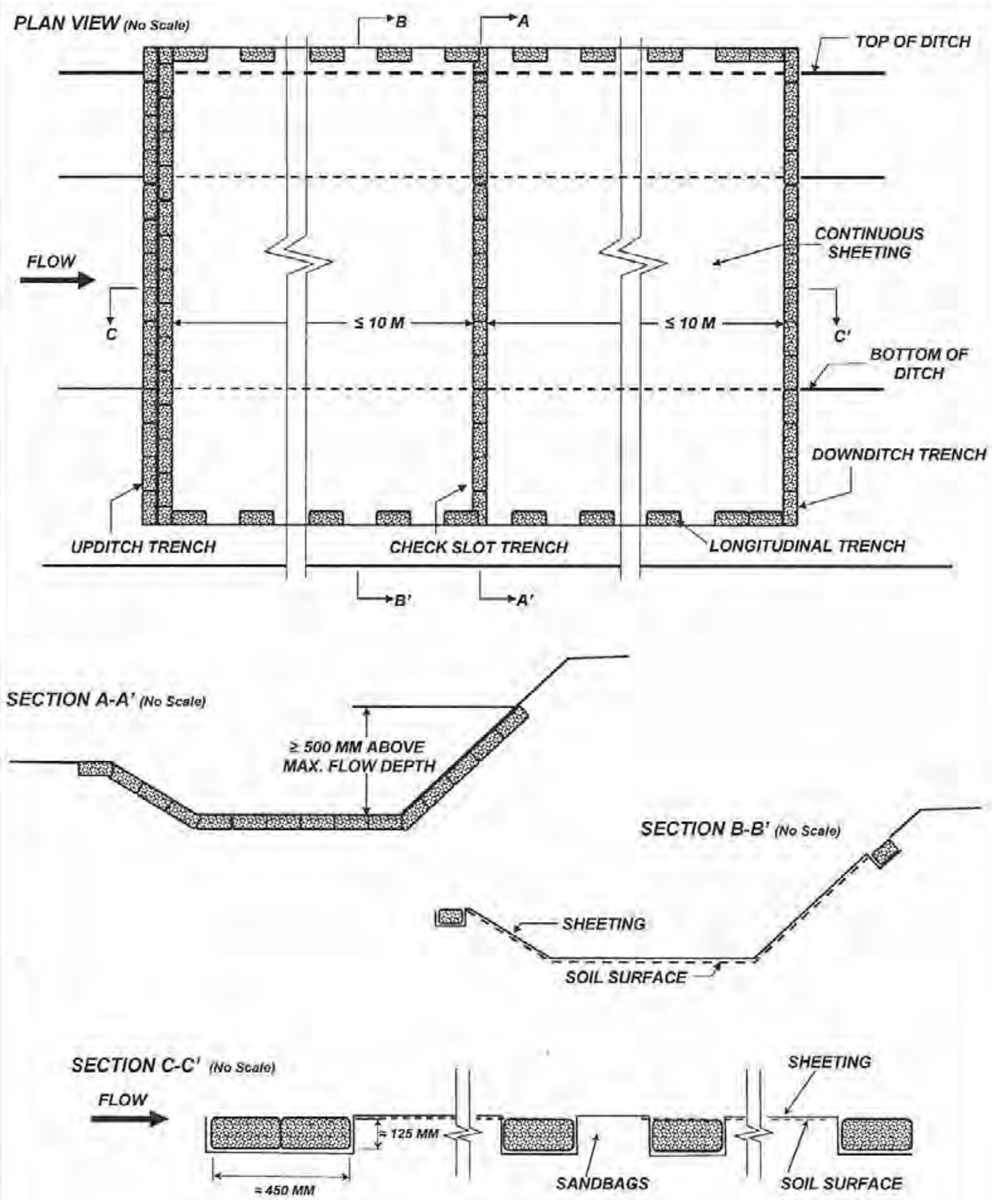
Application

Flat Ground	Y	Large areas of exposed soil, steep terrain, stockpiles
Sloping Ground	Y	
Stockpiles	Y	
Ditches	Y	



NOTES:
1. SOIL SURFACE SHOULD BE FREE OF DEBRIS THAT CAN ABRADE OR PUNCTURE SHEETING.
2. USE CONTINUOUS SANDBAGS FOR TOP, BOTTOM, TERMINAL EDGE AND MIDSLOPE SEAM TRENCHES.
3. USE CONTINUOUS SANDBAGS FOR SLOPE TRENCHES IF BACKFILL SOIL WILL SLIDE DOWN TRENCH DURING BACKFILLING AND DISPLACE SHEETING.
4. BACKFILL OR PLACE SANDBAGS IN SLOPE TRENCHES STARTING FROM BOTTOM OF SLOPE.
5. DO NOT WALK ON SHEETING DURING OR AFTER INSTALLTION.
6. PLACE SUFFICIENT SURFACE WEIGHTS.
7. FIGURE IS PROVIDED FOR REFERENCE ONLY. CONSULT QUALIFIED PROFESSIONAL FOR SITE-SPECIFIC DESIGN.

IMPERMEABLE SHEETING OPEN SLOPE APPLICATIONS



NOTES:
1. SOIL SURFACE SHOULD BE FREE OF DEBRIS THAT CAN ABRADE OR PUNCTURE SHEETING.
2. UNDERLAY SHEETING WITH NON-WOVEN GEOTEXTILE IF PUNCTURING OR ABRASION OF SHEETING IS A CONCERN.
3. FILL SANDBAGS WITH SUITABLE MATERIAL THAT WILL NOT CONTRIBUTE TO SEDIMENT LOADING OF RUNOFF IN DITCH.
4. USE CONTINUOUS SANDBAGS FOR UPDITCH, DOWNDITCH AND CHECK SLOT TRENCHES.
5. USE CONTINUOUS OR DISCONTINUOUS SANDBAGS FOR LONGITUDINAL TRENCHES.
6. ENSURE ALL TRENCHES ARE RECTANGULAR IN SECTION TO STABLIZE PLACED SANDBAGS.
7. CHECK SLOT SPACING ≤ 10 M.
8. DO NOT WALK ON SHEETING DURING OR AFTER INSTALLTION.
9. FIGURE IS PROVIDED FOR REFERENCE ONLY. CONSULT QUALIFIED PROFESSIONAL FOR SITE-SPECIFIC DESIGN.

IMPERMEABLE SHEETING DITCH/CHANNEL APPLICATIONS

References

- VOI Training Group's Erosion and Sediment Control Practitioner (ESCP) Participant's Manual

Also see

- ID-EC_02_Surface Cover

Appendix E

EC_05 Organic Fibre Rolls (Wattles)

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ORGANIC FIBRE ROLLS (STRAW WATTLES/ROLLS)

ID-EC_05

Photo credit: http://www.earth-savers.com/

Description

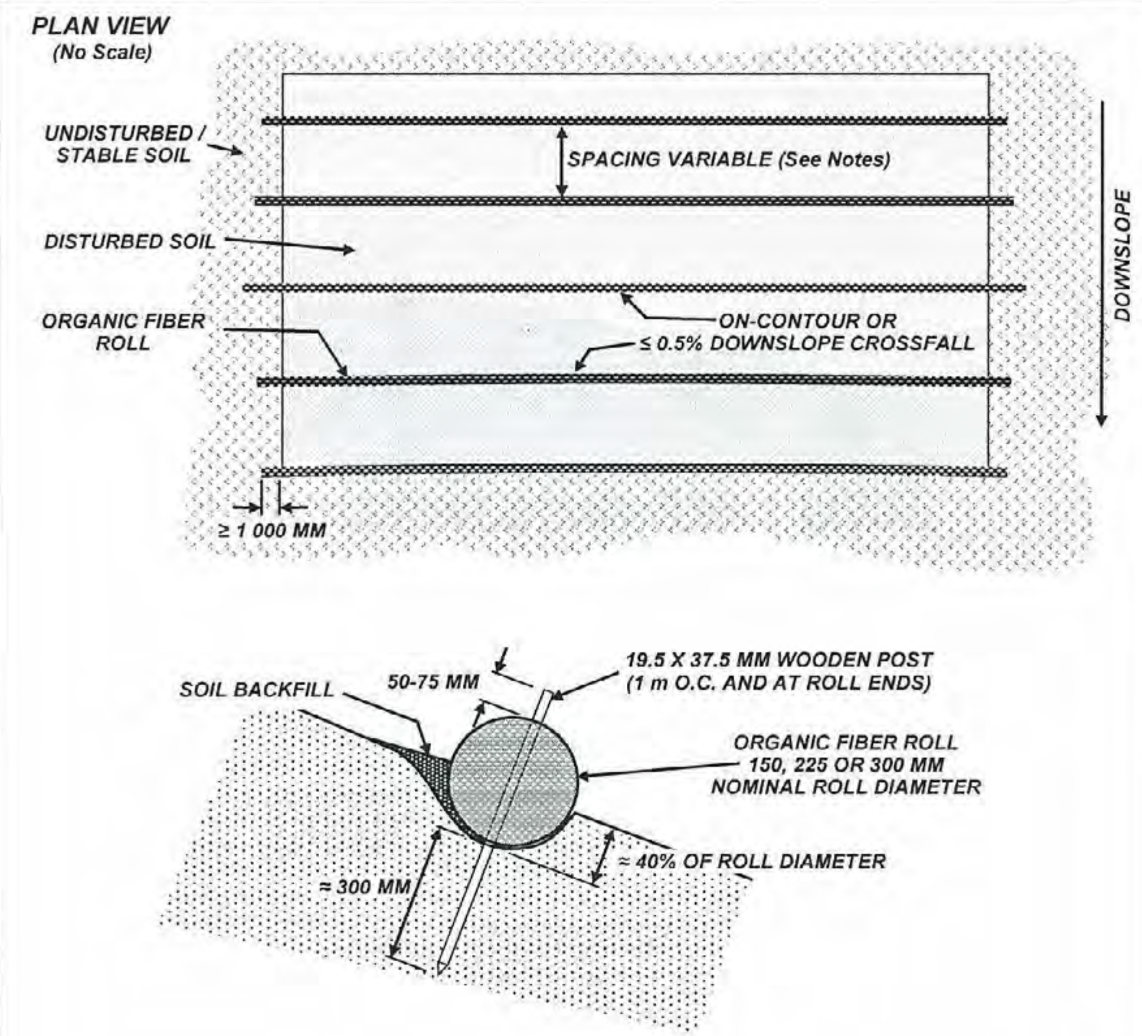
Organic fibres (straw, woodchips etc.) are encased in a photodegradable plastic net casing that form a tube or roll used for erosion control but sediment control as a secondary use. Installed perpendicularly across a slope it reduces erosion by shortening the slope length by providing grade breaks. They are also effective at slowing flow velocity of overland flow and retaining sediment that accumulates behind the roll instead of migrating down slope. These locations also help to retain seed and other organics that would otherwise be washed away.

Implementation

Organic fibre rolls are typically used on steep slopes where the surface has been disturbed and at a risk of erosion. Advantageous on steep slopes as they can be installed by hand in remote sites and can be combined with other methods such as erosion control blankets to optimize protection.
Intended to be used temporarily until slope is re-vegetated. The rolls cannot be installed across ditches, swales or natural water flow paths.

Application

<table>
<tr><td>Flat Ground</td><td>N</td><td rowspan="4">Steep slopes, stepped terraces</td></tr>
<tr><td>Sloping Ground</td><td>Y</td></tr>
<tr><td>Stockpiles</td><td>N</td></tr>
<tr><td>Ditches</td><td>N</td></tr>
</table>



NOTES:

1. NOMINAL POST LENGTH = ROLL DIAMETER + 350 MM.
2. ROLL SPACING VARIABLE:
   - 1H:1V @ ≈ 3 M
   - 2H:1V @ ≈ 6 M
   - 3H:1V @ ≈ 9 M
   - 4H:1V @ ≈ 12 M
   - DECREASE SPACING AND INCREASE ROLL DIAMETER FOR HIGHLY ERODIBLE SITES
3. PREPARE SOIL AND SEED IMMEDIATELY FOLLOWING FIBER ROLL INSTALLATION
4. FIGURE IS PROVIDED FOR REFERENCE ONLY. CONSULT QUALIFIED PROFESSIONAL FOR SITE-SPECIFIC DESIGN.

ORGANIC FIBER ROLLS

References

- VOI Training Group's Erosion and Sediment Control Practitioner (ESCP) Participant's Manual

Also see

- ID-EC_01_VegRetentionAndReplacement
- ID-EC_03_Erosion Control Blankets
- ID-EC_04_Impermeable Sheeting

Appendix F

EC_06 Ditch Check Dams

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DITCH CHECK DAMS ID-EC_06

Photo Credit: FP Innovations https://fpinnovations.ca/media/presentations/Documents/Presentation-handbook-Gillies-Erosion_and_sediment_control.pdfPhoto

Description

Installed as a series of concave dams used in ditches (not fish bearing) natural swales, or overland flow paths that are carrying sediment. Used as a longer term solution to reduce erosion over the duration of onsite activities. By decreasing the grade of a ditch and decreasing flow velocities, this erosion control also has a secondary function in the capture and storage of larger sized sediments.

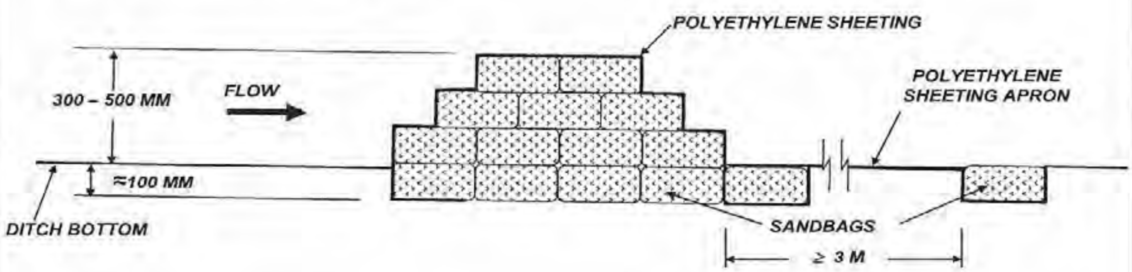
Application

<table>
<tr><td>Flat Ground</td><td>N</td><td rowspan="4">For use on drainage ditches or large diversions but not natural watercourses</td></tr>
<tr><td>Sloping Ground</td><td>N</td></tr>
<tr><td>Stockpiles</td><td>N</td></tr>
<tr><td>Ditches</td><td>Y</td></tr>
</table>

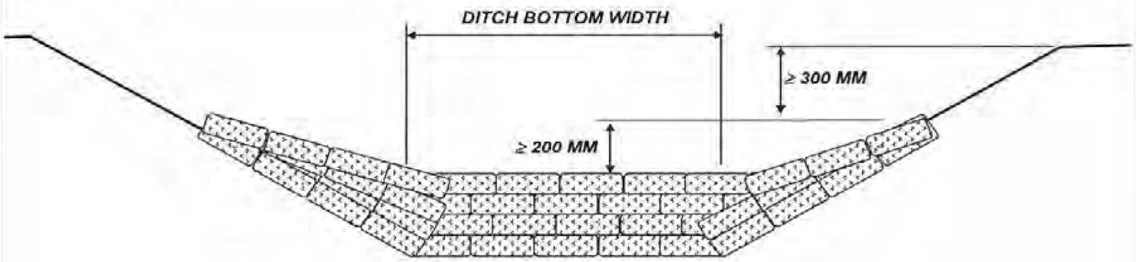
Implementation

Ditch check dams are installed in a series , with steeper slopes requiring a closer spacing to maintain a reduction in the velocity of flowing water.
Check dams are most effective where drainage area is relatively small, with low velocity flow and with a low gradient or slope angle. Typically installed in ditches where water flow is eroding and scouring a channel in finer textured soils. Attention to specifications is required for effective installation, poor installation can cause undercutting and increase erosion. Can be combined with other methods such as erosion control blankets.

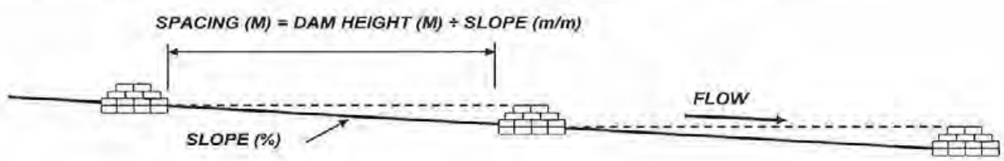
SECTION VIEW THROUGH DAM *(No Scale)*



SECTION VIEW ACROSS DITCH *(No Scale)*



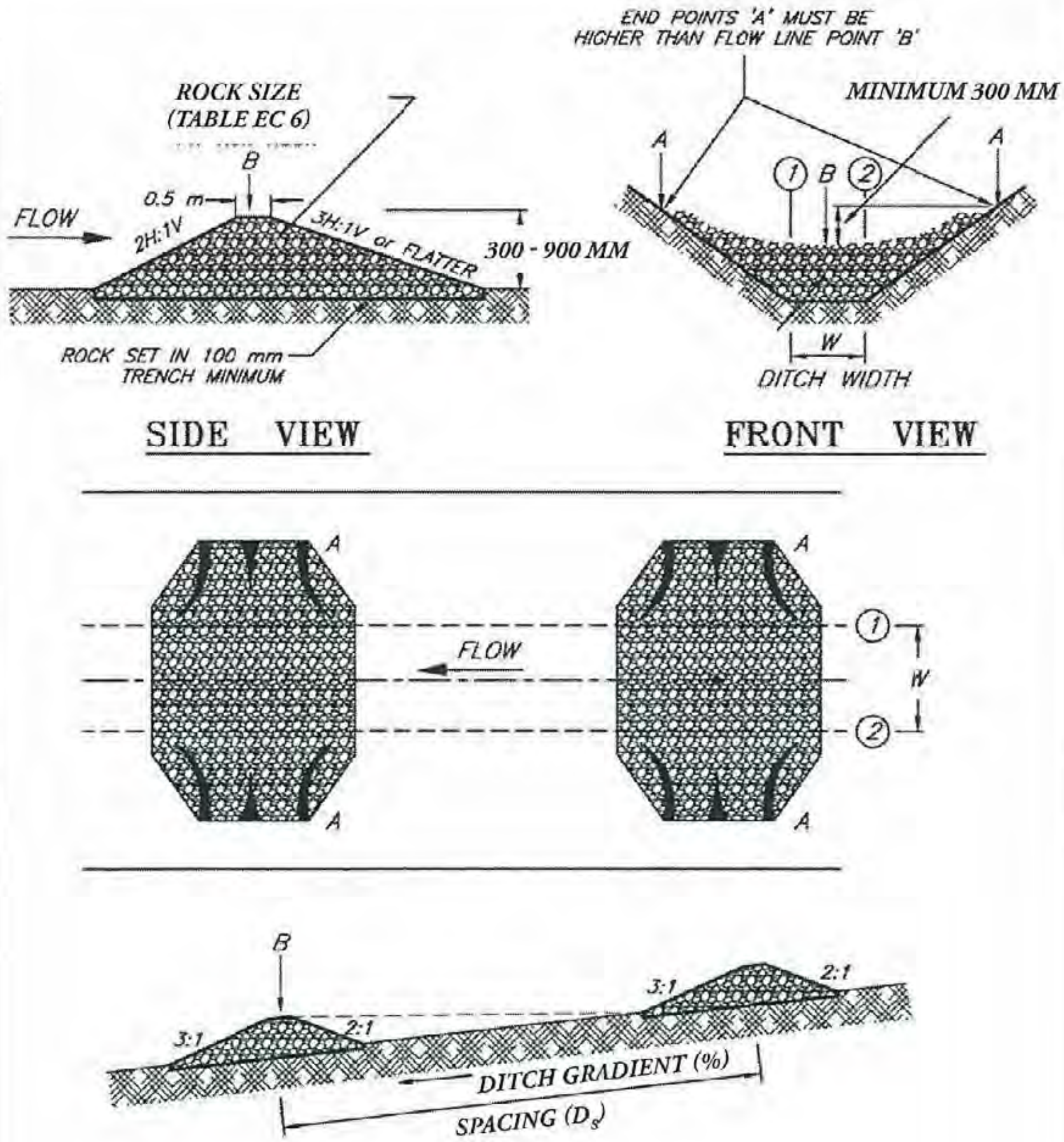
PROFILE VIEW AND TYPICAL SPACING FOR SANDBAG DAMS IN DITCH *(No Scale)*



NOTES:

1. EXCAVATE NOMINAL 100MM DEEP TRENCH FOR FULL DAM FOOTPRINT.
2. INCREASE/DECREASE WIDTH, HEIGHT AND CONFIGURATION OF CHECK DAM TO MEET MINIMUM AND MAXIMUM DAM HEIGHT REQUIREMENT. RESULTING STRUCTURE MUST BE HYDRAULICALLY STABLE.
3. WRAP DAMS WITH POLYETHYLENE SHEETING AND EXTEND 3 M DOWNDITCH (MIN.) OF DAMS. IF SHEETING IS NOT INSTALLED, ALTERNATIVE EROSION RESISTANT APRON MUST BE PLACED.
4. POLYETHYLENE SHEETING 6 MIL (MIN.) THICKNESS AND OF SUFFICIENT WIDTH TO COVER ENTIRE WIDTH OF DAM.
5. DITCH MUST HAVE SUFFICIENT DEPTH TO ENSURE ALL FLOW REMAINS WITHIN DITCH.
6. DITCH SLOPE ≤5%.
7. CONTRIBUTING DRAINAGE AREA ≤2 HA.
8. REMOVE ACCUMULATED SEDIMENT WHEN SEDIMENT DEPTH IS ≤ ½ OF DAM HEIGHT.
9. FIGURE IS PROVIDED FOR REFERENCE ONLY. SITE SPECIFIC DESIGN SHOULD BE OBTAINED FROM QUALIFIED PROFESSIONAL.

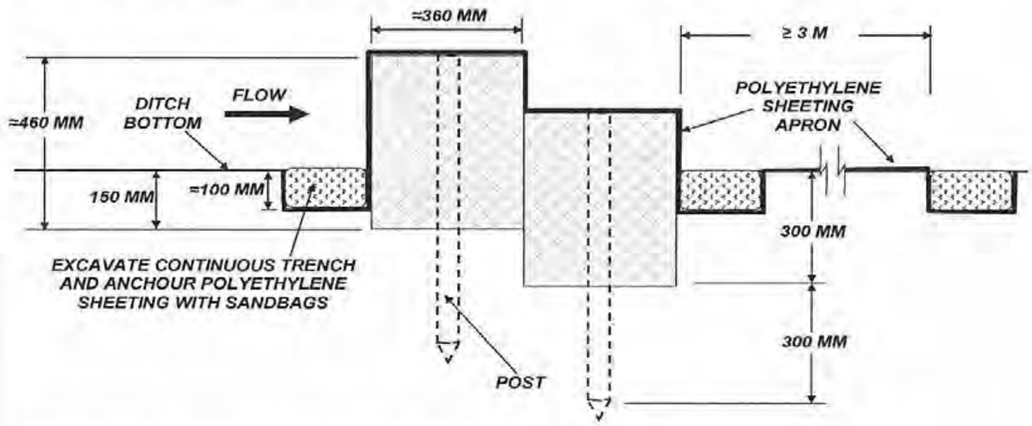
SANDBAG CHECK DAM



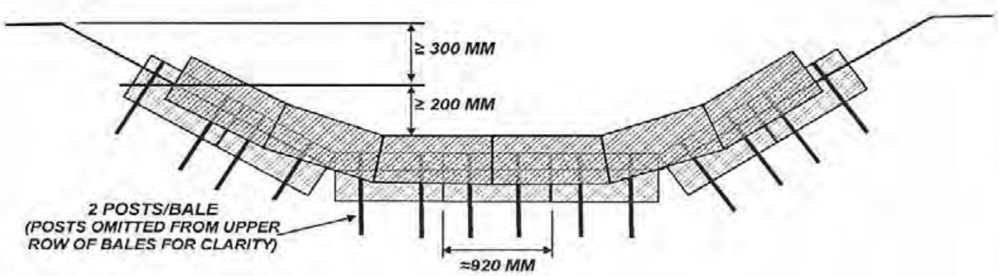
1. NOTES:
2. FLOW VELOCITY ≤ 1.5 M/S.
3. DRAINAGE AREA ≤ 4 HA.
4. DITCH GRADIENT ≤ 8%.
5. EXTEND ROCK APRON MIN. 3 M DOWNDITCH OF EACH CHECK DAM.
6. FIGURE IS PROVIDED FOR REFERENCE ONLY. SITE SPECIFIC DESIGN SHOULD BE OBTAINED FROM QUALIFIED PROFESSIONAL.

ROCK CHECK DAM

SECTION VIEW THROUGH DAM (No Scale)

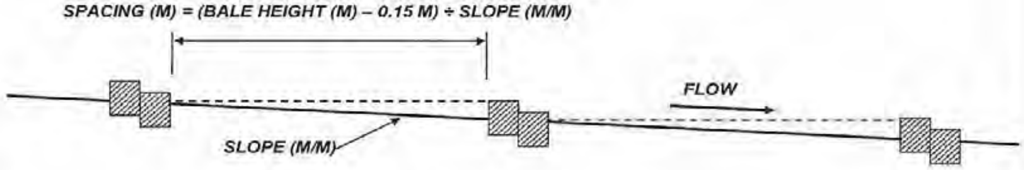


SECTION VIEW DOWNDITCH ACROSS DITCH (No Scale)



PROFILE VIEW AND TYPICAL SPACING FOR DAMS IN DITCH (No Scale)

SPACING (M) = (BALE HEIGHT (M) – 0.15 M) ÷ SLOPE (M/M)



NOTES:
1. ASSUMED BALE DIMENSIONS = 920 MM X 460 MM X 360 MM.
2. CONSTRUCT DAM ONE BALE HIGH (ONLY). MAXIMUM EFFECTIVE DAM HEIGHT IS 310 MM.
3. WRAP DAMS WITH POLYETHYLENE SHEETING AND EXTEND 3 M DOWNDITCH (MIN.) OF DAMS. IF SHEETING IS NOT INSTALLED, ALTERNATIVE EROSION RESISTANT APRON MUST BE PLACED.
4. POLYETHYLENE SHEETING 6 MIL (MIN.) THICKNESS AND OF SUFFICIENT WIDTH TO COVER ENTIRE WIDTH OF DAM.
5. ANCHOUR POSTS – 25 MM X 25 MM X 800 MM WOODEN STAKE, 19 MM X 800 MM REBAR, OR 800 MM STEEL T-BAR.
6. DITCH MUST HAVE SUFFICIENT DEPTH TO ENSURE ALL FLOW REMAINS WITHIN DITCH.
7. DITCH SLOPE ≤5%.
8. CONTRIBUTING DRAINAGE AREA ≤2 HA.
9. REMOVE ACCUMULATED SEDIMENT WHEN SEDIMENT DEPTH ≤100 MM.
10. FIGURE IS PROVIDED FOR REFERENCE ONLY. SITE SPECIFIC DESIGN SHOULD BE OBTAINED FROM QUALIFIED PROFESSIONAL.

STRAW BALE CHECK DAM

References

- VOI Training Group's Erosion and Sediment Control Practitioner (ESCP) Participant's Manual

Also see

- ID-EC_03_Erosion Control Blankets
- ID-EC_04_Impermeable Sheeting

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Appendix G

EC_07 Water Diversion

Description

Constructed temporary drainage that is used to collect and direct sediment laden surface water run off away from water courses, water bodies and wetlands and to a desirable location for sediment control. Can be constructed around the perimeter of where work is occurring. Location of drainage should consider existing topography and utilize drainage patterns where possible.

Application

Flat Ground	N	Areas with large amount of exposed soil, worksite or stock pile
Sloping Ground	Y	
Stockpiles	Y	
Ditches	Y	

Implementation

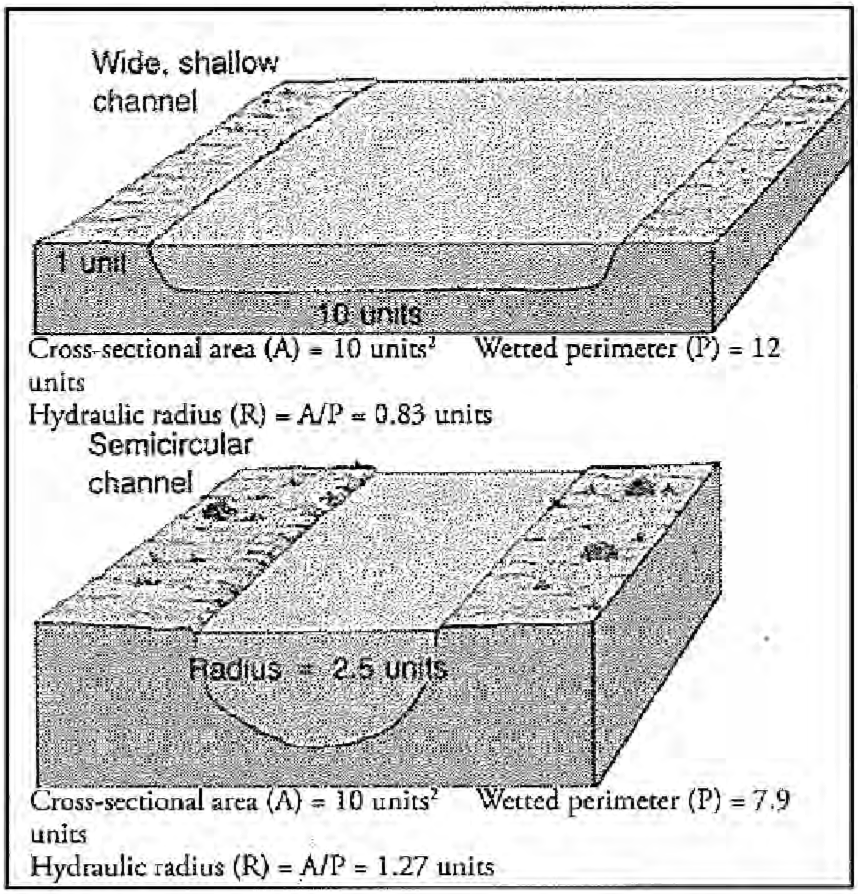
Ditching-

Can be constructed around or through active construction sites. In order to prevent erosion in areas of fine soils, the ditch may need to be lined with either, or a combination of rock (armouring), polyurethane sheeting, or geotextile fabric. Should be combined with other methods such as retention or settling ponds. These catchment areas can be created with retention berms or sediment fabric.

Berms-

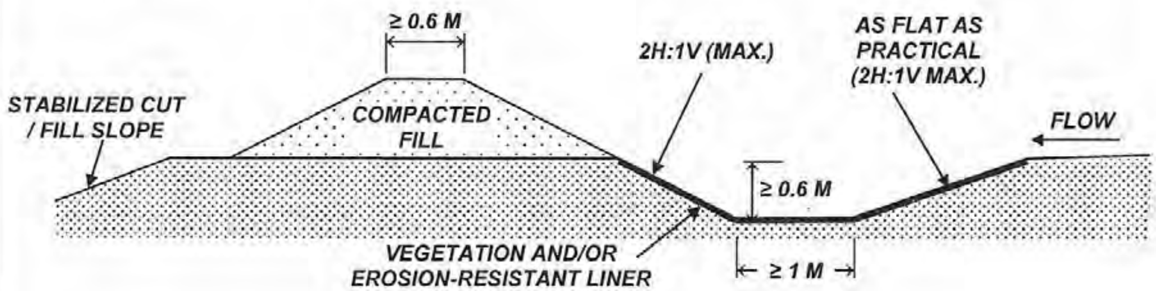
Constructed using compacted lifts from soil or materials found on site, using heavy equipment. Must be inspected on a regular basis (or after rainfall) to identify any failure points that need repair. Berms must be stabilized after construction and should not be used as the primary erosion control measure, and should incorporate other erosion and sediment control methods to optimize performance.

Installation

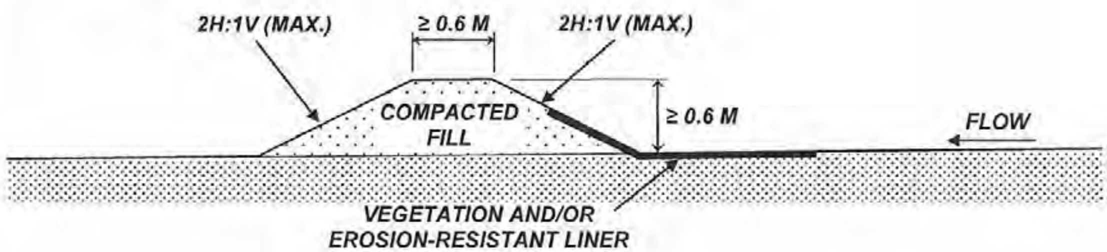


Channel shape influences hydraulic radius and applied shear stress at the channel boundary. A channel shape that decreases hydraulic radius will have deeper flow and higher channel boundary applied shear stress. Channels that decrease hydraulic radius will have shallower flow and lower channel boundary applied shear stress (adapted from **Tarbuck, E.J. and F.K. Lutgens. 1990.** *The Earth*. 3rd ed. Columbus, Ohio: Merrill Publishing Company.

TYPICAL DIVERSION DITCH (No Scale)



TYPICAL DIVERSION BERM (No Scale)



NOTES:

1. DIVERSION DITCH / BERM SHALL HAVE POSITIVE DRAINAGE TO A STABILIZED OUTLET.
2. GRADIENT ALONG DITCH / BERM ≤ 0.5 % DOES NOT REQUIRE EROSION-RESISTANT LINER.
3. SEED ALL DISTURBED SOIL AND INSTALL AND MAINTAIN OTHER EROSION CONTROLS AS REQUIRED.
4. FOR CATCHMENT AREAS ≤ 2 HA.
5. FIGURE IS PROVIDED FOR REFERENCE ONLY. SITE-SPECIFIC DESIGN SHOULD BE OBTAINED FROM QUALIFIED PROFESSIONAL.

TEMPORARY DIVERSION DITCH AND BERM

References

- VOI Training Group's Erosion and Sediment Control Practitioner (ESCP) Participant's Manual

Also see

- ID-EC_03_Erosion Control Blankets
- ID-EC_04_Impermeable Sheeting
- ID-EC_06_Ditch Check Dams

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Appendix H

EC_08 Timber Matting

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Description

Timber mats (Rig mats, swamp mats) are portable mats that are constructed of non-treated wood or plastic which are placed over an area in a network to create a work platform or structural roadway. Matting reduces ground pressure and compaction from heavy equipment by increasing the surface area. This allows for passage or work to take place over sensitive or unstable ground while protecting it and minimizing ground surface disruption. Matting minimizes the amount of compaction and rutting that takes place which can predispose to erosion.

Implementation

Can be utilized in any area of concern such as in areas with thawing or unfrozen ground conditions, riparian areas and other environmentally sensitive sites. Can be used to prevent soil compaction, rutting and as a tool for biosecurity mitigation as it help to minimize ground surface disruption and soil contact.

Application

<table>
<tr><td>Flat Ground</td><td>Y</td><td rowspan="4">Flat ground at risk of erosion due to sensitivities or weather conditions</td></tr>
<tr><td>Sloping Ground</td><td>N</td></tr>
<tr><td>Stockpiles</td><td>N</td></tr>
<tr><td>Ditches</td><td>N</td></tr>
</table>

Installation

- Verify that mats are clean and free of soil, debris and plant material when they arrive for use on site.
- Mats cannot be constructed of chemically treated wood products.
- In wetlands three mats is the maximum number that can be stacked and used in one location.
- Follow the biosecurity management plan for cleaning washing and disinfecting matting prior to moving it to a new project location.
- Matting should not impede or redirect natural drainage patterns or water courses.
- Mat removal will take place from the existing mat road, working in a backwards fashion (from work site to initial access point).
- When mat removal is complete all remaining matting debris will be cleaned, up and transported to an approved waste disposal facility
- When matting is removed any compaction of soils will have to be rehabilitated

References

- VOI Training Group's Erosion and Sediment Control Practitioner (ESCP) Participant's Manual

Also see

- ID-EC_03_Erosion Control Blankets

Appendix I

EC_09 Wind Erosion Control

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WIND EROSION CONTROL

ID-EC_09

Description

Wind can be a mechanism of erosion, particularly for dry, finely textured soils with low organic content that is exposed by construction activities. Wind erosion can influence local air quality on the project site and be a source of sediment for water bodies. Areas of potential wind erosion are roads, stockpiles, exposed soil and helicopter landing pads.

Mitigation Implementation

Wind erosion can be minimized by reducing the factors that cause it, by covering susceptible soils or reducing the amount and duration of exposure.

- The most common method of chemical free dust control approved by Manitoba Hydro is the periodic application of water to the surface.
- If stockpiles are retained for an extended period or during high wind events they can be wetted and or covered with impermeable sheeting.
- Longer term retention of stockpiles could also reduce erosion by packing them with equipment and or converting them to low profile berms.
- Erosion control blankets, impermeable sheeting, surface cover, as well as vegetation retention and replacement are effective ways to stabilize soil and prevent wind erosion in the majority of situations.

Also see

- ID-EC_04_Impermeable Sheeting
- ID-EC_03_Erosion Control Blankets
- ID-EC_01_Vegetation Retention And Replacement
- ID-EC_02_Surface Cover

Appendix J

SC_01 Sediment fencing

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SEDIMENT FENCING ID-SC_01

Photo Credit: VOI Training Group's Erosion and Sediment Control Practitioner (ESCP) Participant's Manual

Description

Permeable geotextile fabric installed vertically, supported by posts with the bottom of the fabric buried in a trench at the bottom. Designed to prevent transport of sediment off site. Sediment fencing is designed to be used as a sediment catch basin but not as a "filter" which is commonly thought. It acts as an above ground settling pond to provide an area of catchment where water can remain still and allow sediment to settle out. Sediment fencing requires frequent monitoring and maintenance to remain effective.

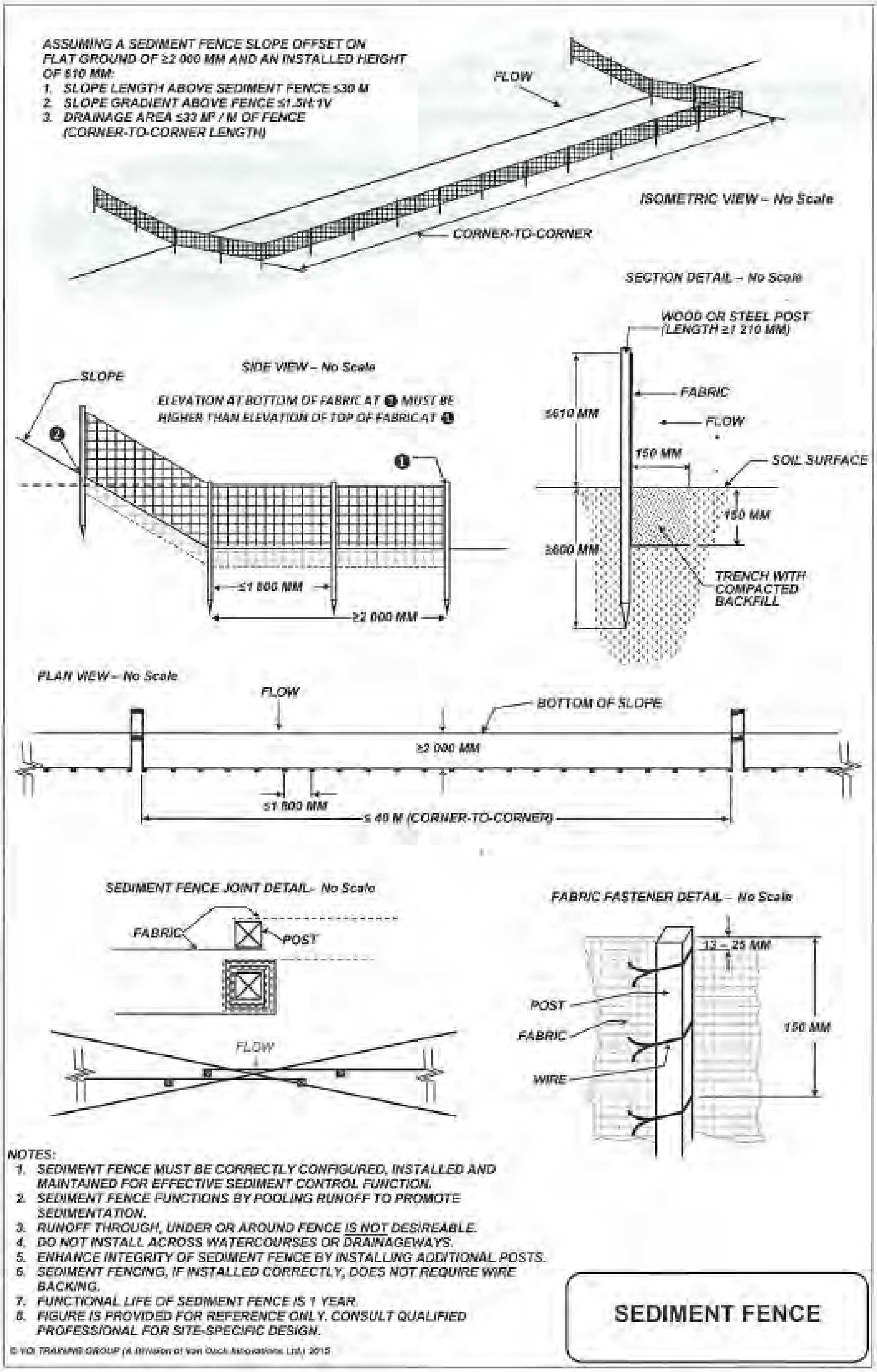
Implementation

Note that correct installation of this sediment control measure is crucial to its effectiveness and the level of maintenance it will require. Installed downslope from construction activities, and used with other control measures (such as straw wattles/roles, or sediment check dams). Should follow the contour of the slope with have sides going upslope making the shape of a "U" or a "smile" to trap water. Minimize the amount of joints if any in the fabric. Regular inspections of the fence should occur, especially after rain events.

Application

Flat Ground	Y	Anywhere low flow runoff is a concern and retention of sediment
Sloping Ground	Y	
Stockpiles	Y	
Ditches	Y	

Installation



References

- VOI Training Group's Erosion and Sediment Control Practitioner (ESCP) Participant's Manual

Also see

- ID-EC_07_Water Diversion
- ID-SC_02_Sediment Retention Berm

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Appendix K

SC_02 Sediment Retention Berm

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Description

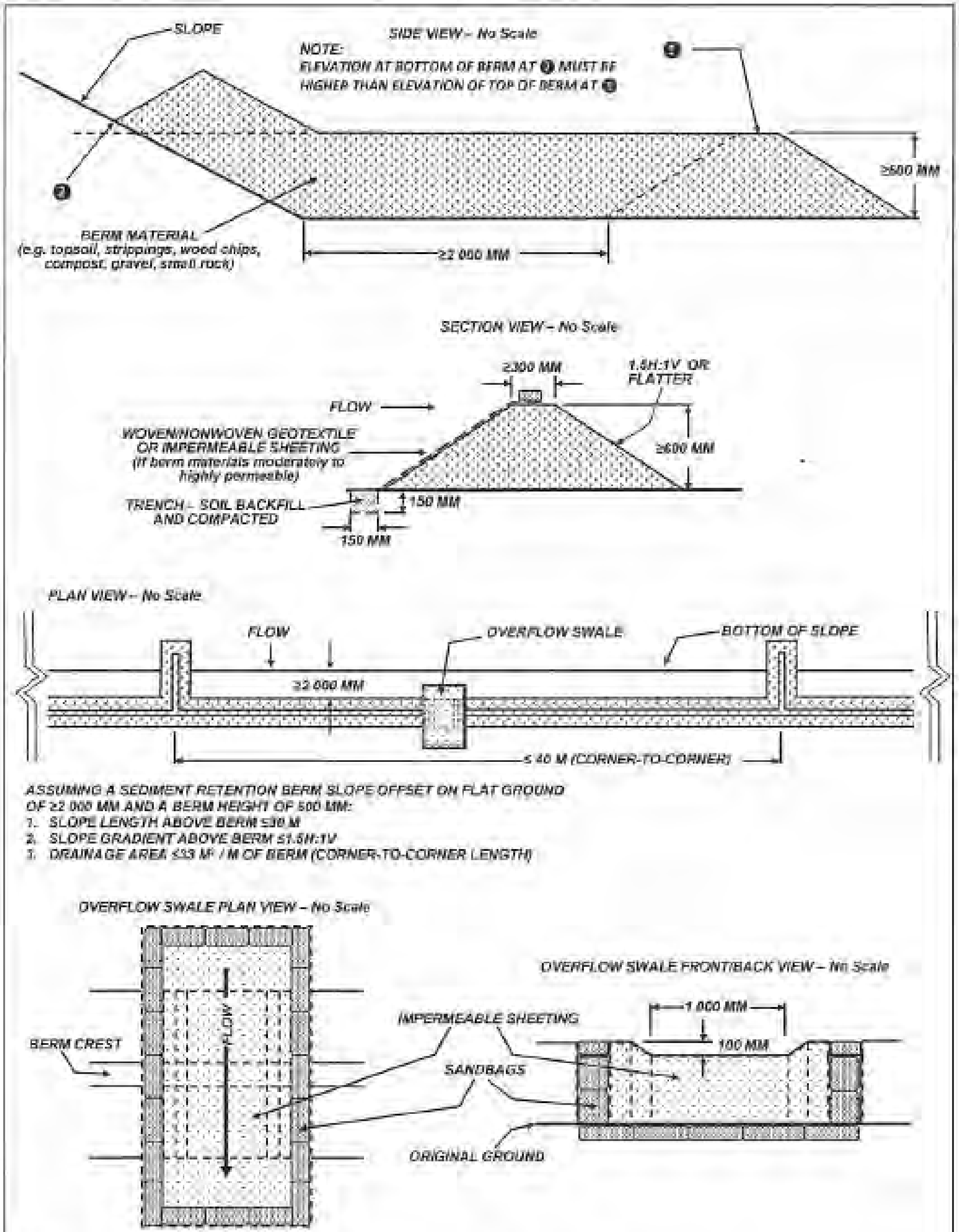
Berms are constructed with heavy equipment using wood chips, soil or bulk material found on site. Purpose of retention berm is to force low volumes of overland flow to pool, allowing sediment to settle out of suspension. Must be inspected on a regular basis (or after rainfall) to identify any failure points that need repair. Berms should not be used as the primary erosion control measure, and should incorporate other erosion and sediment control methods to optimize performance.

Implementation

Located on the downslope of construction activities where a sediment pond or catch basin has been designed to contain site run off. Layout of the berm should follow the site contour and forming a “U” shape or a “smile” configuration with the ends going upslope. Do not install across a drainage ditch or watercourse.

Application

Flat Ground	Y	Anywhere low flow runoff is a concern and retention of sediment
Sloping Ground	Y	
Stockpiles	Y	
Ditches	Y	



NOTES:
1. SEDIMENT RETENTION BERM MUST BE CORRECTLY CONFIGURED, INSTALLED AND MAINTAINED FOR EFFECTIVE SEDIMENT CONTROL FUNCTION.
2. SEDIMENT RETENTION BERM FUNCTIONS BY POOLING RUNOFF TO PROMOTE SEDIMENTATION.
3. RUNOFF THROUGH, UNDER OR AROUND BERM IS NOT DESIREABLE.
4. DO NOT INSTALL ACROSS WATERCOURSES OR DRAINAGEWAYS.
5. BERM CONSTRUCTED FROM HIGHLY PERMEABLE MATERIALS MAY REQUIRE AN UPSLOPE IMPERMEABLE LINING MATERIAL.
6. OVERFLOW SWALE SHOULD BE CONSTRUCTED FOR BERMS CONSTRUCTED FROM MATERIALS WHICH MAY ERODE/FAIL IF OVERTOPPED BY RUNOFF.
7. FIGURE IS PROVIDED FOR REFERENCE ONLY. CONSULT QUALIFIED PROFESSIONAL FOR SITE-SPECIFIC DESIGN.

SEDIMENT RETENTION BERM

References

- VOI Training Group's Erosion and Sediment Control Practitioner (ESCP) Participant's Manual

Also see

- ID-EC_04_Impermeable Sheeting
- ID-EC_07_Water Diversions
- ID-SC_01_Sediment Fencing

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Appendix I

Saturated/Thawed Soils Operating Guidelines

Radisson to Henday (R44H)

Saturated / Thawed Soils Operating

Guidelines

Prepared by Manitoba Hydro

Transmission & Distribution Environment
and Engagement Department
Project Management Division

Table of Contents

Figures

1.0 Intent and implementation

These operating guidelines define contractor requirements with respect to saturated and/or thawed soils, including trigger conditions, assessment criteria, potential work modification options, thresholds for work shutdown, and plan submittal requirements.

These operating guidelines are applicable to all project components including but not limited to the access roads/trails, right of way, marshalling yards (i.e., laydown yards, fly-yards) and temporary structures (i.e., stringing sites).

The process for utilization of these operating guidelines is:

1. The contractor monitors site conditions against trigger conditions
2. The contractor assesses criteria to determine if work modification is required
3. The contractor determines the work modification (if applicable) that will be applied and submit their plan to Manitoba Hydro for review.
    a. Plan submittal shall occur promptly.
    b. Unless the work modification chosen is stoppage of work, the work may proceed (with work modifications implemented) prior to Manitoba Hydro providing review comments to the contractor.
    c. The contractor shall notify Manitoba Hydro each time when/if the contractor determines that any specific work modification is no longer required.
4. If the threshold for a particular land cover type is exceeded:
    i. The contractor shall reassess criteria and submit a revised work modification plan to Manitoba Hydro for review. Plan resubmittal shall occur promptly. Unless the work modification chosen is stoppage of work, the work may proceed (with work modifications implemented) prior to Manitoba Hydro providing review comments to the contractor.
    ii. Manitoba Hydro may issue an Environmental Improvement Order or an Environmental Stop Work Order depending on the severity of the non-compliance, in accordance with the contract.
5. A record of the location, timing, and reason for implementation of work stoppages, work resumptions, and work modifications will be maintained by the contractor environmental representative and submitted to Manitoba Hydro in the Weekly Environmental Report.

2.0 Consideration of guidelines when planning work

The contractor shall plan, sequence, and schedule work activities in a manner that reduces environmental impact risks and the need for work modifications by reducing the activities occurring in saturated/thawed soil conditions. The contractor is responsible for developing any related protocols to facilitate the implementation of these guidelines.

Site-specific work modifications will be developed by the contractor and proposed to Manitoba Hydro (MH) representatives for review.

3.0 Potential effects

The effects of wet weather during construction activities can have a significant impact on ground conditions and can change otherwise stable soils into soils that are affected by erosion and sedimentation. Freeze thaw cycles during the spring can also expose stable soils to an unstable condition overnight and throughout the day. Variations in soil conditions, construction activities, weather conditions, soil types and land cover are all contributing factors when considering working conditions and potential impacts to soil during saturated or thawed conditions. Potential effects to various types of land cover include:

- Compaction, which is considered the primary mechanism of effect to soil productivity and can affect re-vegetation success and crop performance
- Rutting and admixing (mixing of topsoil and subsoils)
- Increased risk of water erosion and sedimentation in riparian areas affecting water quality and fish habitat
- Access restrictions for traditional resource users, farmers, and the public due to road or trail rutting

4.0 Weather parameters

Weather plays an integral role in the planning of work activities. Conditions such as spring thaw, shorter term warmer temperature periods, and heavy precipitation may require implementation of work modification, including localized work stoppage until ground conditions improve. The following weather events will trigger assessment for work modifications:

- Melting conditions indicated by rising air temperatures above -5^{O} Celsius
- During extended periods of adverse conditions (for rain is considered greater than 5 mm of rain in a 24 hour period)
- more than 50 mm of rain/5 cm of wet snow in the preceding 5 days; or
- the forecast calls for more than 50% certainty of 5 mm of rain/or 5 cm of wet snow in the next 24 hours

5.0 Rutting and admixing identification

A rut is a depression made into the soil surface by the passage of a vehicle or equipment. Figure 1 illustrates how a rut is measured. Admixing – examples of rutting can be found in Figure 2 which shows the beginning of soil admixing and Figure 3 shows advanced stages of admixing from continued travel.

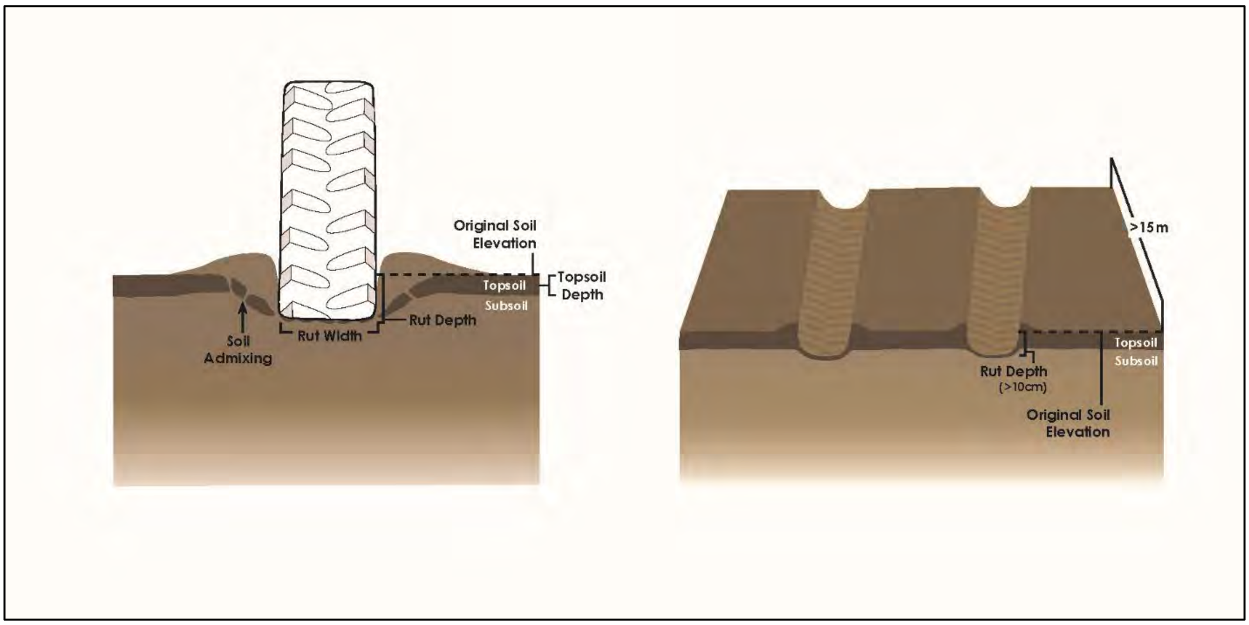


Figure 1: Rut measurement guide

Figure 2: Beginning of admixing

Figure 3: Advanced soil admixing

6.0 Remediation

The level and type of disturbance at each individual site will dictate the amount of remediation necessary. Re-vegetation and/or erosion and sediment controls are site-specific conditions to be considered when planning remediation activities. Refer to the Erosion and Sediment Control Management Plan and the Rehabilitation and Invasive Species Management Plan for further guidance for each disturbed site.

7.0 Guidelines by land cover

7.1 Wetlands

Trigger(s) for the assessment for work modification by contractor

- When air temperature is projected to exceed -5°C that day or when ground conditions cannot support equipment without rutting and compaction; or
- MH Environmental Officer advises contractor of requirement for potential work modification

Criteria to be assessed by the contractor (Manitoba Hydro may conduct its own assessment)

- current and forecasted weather
- current ground conditions
- work schedule
- nature of work activities (i.e., pedestrian traffic vs heavy equipment)
- safety concerns

Potential work modifications (site-specific work modifications will be developed by the contractor and proposed to Manitoba Hydro for review)

- placement of matting or snow
- low(er) ground pressure equipment
- reduced scope of work
- aerial work methods
- change of work hours
- change of work location
- stoppage of work
- other modifications as approved by Manitoba Hydro

Thresholds for immediate implementation of work modification(s):

- When the depth of rutting exceeds 10 cm for more than 15 m in length;
- Admixing (mixing of topsoil and subsoils); or
- MH Environmental Officer advises contractor of requirement for work modification.

If thresholds continue to be exceeded, either due to inadequate work modifications or lack of work modification, Manitoba Hydro may issue an Environmental

Improvement Order or an Environmental Stop Work Order depending on the severity of the non-compliance, in accordance with the Contract.

7.2 Riparian areas and areas in proximity to water

Trigger(s) for the assessment for work modification by contractor

- Any excessive soil disturbance within riparian area including disturbance on the access trail crossing, ground conditions unable to support equipment without rutting and compaction; or
- MH Environmental Officer advises contractor of requirement for work modification.

Criteria to be assessed by contractor (Manitoba Hydro may conduct its own assessment)

- current and forecasted weather
- current ground and aquatic conditions
- work schedule
- nature of work activities (i.e., pedestrian traffic vs heavy equipment)
- accessibility to Project site(s)
- safety

Potential work modifications (site-specific work modifications will be developed by the contractor and proposed to Manitoba Hydro for review)

- placement of matting or snow
- ice bridge
- low(er) ground pressure equipment
- reduced scope of work
- aerial work methods
- closure of access trail within riparian area
- change of work hours
- change of work location
- stoppage of work
- other modifications as approved by Manitoba Hydro

Thresholds for immediate implementation of work modification(s):

- Any construction activity that affects surface water drainage directly into a water body (watercourse and/or wetland) without sufficient erosion and sediment control measure in place;
- Admixing (mixing of topsoil and subsoils); or
- MH Environmental Officer advises contractor of requirement for work modification.

If thresholds continue to be exceeded, either due to inadequate work modifications or lack of work modification, Manitoba Hydro may issue an Environmental

Improvement Order or an Environmental Stop Work Order depending on the severity of the non-compliance, in accordance with the contract.

7.3 Cultivated lands

Trigger(s) for the assessment for work modification by contractor

- When the depth of topsoil is rutted to 50% of the depth of topsoil for more than 15 m in length; or
- MH Environmental Officer advises contractor of requirement for potential work modification

Criteria to be assessed by contractor (Manitoba Hydro may conduct its own assessment)

- current and forecasted weather
- current ground conditions
- current crop and farming practices
- depth of topsoil
- salinity
- work schedule
- nature of work activities (i.e., pedestrian traffic vs heavy equipment)
- accessibility to project site(s)
- safety

Potential work modifications (site-specific work modifications will be developed by the contractor, and proposed to Manitoba Hydro for review with the landowner)

- placement of matting or snow
- lower ground pressure equipment
- reduced scope of work
- aerial work methods
- change of work hours
- change of work location
- stoppage of work
- other modifications as approved by Manitoba Hydro

Thresholds for immediate implementation of work modification(s):

- When rutting depth of topsoil exceeds 80% of the topsoil depth for more than 15 m in length
- Admixing (mixing of topsoil and subsoils); or
- MH Environmental Officer advises contractor of requirement for immediate work modification

If thresholds continue to be exceeded, either due to inadequate work modifications or lack of work modification, Manitoba Hydro may issue an Environmental

Improvement Order or an Environmental Stop Work Order depending on the severity of the non-compliance, in accordance with the Contract.

7.4 Access routes and trails

Trigger(s) for the assessment for work modification by contractor

- When access route or trail conditions caused by the Project create additional risk of damage or barriers to movement to vehicles of other users; or
- MH Environmental Officer advises contractor of requirement for potential work modification

Criteria to be assessed by contractor (Manitoba Hydro may conduct its own assessment)

- current and forecasted weather
- current ground conditions
- work schedule
- nature of work activities (i.e., pedestrian traffic vs heavy equipment)
- accessibility to Project site(s)
- safety

Potential work modifications (site-specific work modification(s) will be developed by the contractor, and proposed to Manitoba Hydro for review with the landowner)

- placement of matting or snow
- lower ground pressure equipment
- closure of access route to Project traffic
- aerial work methods
- change of work hours
- change of work location
- stoppage of work
- other modifications as approved by Manitoba Hydro

Thresholds for immediate implementation of work modification(s):

- Any evidence of access route/trail structure damage occurring, such as admixing, or the creation of ruts that impedes local vehicle traffic; or
- MH Environmental Officer advises contractor of requirement for immediate implementation of work modification.

If thresholds continue to be exceeded, either due to inadequate work modifications or lack of work modification, Manitoba Hydro may issue an Environmental

Improvement Order or an Environmental Stop Work Order depending on the severity of the non-compliance, in accordance with the Contract.

7.5 Forest, tame pasture and grasslands

Trigger(s) for the assessment for work modification by contractor

- When rutting depth exceeds 10 cm for more than 15 m in length; or
- MH Environmental Officer advises contractor of requirement for immediate implementation of work modification(s).

Criteria to be assessed by contractor (Manitoba Hydro may conduct its own assessment)

- current and forecasted weather
- current ground conditions
- work schedule
- nature of work activities (i.e. pedestrian traffic vs heavy equipment)
- accessibility to Project site(s)
- safety

Potential work modifications (site-specific work modifications will be developed by the contractor, and proposed to Manitoba Hydro for review with the landowner)

- placement of matting or snow
- lower ground pressure equipment
- reduced scope of work
- aerial work methods
- change of work hours
- change of work location
- stoppage of work
- other modifications as approved by Manitoba Hydro

Thresholds for immediate implementation of work modification(s):

- When rutting depth exceeds 30 cm for more than 15 m in length;
- Admixing (mixing of topsoil and subsoils); or
- MH Environmental Officer advises contractor of requirement for immediate implementation of work modification.

If thresholds continue to be exceeded, either due to inadequate work modifications or lack of work modification, Manitoba Hydro may issue an Environmental Improvement Order or an Environmental Stop Work Order depending on the severity of the non-compliance, in accordance with the Contract.

APPENDIX J

Rules for Externally Reportable Releases

Externally Reportable Releases

IMPORTANT – Internal reporting is required for all quantities released!

Use the following rules when determining if external reporting to the regulator is required. If any of the rules apply, the release **MUST** be externally reported.

RULES FOR EXTERNALLY REPORTABLE RELEASES (FOR ANY TYPE OF HAZARD)

To determine if a release should be reported to the regulator:

1) First determine if any of the rules apply. If so, an Emergency Report must be made by phone to Manitoba Environment, Climate and Parks.

Rule 1	• **Any volume released to a waterway**
Rule 2	• **Any volume released to an environmentally sensitive area**
Rule 3	• **Any volume released that poses or may pose a threat to human health or the environment**

2) If no rules apply, check to see if the release meets or exceeds the quantities on the '*Externally Reportable Quantities for Releases*' table (on page 2 and 3 of this document). If so, report to Manitoba Environment, Climate and Parks.

Emergency reporting in Manitoba to regulators for all notifications *(Manitoba Environment, Climate and Parks, Environment and Climate Change Canada and Transport Canada)* requires calling the Environmental Emergency Reporting Line at (204) 944-4888.

Externally Reportable Quantities for Releases

Regulated			
Hazard	**TDG Class** (If Applicable)	**Reportable Quantity by Regulation**	**Reportable Quantity for Notification Purposes**
Explosives (i.e. Dynamite)	1	Any Quantity	—
Compressed Gas			
Flammable (i.e. Aerosols, Propane)	2.1	100 L Container Capacity (refers to water capacity)	—
Flammable — Natural Gas Underground Lines	—	—	Any quantity that causes death, injury, fire, explosion, evacuation, threatens safety of public, highly visible and notable, > 2" diameter lines and >550 kPa (80 psig), or has harmed the environment
Non-Flammable, Non-Toxic (i.e. Anhydrous Ammonia, Fire Extinguishers)	2.2	100 L Container Capacity (refers to water capacity)	—
Toxic (i.e. Hydrogen Sulphide; Chlorine)	2.3	Any Quantity	—
Corrosive (i.e. Hydrogen Chloride)	2.3	Any Quantity	—
Flammable Liquids (i.e. Gasoline, Acetone, Diesel Fuel, Methanol)	3	100 L	—
Flammable Solids, Spontaneous Combustible and Water-Reactive Substances (i.e. Sulphur, Zinc Dust)	4	1 kg	—
Oxidizing Substances			
Packing Groups I & II (i.e. Sodium Peroxide, Potassium Permanganate)	5.1	1 kg or 1 L	—
Packing Groups III (i.e. Potassium Nitrate)	5.1	50 kg or 50 L	—
Organic Peroxides (i.e. Methyl Ethyl Ketone Peroxide)	5.2	1 kg or 1 L	—
Toxic Substances			
Packing Group I (i.e. Acrylonitrile, Hydrogen Sulfide)	6.1	1 kg or 1 L	—
Packing Group II & III (i.e. Pesticides, Wood Preservative)	6.1	5 kg or 5 L	—

Regulated			
Hazard	**TDG Class** (If Applicable)	**Reportable Quantity by Regulation**	**Reportable Quantity for Notification Purposes**
Infectious Substances **(i.e. Infectious Substances affecting humans)**	6.2	Any Quantity	—
Radioactive Materials (i.e. Nuclear Densometers)	7	Any discharge or radiation exceeding 10 mSv/h at the package surface and 0.2 mSv/h at 1m from the package surface	—
Corrosive (i.e. Hydrofluoric Acid, Battery Fluid, Mercury)	8	5 kg or 5 L	—
Miscellaneous Products, Substances or Organisms (i.e. Lithium Cells & Batteries, Asbestos)	9	50 kg	—
Polychlorinated Biphenyls			
PCB or PCB Contaminated Oil IN USE	9	1 gram	—
PCB Containing Equipment IN STORAGE	9	Any Quantity ≥ 2 ppm	—
Ozone Depleting Substances (i.e. R-11 Refrigerant) *Report using MOPIA form	—	10 kg	—

Non Regulated			
Hazard	**TDG Class** (If Applicable)	**Reportable Quantity by Regulation**	**Reportable Quantity for Notification Purposes**
Petroleum Products			
Engine Oil	—	—	30 L
Insulating Oil	—	—	100 L
Lubricating & Hydraulic Oil	—	—	50 L
Pesticides (Non-TDG Regulated)			
Concentrate	—	—	10 L
Solutions, Mixtures	—	—	100 L
Antifreeze (Non-TDG Regulated) (Propylene & Ethylene Glycol)	—	—	50 L
Sewage (Solid Sludge or Liquid)	—	—	500 kg or 500 L

CALCULATION FOR PCB GRAMS PER DAY

Determine the number of grams released in PCB spills by multiplying the volume (litres) released, by the concentration (parts-per million) of PCBs in the release, by the density (kilograms/litre) of 0.9 kg/L, and then divide that value by 1000.

$$\frac{\text{(Volume Released (L)x Concentration of PCBs (ppm) x 0.9(kg/L)}}{1000} = \text{PCBs Released (g)}$$

Example: A 90L release of insulating oil with a concentration of 10ppm PCBs from a transformer in use.

$$\frac{(90\text{L x } 10\text{ppm x } 0.9 \text{ kg/L})}{1000} = 0.81$$

Therefore this release ***would not*** be reportable to the regulator.

PCB Concentration / Volume of Oil that equates to 1 gram of PCBs being released	
Concentration of PCBs in Released Oil	**Volume of Oil that equates to 1 gram of PCBs being released**
5 ppm	222 litres
10 ppm	111 litres
20 ppm	55 litres
40 ppm	27 litres
45 ppm	24 litres
100 ppm	11 litres

RULES FOR EXTERNALLY REPORTABLE RELEASES OF DANGEROUS GOODS IN TRANSPORT (SURFACE)

To determine if a release of dangerous goods in transport should be reported to the regulator:

1) First determine if the dangerous goods are being transported using the 150 kg Gross Mass Exemption. If not, follow additional steps below. If Gross Mass Exemption is being used, no reporting of a TDG release is required.

2) If the release endangers or could endanger public safety **AND** meets or exceeds the quantities on the 'TDG Externally Reportable Quantities for Releases' table (on page 5 of this document). If so, an Emergency Report must be made by phone to Manitoba Environment, Climate and Parks.

3) If the Emergency Report under #2 is made, **AND** any of the following rules apply, submit a Release Report by phone to CANUTEC, the consignor (shipper), and the Canadian Nuclear Safety Commission (if Class 7 is involved). A written 30-Day Follow-up Report must also be submitted to Transport Canada (contact Enterprise Environment).

Rule 1	• Death or injuries that require treatment by a health care professional
Rule 2	• An evacuation/closure of a facility, road, mail railway line, or main waterway
Rule 3	• Integrity of the means of containment is compromised

Emergency reporting in Manitoba to regulators for all notifications (Manitoba Environment, Climate and Parks, Environment and Climate Chane Canada and Transport Canada) requires calling the Environmental Emergency Reporting Line at (204) 944-4888.

Release reporting to CANUTEC's 24-hour Emergency Telephone (613) 996-6666
Canadian Nuclear Safety Commission duty officer Emergency Line (613) 995-0479

TDG Externally Reportable Quantities for Releases		
Class of Dangerous Good	**Packing Group or Category**	**Quantity**
1	II	Any quantity
2	Not applicable	Any quantity
3, 4, 5, 6.1 or 8	I or II	Any quantity
3, 4, 5, 6.1 or 8	III	30 L or 30 kg
6.2	A or B	Any quantity
7	Not applicable	A level of ionizing radiation greater than the level established in section 39 of the "Packaging and Transport of Nuclear Substance Regulations, 2015"
9	II or III or without packing group	30 L or 30 kg

Appendix K

Culture and Heritage Resource Protection Plan






CULTURAL AND HERITAGE RESOURCES PROTECTION PLAN

Manitoba Hydro

Document Owner
Transmission & Distribution Environment and Engagement
Project Management Division
Manitoba Hydro

Version - Final

List of Revisions

Number	Nature of Revision	Section(s)	Revised By	Date

Key messages for construction

Workers in the field should remain vigilant to watch for and report any discoveries. Manitoba Hydro expects workers to report any findings to the Manitoba Hydro On-Site Supervisor or designate.

If human remains, a cultural and/or heritage site are found, activities stop at that location.

The Manitoba Hydro Transmission & Distribution Environment and Engagement (T&DEE) is prepared to offer the required support to On-Site Supervisors including archaeological services, to preserve and protect cultural and heritage resources. T&DEE can be contacted at 1-877-343-1631 or projects@hydro.mb.ca.

Potential fines

Under The Heritage Resources Act, any person who contravenes or fails to observe a provision of this Act or a regulation, order, by-law, direction, or requirement made or imposed thereunder is guilty of an offence and liable, on summary conviction, where the person is an individual, to a fine of not more than $5,000. for each day that the offence continues and, where the person is a corporation, to a fine of not more than $50,000. for each day that the offence continues.

Preface

This standard Cultural and Heritage Resources Protection Plan outlines protection measures and protocols that Manitoba Hydro, its contractors and/or consultants will undertake in the event of the discovery of previously unrecorded cultural and **heritage resources** during construction, maintenance, or operation of an electrical or gas transmission line or facility.

The intent for this document is to be a straightforward and practical reference document for use by the Manitoba Hydro On-Site Lead, Environmental Inspector and/or Indigenous Communities and Organizations. Manitoba Hydro - Transmission & Distribution Environment and Engagement Department encourages anyone to provide feedback on this document and will review this plan on an annual basis. Feedback can be provided to projects@hydro.mb.ca.

Some words in the text are in **bold face** the first time they occur in the document and definitions are included in the glossary in section 3.0.

Table of contents

1.0 Introduction

Manitoba Hydro understands and appreciates the value that Manitobans place on cultural and heritage resources and the rich legacy found throughout our Province. Manitoba Hydro's commitment to safeguarding these resources has led to the development of this Cultural and Heritage Resources Protection Plan (CHRPP). The CHRPP will provide clear instructions if Manitoba Hydro, its contractors and/or consultants, discover or disturb a cultural or heritage resource and will determine the ongoing protection measures for the resources through processes outlined in this document.

1.1 Commitment to environmental protection

Protecting the environment is an integral part of everything Manitoba Hydro does. Manitoba Hydro accomplishes this by integrating environmentally responsible practices in all aspects of our business. Environmental protection can only be achieved with the full cooperation of Manitoba Hydro employees, consultants, and contractors at all stages of the Project from planning and design through construction and operational phases.

The use of a Cultural and Heritage Resources Protection Plan (CHRPP) is a practical and direct implementation of Manitoba Hydro's environmental policy and its commitment to responsible environmental and social stewardship. It is a proactive approach to manage potential discoveries of **human remains**, cultural and heritage resources.

Manitoba Hydro is committed to implementing this CHRPP. Manitoba Hydro will also require companies that contract with us to follow the terms of this and other applicable plans.

1.2 Regulatory and policy setting

Legislation that commonly applies to cultural and heritage resources for construction, maintenance or operation of transmission lines or facilities includes: ***The Heritage Resources Act*** *(The Act)* and the ***Province of Manitoba Policy Concerning the Reporting, Exhumation and Reburial of Found Human Remains (Burials Policy)***. This CHRPP is consistent with and does not replace the above. In effect, the CHRPP builds on the protective measures afforded by *The Act and policy*.

1.3 Implementation

The goal of the CHRPP is to act as a reference manual to describe key actions in the event of discovery of cultural or heritage resources or human remains. Manitoba Hydro will inform relevant employees and contractors working on the project of the contents of applicable regulatory specifications, guidelines, licenses, authorizations and permits, and of this plan, and copies will be available from the on-site lead office.

The plan also allows for adaptive management to include new and evolving strategies, protocols, and information to support and protect culture and heritage resources. Appendix B includes a protocol template that interested communities and organizations can complete to augment and enhance this CHRPP.

This protocol could provide feedback on items such as:

- Whether the community/organization wants Manitoba Hydro to contact them upon discovery of unrecorded cultural or heritage resources
- Who and how to contact the community representative(s) upon discovery of unrecorded cultural or heritage resources
- When the community representative(s) would like to be contacted
- Description of the Area of Interest the community feels may contain heritage and **cultural resources** important to them
- General types of cultural and heritage resources that may be in Area of Interest
- Ceremonial or spiritual activities the community would like conducted prior to construction
- Any other concerns the community may have regarding cultural and heritage resources
- Whether the community has received a copy of this standard CHRPP

Upon the discovery of unrecorded cultural or heritage resources, Manitoba Hydro will follow the steps outlined in section 1.8 in conjunction with the applicable attached Protocols.

1.4 On-site project management structure

Manitoba Hydro staff and consultants will be required to undertake activities, steps, procedures and measures set out in the Figure 1-1 and Figure 1-2 should cultural or heritage resources or human remains be discovered during the construction, operation or maintenance of the project. There is a potential to discover cultural and heritage resources in many different locations and workers in the field should remain vigilant to watch for and report any discoveries. Manitoba Hydro expects workers to report any findings to the Manitoba Hydro On-Site Supervisor or designate.

The Manitoba Hydro Transmission & Distribution Environment and Engagement Department is prepared to offer the required support to On-Site Supervisors including archaeological services, to preserve and protect cultural and heritage resources. T&DEE can be contacted at 1-877-343-1631 or projects@hydro.mb.ca.

To conduct any type of archaeological or heritage resource investigation, a Heritage Permit is required from the Historic Resources Branch (HRB) (Manitoba Sport, Culture and Heritage Department). The HRB is responsible for the issuance and management of heritage permits. Permits can only be issued to Registered Archaeologists; T&DEE has access to archaeologists to support any investigation.

1.5 Human remains

The Heritage Resources Act (1986), Section 43 (1) states that "human remains" means:

> *"remains of human bodies that in the opinion of the minister have heritage significance and that are situated or discovered outside a recognized cemetery or burial ground in respect of which there is some manner of identifying the persons buried therein."*

Manitoba Hydro will not disturb or remove human remains from their original resting place unless removal is unavoidable and necessary. Out of respect for the remains, all work related to the remains will be conducted as much as possible out of the public eye. **Funerary (grave) goods** found with human remains will accompany human remains at all times. No reports related to any such find and its analysis will be published unless the Community Representative(s) consents to such publication, other than such reports provided to Manitoba Hydro and the Historic Resources Branch or other agencies as may be required by law. The following describes the practices that Manitoba Hydro would follow if **skeletal remains** believed or known to be human remains and/or accompanying grave goods are discovered or disturbed:

Figure 1-1 Discovery of human remains

Discovery of Human Remains	On Site Lead	Transmission & Distribution Environment and Engagement (T&DEE)	Archaeologist	Manitoba Historic Resources Branch (HRB)	RCMP
Step 1	STOP activities at location				
Step 2	Immediately mark discovery location with flagging tape and cordon off with temporary fencing (minimum buffer distance 35 m radius from centre of discovery)		Size of buffer may be adjusted once archaeologist, in consultation with HRB, examine site [i.e., on a case-by-case basis].		
Step 3	Contact T&DEE →	Contact archaeologist and communities/ organizations with protocols →	Contact HRB		
Step 4			Determine whether human remains are present →	If remains human, contact RCMP	
Step 5				For human remains, if not already known, confirm whether RCMP and/or the Chief Medical Examiner have an ongoing interest in remains under *The Fatalities Inquiries Act.*	
Step 6				If remains are **non-forensic** and their removal is required to protect remains, lead exhumation of human remains.	If remains are **forensic** in nature or cannot be immediately determined whether remains are forensic, RCMP and Chief Medical Examiner have jurisdiction over area of find and human remains

Discovery of Human Remains

	On Site Lead	Transmission & Distribution Environment and Engagement (T&DEE)	Archaeologist	Manitoba Historic Resources Branch (HRB)	RCMP
Step 7		If human remains are left in place where discovered, Community Representative(s) may arrange for and facilitate an appropriate ceremony	HRB and/or archaeologist directs cautious investigation of surrounding surface prior to exhumation of remains to determine if other human remains or artifacts are in area		
Step 8			Locate and document human remains with GPS, record relevant data and submit with reports to HRB, construction supervisor and Community Representative(s)	Oversee basic non-invasive physical anthropological techniques, including drawings, sketches and initial measurements to assist in determining basic information about individual	
Step 9	Construction activities in vicinity of site that will not impact artifacts or related archeological activities may proceed	T&DEE would work with communities to decide whether and what type of analysis would be done on remains	No construction activities within buffer until archaeologist has completed archaeological investigation		

1.6 Heritage resources

Heritage resources are the physical remains of past cultures. They are the product of human art, workmanship, or use, including plant and animal remains that have been modified by or left behind due to human activities.

The *Manitoba Heritage Resources Act* (1986) defines “Heritage Resource” as:

(a) a heritage site

(b) a heritage object

(c) any work or assembly of works of nature or of human endeavour that is of value for its archaeological, palaeontological, pre-historic, historic, cultural, natural, scientific, or aesthetic features, and may be in the form of sites or objects or a combination thereof (Section 1)

There are two types of heritage resources, **artifacts,** and features. Heritage objects (artifacts) can be as small as a single stone flake (a product from stone tool production) or as large as a shipwreck. Other types of artifacts can include butchered animal bones, pottery, and historic materials such as nails, bottle glass, beads that are at least 75 years or older. Features are in situ (or in place) objects or changes to the landscape that are non-portable, meaning that they cannot be easily removed from their original location. Examples of features include petroforms (stones that have been placed in a shape or design and may be an effigy of an animal or thunderbird nest). Stones were also used as waymarkers or could indicate a food cache or burial location.

All heritage resources, whether a single isolated find (such as single artifacts) or a site with numerous artifacts and/or features, are protected under the Act. These physical remains can provide some evidence of specific activities such as campsites, workstations, quarries, kill sites, and post-contact settlement, industry, and events. Deliberate destruction or disturbance of heritage resources is considered an offence. Certain heritage resources have special consideration such as pictographs, petroforms or ceremonial sites and represent a connection to First Nation and Metis to the landscape.

1.7 Cultural resources

For the purposes of this plan, Manitoba Hydro defines cultural resources as an object, site, or location of a traditional or cultural practice that is the focus of traditional or contemporary use and is of continuing importance to people. Some examples include important resource gathering areas, sites of spiritual significance or ceremonial sites.

Although there are some commonalities, each community has a unique interpretation of what the cultural resource value represents.

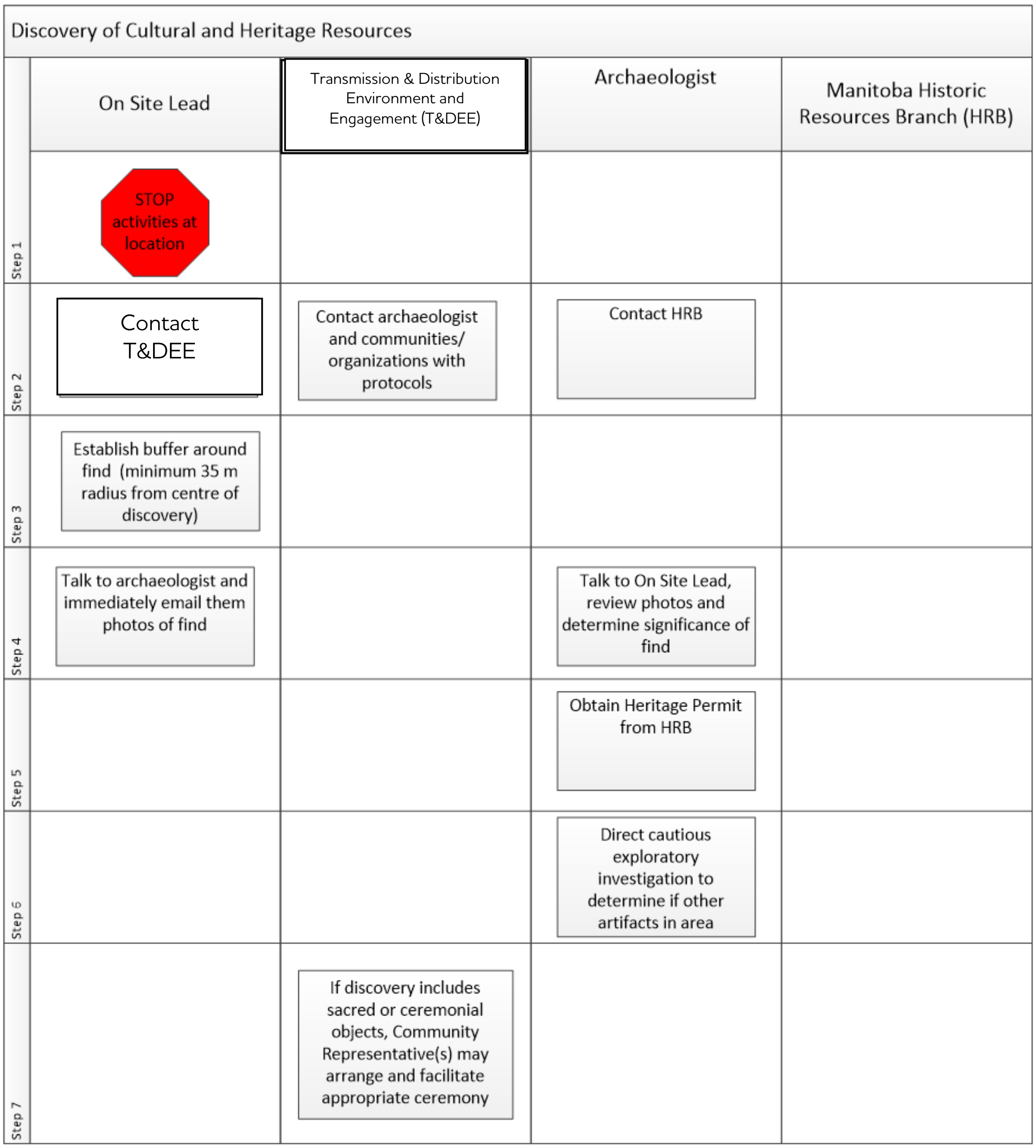
1.8 Practices Manitoba Hydro will follow if cultural and heritage resources are found

Manitoba Hydro and its contractors will leave all artifacts **in situ**, that is, in the same position and will not remove objects from the site until advised by the archaeologist. There will be no activities within the buffer until the archaeologist has completed their archaeological investigation. No reports related to any such find and its analysis will be published, other than such reports provided to Manitoba Hydro and the Historic

Resources Branch or other agencies, as may be required by law.

The following describes the practices that Manitoba Hydro will follow if cultural and heritage resources are found:

Figure 1-2: Discovery of cultural and heritage resources



Discovery of Heritage Resources

	On Site Lead	Transmission & Distribution Environment and Engagement (T&DEE)	Archaeologist	Manitoba Historic Resources Branch (HRB)
Step 7			Undertake: extended surface reconnaissance; - shovel tests at regular intervals perpendicular and parallel to artifact deposit; - controlled collection of data about artifacts, including mapping using global positioning system or chain and compass; and - test excavations, if necessary	
Step 8			Locate and document finds with GPS, record relevant data	
Step 9			Collect and place artifacts in protective container include date, project, contents, coordinates and other information, including site classification	
Step 10				Evaluate heritage resource site and findings presented by archaeologist to determine if further mitigative action is necessary before construction in site vicinity may continue
Step 11	Construction activities in vicinity of site that will not impact artifacts or related archeological activities may proceed		If MH cannot avoid site based on progress of construction, direct site's removal by standard and most appropriate excavation methods.	No construction activities will take place at site until HRB is satisfied that site removal is complete and meets provincial standards
Step 12			Submit copies of technical data and reports to HRB and MH	

2.0 Reporting and follow-up

The archaeologist will establish and maintain a record for each discovered or disturbed heritage object and of any human remains found during construction. Information will include the **provenience**, artifact chain of custody, as well as a conservation and /or identification plan for the heritage resource or resources associated with each record. This is a requirement of *The Heritage Resources Act*. The Province of Manitoba manages a descriptive inventory regarding the physical location and composition of archaeological sites. All artifacts and field-collected data such as notes, photographs and geo-referenced information is provided to the HRB who has ownership of heritage resources found in the province.

The archaeologist will prepare an annual report, as well as updated summaries and technical reports as are necessary, to the HRB as partial fulfillment of the Heritage Permit and to Manitoba Hydro who in turn will share with the applicable Community Representative(s). The report will provide the following information:

- A record of the human remains found. This will include the reporting, exhumation, and reburial of the found human remains per the provincial policy, the date of the report and the process by which Manitoba Hydro managed, honored, and reinterred the remains.
- A record of archaeological investigations and finds documented throughout each year.
- A summary of any directions provided by the Community Representative(s) regarding permission granted to conduct specialized analysis (where such permission is required).
- A record of the heritage objects that Manitoba Hydro found and the process by which they managed the heritage objects.
- Any additional information concerning matters of significance related to heritage resources.

Manitoba Hydro will treat information shared by Indigenous communities regarding burial sites, sacred sites and other sites traditionally and presently used for cultural and ceremonial purposes as confidential and may only be shared with the province or other authorities if agreed upon by the community to which the resource is associated.

Specific information regarding details or locational information of these cultural or ceremonial sites will not be included in the recording or reporting processes nor included in the HRB's site database.

Manitoba Hydro appreciates that this is sensitive information; the reports will be treated as confidential, unless otherwise authorized or specified by the Community Representative(s), if applicable, in discussion with the HRB.

The archaeologist will prepare an overview of the annual report and provide it T&DEE to review with the on-site supervisor. The overview report will not contain confidential information but will include information required by the on-site supervisor to fulfill regulatory and managerial responsibilities.

If requested, the archaeologist will meet with the applicable Community Representative(s), HRB and the Manitoba Hydro Transmission & Distribution Environment and Engagement Department to review the reports.

3.0 Glossary of terms

Artifacts	Any object made or modified by a human being.
Caches	Rock features in which supplies were stored.
Cultural Resource	An object, site or location of a traditional or cultural practice that is the focus of traditional or contemporary use and is of continuing importance to people.
Diagnostic	Any artifact that provides information as to cultural affiliation or age.
Exhumation	The act of removing a buried, or once buried, human body from the grave or found location.
Funerary goods	Items placed with a person at the time when they were buried. Often referred to as Grave Goods, these items are treated no differently than the person's actual skeletal remains.
Forensic	Of interest to law enforcement or Office of Chief Medical Examiner.
Heritage Resource	The Manitoba Heritage Resources Act (1986) defines "Heritage Resource" as: (as) a heritage site; (b) a heritage object, and; (c) any work or assembly of works of nature or of human endeavour that is of value for its archaeological, palaeontological, pre-historic, historic, cultural, natural, scientific or aesthetic features, and may be in the form of sites or objects or a combination thereof (Section 1).
Human Remains	The remains of human bodies, normally referring to those recovered in the skeletal form. This may range from a single bone or tooth to complete skeletons.
Identification	Refers to the process of examining human skeletal remains in order to determine jurisdiction and disposition of the remains. The may be done by archaeologists trained in human osteology, or physical anthropologists. Age at death, sex, height, general health, relative age: recent, early contact or ancient age may be possible along with ethnic identification.
In situ	An artifact is found in the exact spot that it was probably deposited at some time in the past.
Manitoba's Burials Policy (1987)	Short name of: '*Province of Manitoba Policy Concerning the Reporting, Exhumation, and Reburial of Found Human Remains*.' This is the 1987 Provincial Cabinet approved policy based on *The Heritage Resources Act* (1986) governing and directing the actions, responsibilities, duties and task to be undertaken upon the discovery of found human remains in Manitoba.

Matrix	The consistency and quality of the soil.
Morphology	The form, structure, and method by which an object is created.
Non-Forensic	Not of interest to law enforcement or Office of Chief Medical Examiner.
Ochre	An earthy clay colored by iron oxide – usually red but can be yellow.
Provenience	The original place of an artifact. Can be measured by two or three-points.
Stratum	A layer of soil that is distinct and separate from that above and below it.
Skeletal Remains	Skeletal remains are all that is left of a corpse after nature has taken its course and has disposed of skin, tissue, and any other organ that may cover the skeletal frame.
The Heritage Resources Act (1986)	The Provincial legislation (law) governing the physical heritage of all Manitobans, located in Manitoba on either provincial crown lands or private lands within the province of Manitoba.
Way-markers	A sign or feature that marks a portage or trail or announces a change in direction.

Appendix A: Resources Identification Guide

Examples of cultural and heritage resources of potential interest

The following are some examples of surface or sub-surface heritage objects or features that may be encountered in the field that have the potential to be of archaeological interest or cultural significance. These descriptions are provided for information only. When the features described in these examples are encountered in the field, or when it is otherwise believed that a site potentially may be of archaeological interest, a Manitoba Hydro On-Site Supervisor/delegate or Environmental Inspector/Officer must be notified**.**

In situ artifacts

Projectile points, pottery, historic trade goods and thousands of other types of artifacts have been recovered from across the province. Before collection, the artifact will be photographed, and the surrounding vegetation and soils described in detail. If a **diagnostic** artifact is found during a controlled surface collection, the recovery of the artifact will not take place until mapping is complete.

Often metal objects are found abandoned along old portage routes, former trails and at long-forgotten cabin sites. This old, blue enameled kettle was found in the hollow of a tree with tin cups nestled inside. The way that metal tins were constructed can be dated. Glass fragments can also be identified as belonging to a certain time period. The morphology and markings on bottles help archaeologists to date sites.

Pre-contact pottery sherd

Historic period kettle and tin cups

Projectile point (left) and lithic flake (right)

Soil Staining

Discolourations in the soil may indicate an archaeological site. The following examples are common colours associated with artifacts, features that have been found within the province.

Red or yellow **Ochre** or rust stains can be found in the soil. They can be the result of oxidized metal fragments or nails; red or yellow ochre nodules may indicate a burial or ceremonial activity.

Soil staining can also be found in the form of charcoal flecks and white ash from a hearth or fire pit. Black soil stains may indicate human activity and organic materials or a living floor. Cultural strata can vary in depths depending on the length of occupation at the site. The presence of burned bone, fire-cracked rock, stone chips, pottery, and other objects may be found in association with soil discolouration and would confirm the soil staining is a cultural layer.


Ash and organic soil staining of a hearth

Animal Bone

Animal Bone (mammal, bird, fish) at a site can indicate the kinds of resources that were being used as food as well as indicate seasonality of occupation.

Bone was also an important material for tool manufacturing. Common bone tools include fleshers and beamers fashioned from large mammal long bones, barbed spear points and harpoons, awls, and needles. Bones at a site can indicate the kinds of animals that were being used as food. The ulna of swans, eagles and other large birds were used for bird whistles.


Animal Long Bone with red staining

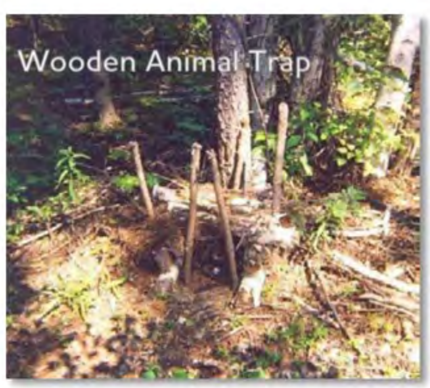
Key features to look for on bones to determine if they have been deposited by humans include signs of cut-marks or burning or staining which may indicate human modification by various butchering or processing techniques.


Bison bone fragments

Culturally modified trees

Occasionally evidence of cultural practices is found in the form of modified trees such as the birch trees noted in this photograph. Birch bark was used for many purposes such as storage baskets, canoes and more recently, birch-bark biting crafts. Cut wood has been used to construct an animal trap, as a material for building or for firewood and indicates that humans have been in the area.


Prayer Tree


Wooden Animal Trap


Culturally Modified Tree

Stone features

There are many kinds of stone alignments that have been constructed by humans: **Way-markers**, **caches**, ceremonial sites, building foundations, tepee rings and burials are the major rock features that are found during archaeological investigations. These can be on or above the ground surface or buried features.


Petroform in the shape of a turtle


Rock Cairn

Ground or Structural Features

It is especially important to note unusual ground features. Depressions or mounds that are out-of-place from the surrounding landscape may indicate an underlying structure or possible burial. The way structural features are constructed can be dated.

Appendix B: Cultural and heritage resource protection protocol

Community/Organization: ____________________

1. Do you want Manitoba Hydro to notify your community/organization about cultural and heritage discoveries?

   Yes ☐ No ☐

2. If yes, we would like to be notified about the following type of discoveries:

Human remains	Yes	☐	No	☐
Heritage/cultural resources (pictographs, petroforms, bone tools)	Yes	☐	No	☐

3. Leadership have chosen ____________________ as the community representative that Manitoba Hydro should contact for heritage or cultural resources discoveries

Phone number: ____________________

Cell phone: ____________________

Email address: ____________________

Preference for contact ____________________

(i.e.: cell phone, email)

4. Should a previously unrecorded heritage or cultural resource be encountered, would your community like to conduct a ceremonial or spiritual activity?

   Yes ☐ No ☐

5. Please sketch the cultural and heritage resource area of interest for the community/organization on an attached map. This information can be kept confidential.

6. Are you aware of recent discoveries of the following in the area near the project:

Human remains	Yes	☐	No	☐
Heritage/cultural resources	Yes	☐	No	☐

7. Have you received a copy of the Cultural and Heritage Resources Protection Plan?

   Yes ☐ No ☐

Date: ____________________

Filled out by (Please print): ____________________

Signature ____________________

Appendix L

Access Management Plan

Radisson to Henday (R44H)

230 kV Transmission Project

Access management plan

Prepared by Manitoba Hydro

Transmission & Distribution Environment
and Engagement Department

Project Management Division

December 2023

Preface

This document presents the Construction Access Management Plan (the Plan) for the construction of Radisson to Henday 230 kV transmission project (the project). It is intended to provide information and instruction to Manitoba Hydro employees as well as contractors, regulators, and members of the public. The Plan provides regulatory context as well as general considerations and guidance pertinent to how Manitoba Hydro will access the Right of way (ROW) during the construction phase in the Project area within Manitoba. Manitoba Hydro employees and contractors are encouraged to contact the onsite Manitoba Hydro Environmental Inspector/Officer if they require information, clarification, or support. Regulators and the Public are to direct any inquiries about this Plan to:

Manitoba Hydro

Transmission & Distribution Environment and Engagement
360 Portage Avenue
Winnipeg, MB
Canada R3C 0G8
1-877-343-1631

Projects@hydro.mb.ca

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Definitions

Approach: These are either temporary or permanent structures to allow access through a ditch or drain.

Access point: These are locations where the ROW intersects and existing road, highway, or trail.

Access route: These are roads, and trails that facilitate access from a provincial road or highway, they are primarily existing, however new access routes may be developed, new developed access routes are primarily trails less than 15 m in width construction.

Right of way access trail: This access trail is along the entire length of the ROW and is approximately 15m in width, typically centered in the ROW to accommodate construction activities and allow access around towers and stringing equipment. The ROW access trail is not a continually active road and not constructed (no cut and fill, soil storage or use of gravel base) or maintained as such during operations.

By-pass trail: This type of trail is typically outside the ROW and less than 15m in width and vary in length depending on obstacle on the ROW being avoided (e.g., unfrozen wetland, steep slope). A by-pass trail is not a continually active road and not constructed (no cut and fill, soil storage or use of gravel base) or maintained as such during operations.

List of Acronyms

AC	Alternating current
AMP	Access management plan
IK	Indigenous Knowledge
ATV	All-terrain vehicle
CEnvPP	Construction environmental protection plan
ESS	Environmentally sensitive site
kV	Kilovolt
ORV	Off-road vehicle
PR	Provincial road
PTH	Provincial Trunk Highway
RCMP	Royal Canadian Mounted Police
ROW	Right-of-way
MH	Manitoba Hydro

1.0 Introduction

Consistent with its corporate environmental management policy, Manitoba Hydro has committed within the construction environmental protection plan to managing construction access as part of a larger suite of mitigation measures to minimize potential negative environmental and socio-economic effects. This access management plan (AMP) is designed to accomplish this goal. General and site-specific access management mitigation strategies are detailed in the project's construction environmental protection plan (CEnvPP).

Manitoba Hydro's environmental protection program (EPP) provides the framework for the delivery, management and monitoring of environmental and socio-economic protection measures that satisfy corporate policies and commitments, regulatory requirements, environmental protection guidelines and best practices, and input during project engagement. The program describes how Manitoba Hydro is organized and functions to deliver timely, effective, and comprehensive solutions and mitigation measures to address potential environmental effects. This AMP is a component of the EPP as illustrated in Figure 1.

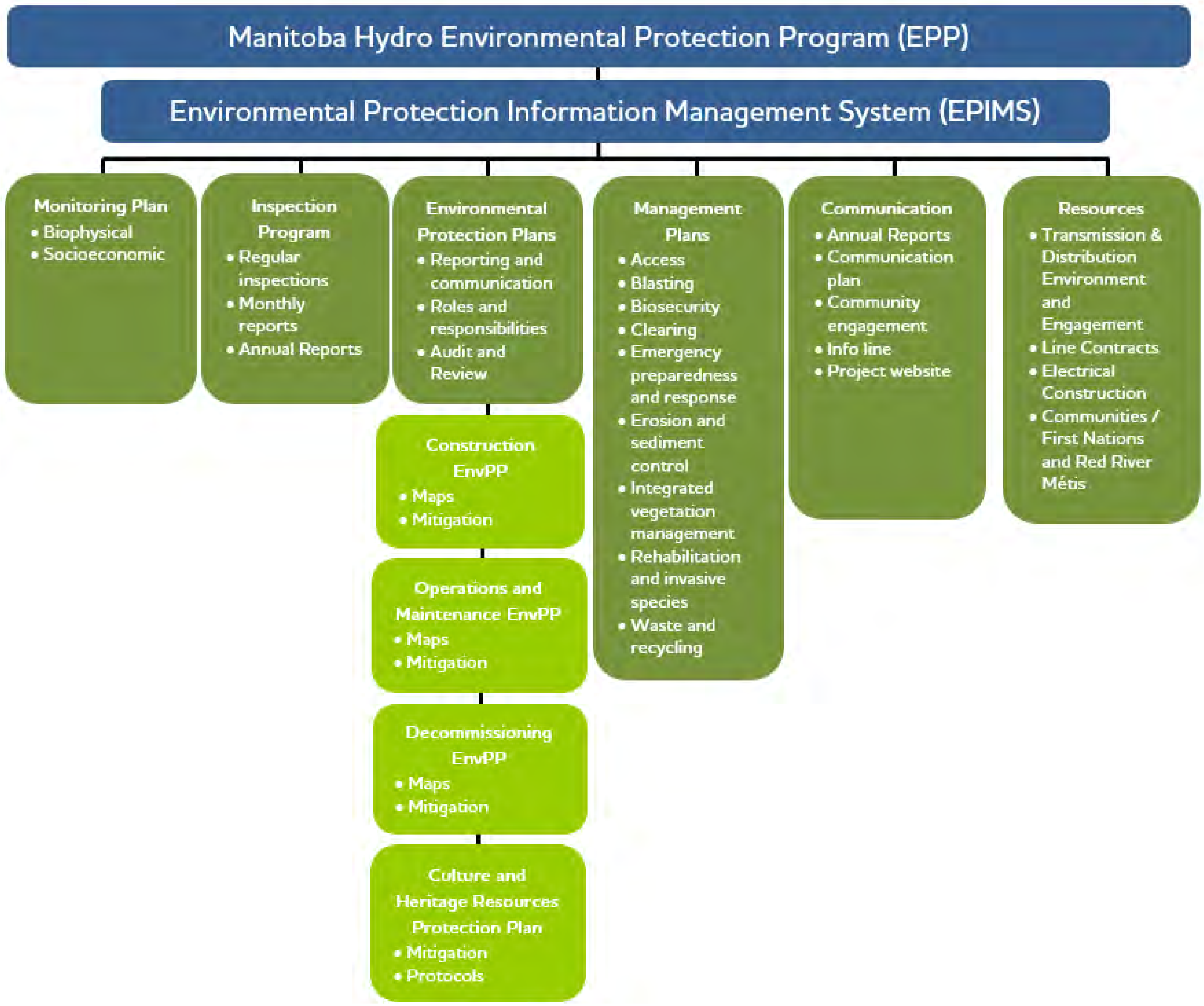

Figure 1: Transmission environmental protection program

In this document access management for the project is considered only during the construction phase of the development. The implementation of this AMP requires the performance of tasks prior to and during construction.

1.1 Commitment to environmental protection

Manitoba Hydro integrates environmentally responsible practices in all aspects of our business. Environmental protection can only be achieved with the involvement of Manitoba Hydro employees, consultants, contractors, Indigenous communities and organizations and the public at all stages of the project from planning and design through construction and operational phases.

The use of an AMP is a practical and direct implementation of Manitoba Hydro's environmental policy and its commitment to responsible environmental and social stewardship. It is a proactive approach to manage potential effects of access related to the construction of a new transmission line and minimizes the needs for site rehabilitation and invasive species management as well as minimizing the impacts on cultural and heritage resources.

Manitoba Hydro is committed to implementing this AMP and requiring contractors to follow the terms of this and other applicable plans within the environmental protection program.

1.1 Purpose and objectives

The AMP is intended to address concerns regarding the preservation of environmental, socio-economic, cultural and heritage values within the projects' area of direct impacts. The focus of this AMP is on the construction phase of the project.

The objectives of the AMP are to:

- Provide for safe, coordinated access onto and along the project construction site for project workers
- Support sustainable use through the protection of natural resources within the project area
- Support the preservation of socio-economic, cultural, spiritual and heritage values within the project area
- Allow Manitoba Hydro staff and contractors to construct the project year-round (where applicable)
- Provide security for project personnel and property.
- Prescribe strategies and mitigation measures to minimize potential negative direct and indirect effects of project access.

1.2 Roles and responsibilities

A successful construction program requires commitment and cooperation from all participants. Instrumental for those involved is to fully understand their roles, responsibilities, and lines of communication within the project. For purposes of implementing this AMP, responsibilities rest with Manitoba Hydro's project engineer, line contact administrator, line construction business partner/environmental specialist, environmental officer/ inspectors, and the construction contractors' project manager/supervisor, and environmental representative. The communication and reporting structure is detailed in Figure 2. Their key responsibilities are shown in Table 1.

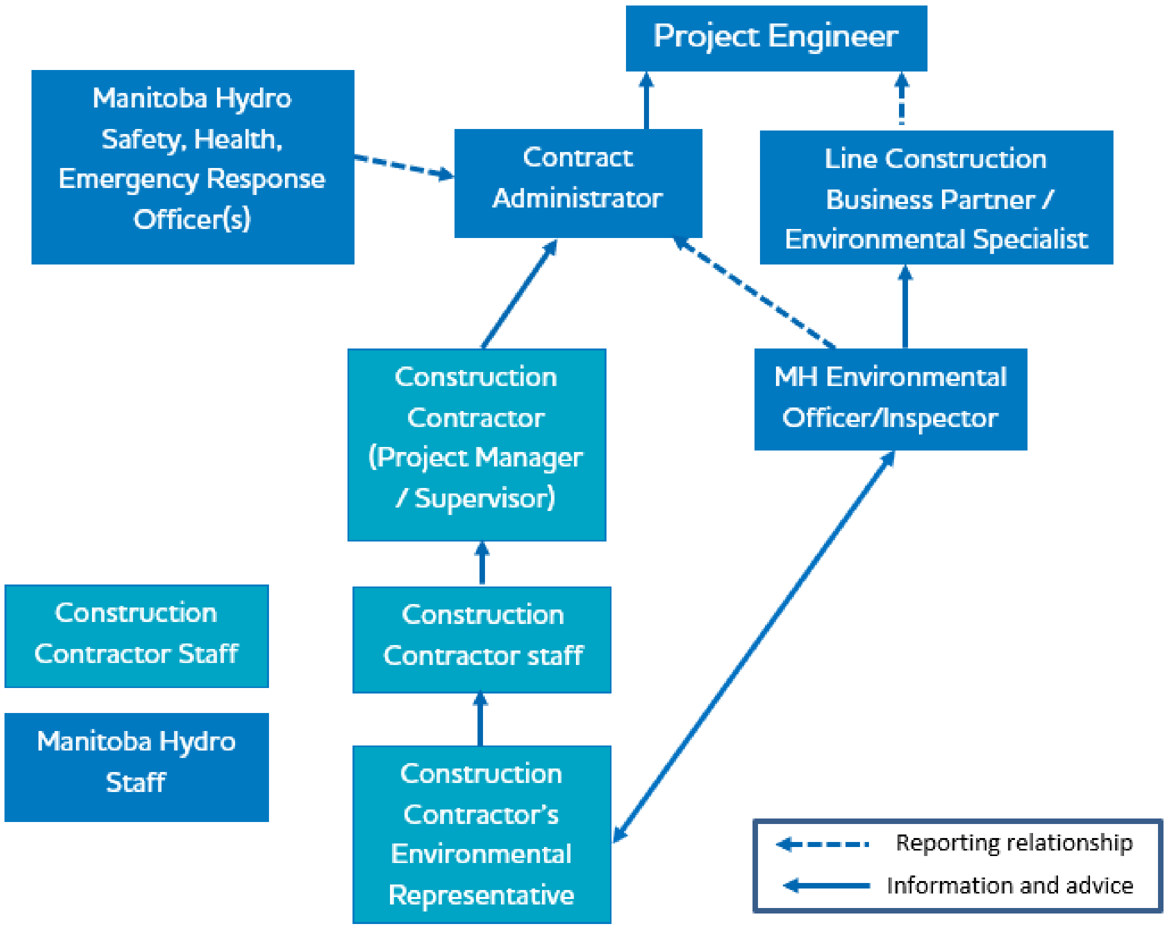

Figure 2: Environmental communication reporting structure

Table 1: Key roles and responsibilities

Role	Key responsibilities
Manitoba Hydro	• Provides advice and guidance on access management and environmental protection matters • Issues environmental improvement and stop work orders as required for non-compliance issues • Responsible for the inspection of compliance with CEnvPP • Seeks approval for any access routes or by-pass trails from landowner • Liaises with regional regulatory authorities and other regulatory authorities where required or applicable • Responsible for implementing compliance inspection to ensure consistent and accurate reporting into EPIMS • Responsible for MH project staff compliance with this plan • Ensures construction contractor(s) implementation of remedial actions, responses to non-compliance situations or incidents are implemented as required • Ensures that appropriate authorities are notified in emergency or incident situations • Implement invasive species management treatment options where required

Table 1: Key roles and responsibilities

Role	Key responsibilities
Construction contractor(s)	• Accountable for all regulatory and environmental prescriptions (i.e., follow CEnvPP and mitigation measures prescribed) • Ensure all contractor project staff are adequately trained/informed of pertinent access requirements of the Project related to their position • Report any discoveries of non-compliance, accidents or incidents to the line contracts representative and environmental inspector/officer • Ensure that all remedial actions are carried out as per Manitoba Hydro instruction • Ensures contractor staff utilize only approved access as per the construction environmental protection plan Mapbook • Ensures all discoveries of heritage resources, human remains, paleontological finds, environmentally sensitive sites, etc. are reported to supervisor or contractor's environmental representative • Responsible for implementation, coordination, and verification of pre-project employee environmental orientation • Ensures that the contractor employees adhere to all aspects of the AMP • Sign and/or flag all access approaches, points, routes, bypass trails in the field as per flagging and signage standards • Communicate any access related issues and/or concerns to Manitoba Hydro environmental officer

2.0 Implementation

This section discusses the proposed access strategies for construction purposes and describes the proposed access routes to be used for construction.

2.1 Construction access management plan coverage

From a geographic perspective the scope of this AMP includes the project's transmission construction site (i.e., rights-of-way, camps, marshalling yards, borrow pits and access trails specifically constructed for project purposes). Public access restrictions are primarily limited to the "active" construction site, for reasons of safety, and will generally not interfere with traditional traffic patterns.

This AMP also addresses project specific issues relating to existing provincial and municipal roads and concerns relating to private lands within Manitoba Hydro's control. Manitoba Hydro will minimize damage to infrastructure and private lands from its activities, and where possible, limit third party access to the active construction site. Of greatest concern are areas with environmental sensitivities, and areas of work force concentrations (e.g., camps, marshalling yards).

2.2 Identification of potential construction access opportunities

Manitoba Hydro has conducted a survey along the final preferred route to identify all potential construction access opportunities to the ROW using existing roads and trails.

These access opportunities outlined in the mapbook have been selected based on the following criteria:

- To provide reasonable and safe entrance and egress to the transmission line ROW while minimizing disruption to provincial, municipal, and private roads along with trails and private property
- To ensure that there a minimum of one access point to get to any given location on the ROW
- To provide good visibility for upcoming traffic at each access point turn off from existing roads and trails

- To minimize the number of new access ditch crossings and potential culverts where the ROW intersects existing roads or trails by utilizing existing crossings if available within the ROW. If there is an existing crossing outside of the ROW within reasonable distance from the ROW, obtain permission to utilize crossing from owner
- Minimize the use of existing access routes in heavily populated residential areas
- Minimize the use of private roads and trails

2.3 Transmission line construction access opportunities

Manitoba Hydro and its contractors will use existing roads, trails, and linear features where possible for accessing the project construction site. To facilitate this, Manitoba Hydro has identified existing strategic access routes relative to the construction site and major roads to guide construction planners and contractors.

The mapbook illustrates the existing access opportunities (i.e., intersections between the proposed ROW and existing highways, roads, trails, and linear features) that minimize the need for new access development to access the ROWs. The AMP will restrict Manitoba Hydro and its contractors to use the identified access options, thereby minimizing project effects as they relate to access.

2.4 Access mitigation measures

Manitoba Hydro, its personnel, contractors, and consultants will adhere to the access management measures (AMMs) outlined in Section 5.0 (Table Access Roads and Trails PC-1) in the Construction Environmental Protection Plan (CEnvPP).

2.5 By-pass routes and trails

Manitoba Hydro and its contractors will be accessing the ROW through existing trails and access points to the extent feasible. However, in some instances there may be a requirement for a by-pass trail located outside, but along the ROW, or the creation of a new access route to the ROW. In those situations where a new by-pass trail/access route would be required, Manitoba Hydro would undertake the following process to:

1) site the by-pass trail/access route
2) evaluate location for environmental and cultural sensitivities

3) ensure any new by-pass trails/access routes follow the applicable mitigation measures as outlined in the construction environmental protection plan (CEnvPP).

Figure 3 illustrates the process and details of the steps are provided to operationalize the process.

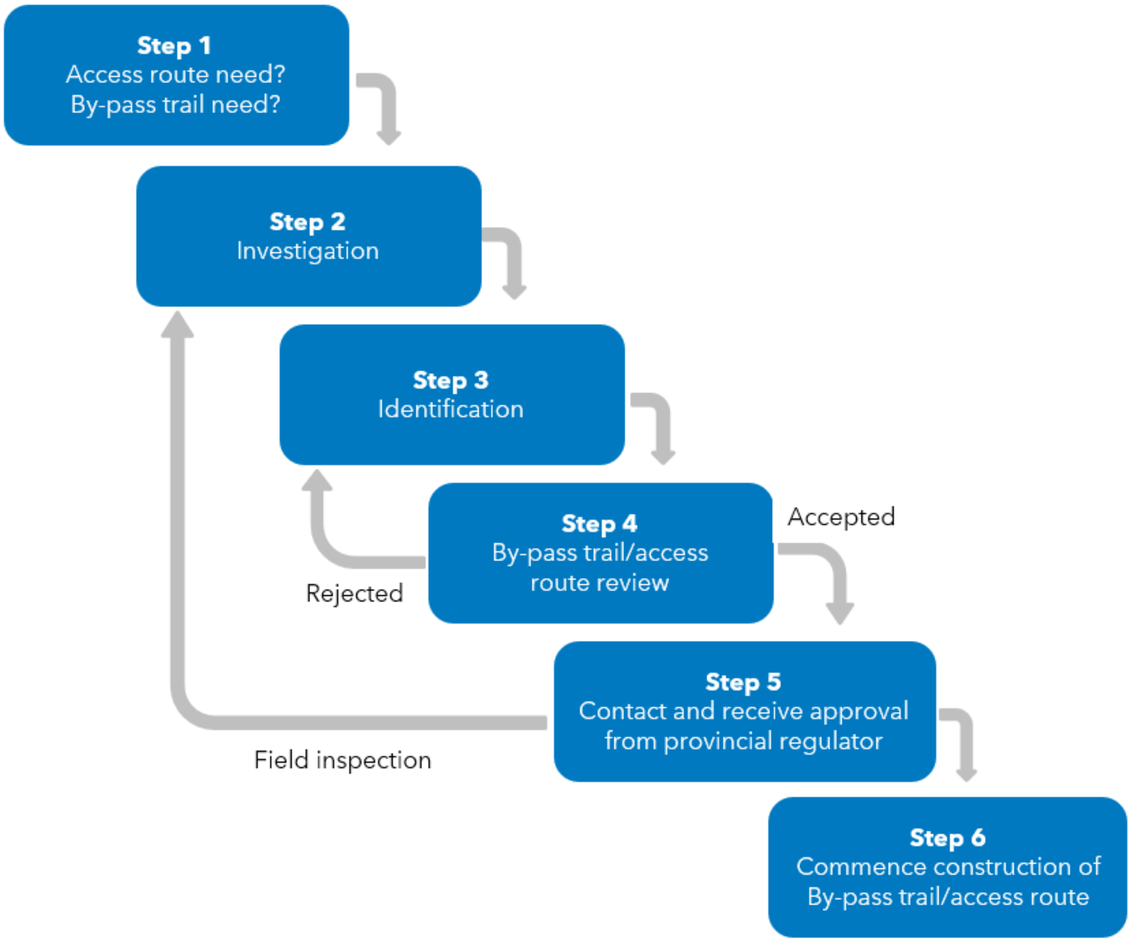

Figure 3: By-pass trail/access route siting and approval process on Crown land

Step 1: Determine by-pass trail/access route need: Manitoba Hydro in conjunction with the contractor identifies the need for a by-pass trail or new access route (i.e., unfrozen wetlands, impassable terrain) outside of the approved access routes and the potential by-pass areas identified in this plan. If any new access routes or by-pass trail is required on private land, MH will seek written approval from the landowner.

Step 2: Investigation: Manitoba Hydro and contractor will assess potential by-pass area/access route area on foot for a viable location. In some instances, an overflight may be required.

Step 3: Identification: Manitoba Hydro environmental officer/inspector will review the by-pass trail/access route for the presence of environmentally sensitive sites, invasive species, or any other biosecurity concerns. If none are found they will identify and verify the location of the by-pass trail/access route and sensitive sites by recording GPS coordinates and flagging the centerline, buffers and/or boundaries.

Step 4: By-pass trail/access route review: Manitoba Hydro line construction business partner or environmental officer will review by-pass trail/access route and evaluate against known environmentally sensitive sites (ESS) as well as sensitive sites identified by the environmental inspector's site investigation. **If rejected**, by-pass trail/access route alternatives will be suggested for field assessment (Return to Step 3) and the process of submitting "unplanned infrastructure" through EPIMS will be restarted. **If accepted**, proceeds to Step 5 or 6 for approval.

Step 5: Contact and receive approval from provincial regulator: If by-pass trail/access route is accepted in Step 4, it will be added to the AMP and appropriate CEnvPP including any ESS sites and sent to the provincial regulator for approval.

Step 6: Commence construction of by-pass trail/access route: Implement mitigation and commence construction. Manitoba Hydro will identify and document any by-pass trails/access routes that may be required post construction for line maintenance activities and incorporate into the operations and maintenance environmental protection plan.

2.6 Traffic safety and access management mechanisms overview

Manitoba Hydro and its contractors will rely extensively on the provincial and municipal existing road infrastructure to transport vehicles, personnel, equipment, and materials to the construction site. In the interests of safety, Manitoba Hydro expects that all personnel and those of its contractors and consultants will adhere to all traffic laws while engaged in project related activities and while commuting back and forth between their residences/camps/offices and the construction site.

Safety is of primary concern during the construction phase for construction workers, stakeholders, and the public. During the clearing and construction process, a seasonal access trail will be constructed on the rights-of-way to facilitate the transportation of construction materials, equipment, and workers. Manitoba Hydro and its contractors will restrict non-project traffic on and along the active construction site during this period.

Where Manitoba Hydro and its contractor staff encounter non-project related traffic on the active construction site, safety advisory information will be provided, and individuals will be asked to vacate the area for reasons of safety.

Signs may be placed at road/rights-of-way crossings and other locations in the active construction area to discourage/minimize access and to outline safety concerns.

Various types of signage may be used to convey safety or educational information, including:

- No hunting/shooting
- Guy wire shields/sleeves (brightly colored and/or reflective), where appropriate
- Reflective tape on tower legs and other obstructions
- Access restrictions to specific infrastructure sites (e.g., transformer, converter, repeater stations)
- Access restrictions to hazardous materials and petroleum storage sites
- Warning signs on vehicles transporting hazardous materials and petroleum products
- Private land
- Directional guidance signs
- High risk wildlife collision areas
- Speed limit postings
- Road/trail hazard warning signs
- Bollards, signage at water wells, petroleum storage areas, etc.
- Other

Manitoba Hydro will determine the type and quantity of signage required for the contractor to supply and install.

2.6.1 Access allowance

During the construction phase of the project, one of Manitoba Hydro's concerns is safety for workers and others who may access the active construction site. Access and safety issues will be monitored by the construction contractor, the Manitoba Hydro line contracts representative, and the environmental officer/inspector.

All intersecting trails/roads will be kept clear of debris so as not to impede existing travel routes. Manitoba Hydro will limit/restrict access to the active construction site as safety is a primary consideration.

Those authorized to access the active construction site (including work camps) are noted in Table 2. Manitoba Hydro and its contractors will carefully monitor for safety and security issues and, if problems warrant, are prepared to limit access to only those directly associated with the project.

Table 2: Access allowance and authorization in active construction areas

User	Type of user	Authority
Project traffic	Manitoba Hydro staff	No conditions
	Contractor personnel	
	Government (provincial and federal) personnel	Line contracts representative
	Research and monitoring personnel	
	Emergency vehicles/personnel	No conditions
Resource harvesters	Licensed outfitters/rights-based hunters	Line contracts representative or delegate
Non-project traffic	Public	Restricted
Others	Community officials, Manitoba Hydro staff/ officials/ contractors/ consultants, employee family members	Line contracts representative or delegate
	School and public tours, media, etc.	

2.6.2 Recreational vehicles

Project personnel will not be permitted to transport, use, or store their personal off-road vehicles (ORV) (e.g., snowmobiles, all-terrain vehicles, boats, etc.) on the construction site where the intent of use is not project work related. This condition will form part of the condition of employment and will be conveyed to all personnel at the time of hire. Breach of the condition will be grounds for disciplinary action, including dismissal. Manitoba Hydro and contractor ORV equipment shall be used exclusively for project work related purposes.

2.6.3 Temporary work camp sites, marshalling yards and borrow pits

Temporary work camp sites, marshalling yards and borrow pits used for project purposes form part of the construction site. All project related access management measures shall apply to these sites. When any of the new sites are no longer required for project purposes, and if not required by other non-project parties (e.g., Manitoba Environment and Climate, Manitoba Transportation and Infrastructure, etc.), access into such sites may be decommissioned and all project personnel will be restricted from entering such sites. Access decommissioning could include the placement of impediments (e.g., berms, boulders, debris, etc.) to restrict public access.

2.6.4 Compliance

Manitoba Hydro environmental officers/inspectors will regularly inspect all aspects of the clearing and construction work to ensure compliance with the Environment Act licence (if licensable), work permits, regulations, applicable guidelines and the applicable CEnvPP. Manitoba Hydro and its' contractor personnel will limit/restrict non-project related vehicles and personnel on the construction site with particular emphasis on the active construction site. Information about safety, firearms/weapons rules will be distributed, as required, through:

- Signage at access points and on the construction site
- Orientation of all workers

Breach of stated employment conditions (e.g., ORV, weapons, fishing) by Manitoba Hydro employees or contractor staff will result in disciplinary action, including potential dismissal from employment.

Clear communication of restrictions and safety measures, included in the construction access management plan, to workers, resource harvesters, stakeholders, and local Indigenous communities will contribute to safe work practices and the prevention of conflicts.

2.7 Education and training

Training and communication form a critical component of the implementation plan. Manitoba Hydro will hold a contractor environmental pre-construction requirements orientation meeting to review project specifics and key environmental requirements with its contractors at a supervisory level. A summary of this plan, implementation requirements, roles and responsibilities, and Manitoba Hydro's expectations will be presented at that time.

2.8 Access rehabilitation

Transmission development on the landscape often requires the creation of or improving of existing access roads and trails to facilitate construction and operation of the development. Manitoba Hydro's preference is to utilize existing roads and trails prior to development of any new access routes. The use of existing access routes may result in vegetation removal and road base improvements. Where access is not required for operations those access routes may require decommissioning to ensure that areas previously inaccessible are returned to that state. Prior to access route development the route will be assessed for existing access restrictions, including details such as trail width, vegetation, presence of previous decommissioning activity.

Appendix M

Example Environmental Prework Orientation Record

Radisson to Henday (R44H) 230kV transmission line

Line Contracts Contractor Commencement Meeting

Environmental Requirements Orientation

The following Manitoba Hydro Contractor Environmental Requirements Orientation will be reviewed by Manitoba Hydro at the Contractor Commencement Meeting. All individuals in attendance at the Contractor Commencement Meeting will be recorded and the attendance list will be attached to the signed copy of this document

Division:	**Construction Division**
Department:	**Line Contracts Department**
Project Name:	Radisson to Henday (R44H) 230 kV Transmission Project
Contract Number:	**TBD**
Work Location:	**TBD**
Meeting Date:	**YYYY/MM/DD**
Contractor:	

Manitoba Hydro Contact Information (To Be Determined)
Manitoba Hydro Project Engineer: Name First and Last, email; (204) 123-4567 address; ___, Manitoba; A1B 2C3 **Manitoba Hydro Project Engineer:** Name First and Last, email; (204) 123-4567 address; ___, Manitoba; A1B 2C3

Manitoba Hydro Environmental Specialist: Name First and Last, email; (204) 123-4567 360 Portage Avenue (18); Winnipeg, Manitoba; R3M 3T1 **Manitoba Hydro Line Construction Business Partner:** Name First and Last, email; (204) 123-4567 360 Portage Avenue (18); Winnipeg, Manitoba; R3M 3T1 **Manitoba Hydro Environmental Officer:** Name First and Last, email; (204) 123-4567 360 Portage Avenue (18); Winnipeg, Manitoba; R3M 3T1 **TBD Environmental Inspectors:** ***Primary:*** Name First and Last, email; (204) 123-4567 ***Alternate:*** Name First and Last, email; (204) 123-4567

Contractor: (ALL To Be Determined)	

Contractor: **(ALL To Be Determined)**

Contractor Project Manager: _________________________Email: ____

Address: ____

Phone Numbers: Office (_________)_____________________________Cell (_________)_______________________

Contractor Construction Manager: __________________________________Email: ___________________________

Address: ____

Phone Numbers: Office (_________)_____________________________Cell (_________)________________________

Contractor Environmental Supervisor: ____Email:_________________________________

Address: ____

Phone Numbers: Office (_________)_____________________________Cell (_________)________________________

Contractor Environmental Representative: ____Email:___________________________________ __ Address: ____ __ Phone Numbers: Office (_________)_______________________________Cell (_________)_________________________
List Sub-Contractors: 1. ____ 2. ____ 3. ____ 4. ____ 5. ____ 6. ____ 7. ____

Contractor Commencement Meeting- Key Environmental Requirements Checklist:

Topic	Key Environmental Requirements	Discussed
Regulatory Requirements & Environment Act Licence TBD EAL 1234 is in Appendix B of the Construction Environmental Protection Plan Text (pages _ to _)	All work on the project must be completed in accordance with regulatory requirements including applicable federal and provincially legislated regulations as well as municipal bylaws All work on the project must be completed in accordance with conditions identified in the provincial Environment Act Licence 1234	
Proj Name Environmental Protection Plan Part 1 TBD CEnvPP text document	All work on the project must be completed in accordance with general environmental information as well in accordance with general environmental mitigation requirements identified in the CEnvPP text document (5 categories): • <u>1) Management Measures</u> Management Measures key environmental requirements include: • TBD • <u>2) Project Activities</u> Blasting and Exploding key environmental requirements include: • TBD Construction Matting key environmental requirements include: • TBD Demobilizing and cleaning up key environmental requirements include: • TBD Directional drilling key environmental requirements include: • TBD Draining key environmental requirements include: • TBD	

Topic	Key Environmental Requirements	Discussed
	Drilling key environmental requirements include: • TBD Grading key environmental requirements include: • TBD Grubbing key environmental requirements include: • TBD Rehabilitating and Re-vegetation key environmental requirements include: • TBD Stripping key environmental requirements include: • TBD <u>3) Project Components</u> Access Roads and Trails key environmental requirements include: • TBD Borrow pits and quarries key environmental requirements include: • TBD Marshaling yards key environmental requirements include: • TBD Rights-of-way key environmental requirements include: • TBD Transmission towers and conductors key environmental requirements include: • TBD Water Crossings key environmental requirements include: • TBD <u>4) Environmental Components</u> Agricultural areas key environmental requirements include: • TBD Built-up and populated areas protection key environmental requirements include: • TBD	

Topic	Key Environmental Requirements	Discussed
	Fish protection key environmental requirements include: • TBD Groundwater key environmental requirements include: • TBD Heritage Resources key environmental requirements include: • TBD Wetlands key environmental requirements include: • TBD Wildlife protection key environmental requirements include: • TBD <u>5) Environmental Issues</u> Hazardous materials key environmental requirements include: • TBD Petroleum products key environmental requirements include: • TBD Potable water key environmental requirements include: • TBD Soil contamination key environmental requirements include: • TBD Vehicle and equipment maintenance key environmental requirements include: • TBD Waste Management key environmental requirements include: • TBD Wastewater key environmental requirements include: • TBD Aircraft use key environmental requirements include: TBD	

Topic	Key Environmental Requirements	Discussed
Proj Name Environmental Protection Plan Part 2 TBD CEnvPP Mapbook	Construction Environmental Protection Plan Mapbook All work on the project must be completed in accordance with site specific mitigation requirements for Environmentally Sensitive Areas identified in the CEnvPP mapbook All access on the project must be completed in accordance access identified in the CEnvPP mapbook. Proposed alterations or additions to access identified in the mapbook can typically be approved fairly quickly if requested by email including details of the request and a map	
Proj Name Environmental Protection Plan Appendix A- Contact List Template	A project contact list template is provided in Appendix A of the CEnvPP text document	
Proj Name Environmental Protection Plan TBD Appendix B- Environmental licenses, approvals, and permits information	General information about project environmental licenses, approvals, and permits are provided in Appendix B of the CEnvPP text document. Note: Depending on contractor activities other permits may apply ie provincial fuel tank permits, provincial septic install registration, RM approvals, etc	
Proj Name Environmental Protection Plan TBD Appendix C- Timing Windows	Project wildlife reduced risk timing windows are provided in Appendix C of the CEnvPP text document	
Proj Name Environmental Protection Plan TBD Appendix D- Buffers and Setbacks	Project Buffer and Setback distances are provided in Appendix D of the CEnvPP text document	
Proj Name Environmental Protection Plan TBD Appendix E- Avian Protection Documents	All work on the project must be completed in accordance with any applicable requirements identified in the Avian Protection Documents in Appendix E of the CEnvPP text document	

Topic	Key Environmental Requirements	Discussed
Proj Name Environmental Protection Plan TBD Appendix F- Reptile and Amphibian Protection Document	All work on the project must be completed in accordance with any applicable requirements identified in the Reptile and Amphibian Protection Document in Appendix F of the CEnvPP text document	
Proj Name Environmental Protection Plan TBD Appendix G- Species of Concern Contingency Measures	All work on the project must be completed in accordance with any applicable requirements identified in the Species of Concern Contingency Measures in Appendix G of the CEnvPP text document	
Proj Name Environmental Protection Plan TBD Appendix H- Erosion and Sediment Control Plan	All work on the project must be completed in accordance with any applicable requirements identified in the Erosion and Sediment Control Plan in Appendix H of the CEnvPP text document	
Proj Name Environmental Protection Plan TBD Appendix I - Saturated and Thawed Soils Operating Guidelines	All work on the project must be completed in accordance with the Saturated and Thawed Soils Operating Guidelines in Appendix I of the CEnvPP text document Potential for ground disturbance is a significant risk on this project for any work activities occurring on unfrozen ground if mud is saturated	
Proj Name Environmental Protection Plan TBD Appendix J - Rules for Externally Reportable Releases	Rules for Externally Reportable Releases is provided in Appendix J of the CEnvPP text document	
Proj Name Environmental Protection Plan TBD Appendix K - Cultural and Heritage Resources Protection Plan	All work on the project must be completed in accordance with the requirements identified in the Cultural and Heritages Resources Protection Plan in Appendix K of the CEnvPP text document	

Topic	Key Environmental Requirements	Discussed
Proj Name Environmental Protection Plan TBD Appendix L - Access Management Plan	All work on the project must be completed in accordance with the requirements identified in the Access Management Plan in Appendix L of the CEnvPP text document All gates must be kept closed other than for access	
Proj Name Environmental Protection Plan TBD Appendix M - Example Environmental Requirements Orientation	A template for the Environmental Requirements Orientation is provided in Appendix M of the CEnvPP text document	
Proj Name Environmental Protection Plan TBD Appendix N - Rehabilitation and Invasive Species Management Plan	All rehabilitation work on the project must be completed in accordance with the requirements identified in the Rehabilitation and Invasive Species Management Plan in Appendix N of the CEnvPP text document	
Proj Name Environmental Protection Plan TBD Appendix O - Waste and Recycling Management Plan	All waste generated by project activities must be managed in accordance with the requirements identified in the Waste and Recycling Management Plan in Appendix O of the CEnvPP text document	
Proj Name Environmental Protection Plan TBD Appendix P - Clearing Management Plan	All work on the project must be completed in accordance with the requirements identified in the Clearing Management Plan in Appendix P of the CEnvPP text document.	
Contractor Environmental Management Plan	All work on the project must be completed in accordance with the requirements identified in the Contractor Environmental Management Plan (unless there is a conflict between the Contractor EMP and the Manitoba Hydro CEnvPP in which case the Manitoba Hydro document will supersede)	
Contractor Weekly & Final Environmental Report	The contractor shall prepare and submit a Weekly Environmental Report as part of the Weekly Progress Report that will include environmental information, descriptions, and statistics for the contractor's site activities. A Final Environmental Report will be submitted after the completion of construction activities.	

Topic	Key Environmental Requirements	Discussed
Compliance with Environmental Requirements	1) Environmental Corrections 2) Environmental Non-Conformance Reports 3) Environmental Improvement Orders 4) Environmental Stop Work Orders	
Other TBD		

Additional notes:

Schedule a Pre-job Environmental Meeting

The above items have been discussed and understood. ***(Note: This Environmental Requirements Orientation is a summary of some of the key environmental requirements of this project but is not intended to be a comprehensive review).*** Any questions relating to these items or any other project environmental requirements may be further discussed at the project pre-job environmental meeting or during the course of the contract.

"Original Signed by First Last name"

____ ______________

MANITOBA HYDRO REPRESENTATIVE (SIGN) YYYY MM DD

____ ______________

CONTRACTOR'S REPRESENTATIVE (SIGN) YYYY MM DD

Contractor Commencement Meeting Environmental Orientation Attendance List

Name (print)	Company	Signature

Appendix N

Rehabilitation and Invasive Species Management Plan

Manitoba Hydro

Radisson to Henday (R44H)

230 kV Transmission Project

Rehabilitation and invasive species management plan

Prepared by Manitoba Hydro

Transmission & Distribution Environment
and Engagement Department

Project Management Division

December 2023

Preface

This document presents the Rehabilitation and Invasive Species Management Plan (the plan) for the construction of the Radisson to Henday 230 kV transmission project (the project). It is intended to provide information and instruction to Manitoba Hydro employees as well as contractors, regulators and members of the public. The plan provides regulatory context as well as general considerations and guidance pertinent to the post construction rehabilitation of project sites and management of invasive species within the project footprint.

Manitoba Hydro employees and contractors are encouraged to contact the onsite Manitoba Hydro environmental inspector/officer if they require information, clarification or support. Regulators and the public are to direct any inquiries about this plan to:

Manitoba Hydro

Transmission & Distribution Environment and Engagement Department
Manitoba Hydro
360 Portage Avenue

Winnipeg, MB

Canada R3C 0G8

1-877-343-1631

Projects@hydro.mb.ca

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Tables

1.0 Introduction

Consistent with its corporate Environmental Management Policy, Manitoba Hydro has committed within the Radisson to Henday 230 kV transmission project (the project) construction environmental protection plan to developing a rehabilitation and invasive species management plan (RISMP) as part of a larger suite of mitigation measures to minimize potential negative environmental and socio-economic effects.

Manitoba Hydro's environmental protection program (EPP) provides the framework for the delivery, management and monitoring of environmental and socio-economic protection measures that satisfy corporate policies and commitments, regulatory requirements, environmental protection guidelines and best practices, and input during project engagement. The program describes how Manitoba Hydro is organized and functions to deliver timely, effective, and comprehensive solutions and mitigation measures to address potential environmental effects. This RISMP is a component of the EPP as illustrated in Figure 1.

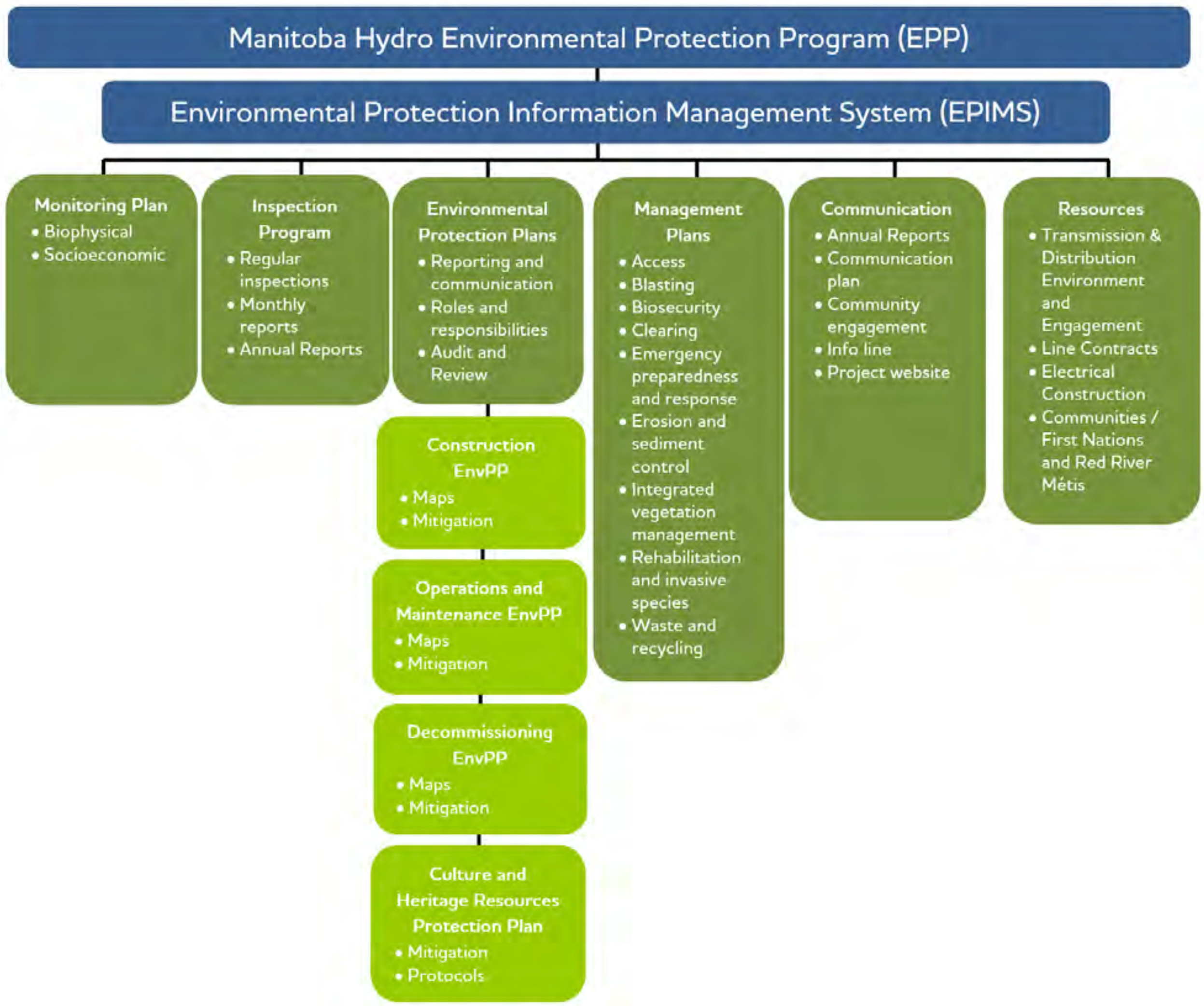

Figure 1: Transmission environmental protection program

1.1 Commitment to environmental protection

Manitoba Hydro integrates environmentally responsible practices in all aspects of our business. Environmental protection can only be achieved with the involvement of Manitoba Hydro employees, consultants, contractors, Indigenous communities and organizations and the public at all stages of the project from planning and design through construction and operational phases.

The use of an RISMP is a practical and direct implementation of Manitoba Hydro's environmental policy and its commitment to responsible environmental and social stewardship. It is a proactive approach to manage potential disturbance of access related to the construction of a new transmission line.

Manitoba Hydro is committed to implementing this RISMP and requiring contractors to follow the terms of this and other applicable plans within the environmental protection program.

1.2 Purpose and objectives

The purpose of this rehabilitation and invasive species management plan (RISMP) is to provide information that will guide contractors and Manitoba Hydro staff through project construction, maintenance, and decommissioning in a manner that meets Manitoba Hydro's environmental management policy and project commitments.

Rehabilitation is the process of returning the land in a project area to a condition compatible to its former state after development has disturbed the land. As there has already been a large amount of habitat degradation and increasing pressures on the surrounding areas, Manitoba Hydro seeks to enhance habitat and biodiversity on the ROW through the implementation of rehabilitation measures that consider traditional resource use along with wildlife habitat. Manitoba Hydro has participated in endeavours with researchers to measure and enhance the biodiversity of its ROW's. Manitoba Hydro continues to be open to discussing opportunities for research and collaboration with researchers from universities and Indigenous communities and organizations.

Invasive species management is the process of managing the invasive species growing in the project area through a variety of methods. Invasive species are plants, animals or other organisms that are growing outside of their country or region of origin and are out-competing or even replacing native organisms. They have a distinct advantage over our native species whose populations are kept in check by native predators, competitors, or disease.

Reasons for rehabilitation and invasive species management may include:

- Reducing the risk of erosion
- Controlling the spread of invasive plants
- Reducing access
- Reclaiming land
- Improving aesthetics
- Restoring ecosystem function

1.3 Roles and responsibilities

This section outlines the major roles and responsibilities of those involved in the implementation of the plan.

A summary of roles and key responsibilities is found in Table 1. Communication and reporting on environmental issues, monitoring and compliance will be as outlined in Figure 2.

Table 1: Key roles and responsibilities

Role	Responsibilities
Manitoba Hydro	• Identifying Invasive species locations in Biosecurity Management Plan Mapbook • Monitoring rehabilitation measure success • Review contractor developed site-specific rehabilitation measures • Implement invasive species management treatment options where required
Contractor	• Shall adhere to Rehabilitation and Invasive Species Management Plan including employee training, implement rehabilitation measures prescribed actions, signage and submit all required assessment documentation. • Respond and act promptly to resolve if any activities are identified as not in compliance with the RISMP or any regulatory requirements. • Conducting assessment of project sites for rehabilitation • Develop and propose site specific rehabilitation measures as per guidelines • Implement site specific rehabilitation measures • Prevent the spread of Invasive plant species • Rehabilitate disturbed areas as soon as practicable or when deemed necessary by Manitoba Hydro. Rehabilitation is not to be deferred until construction is complete

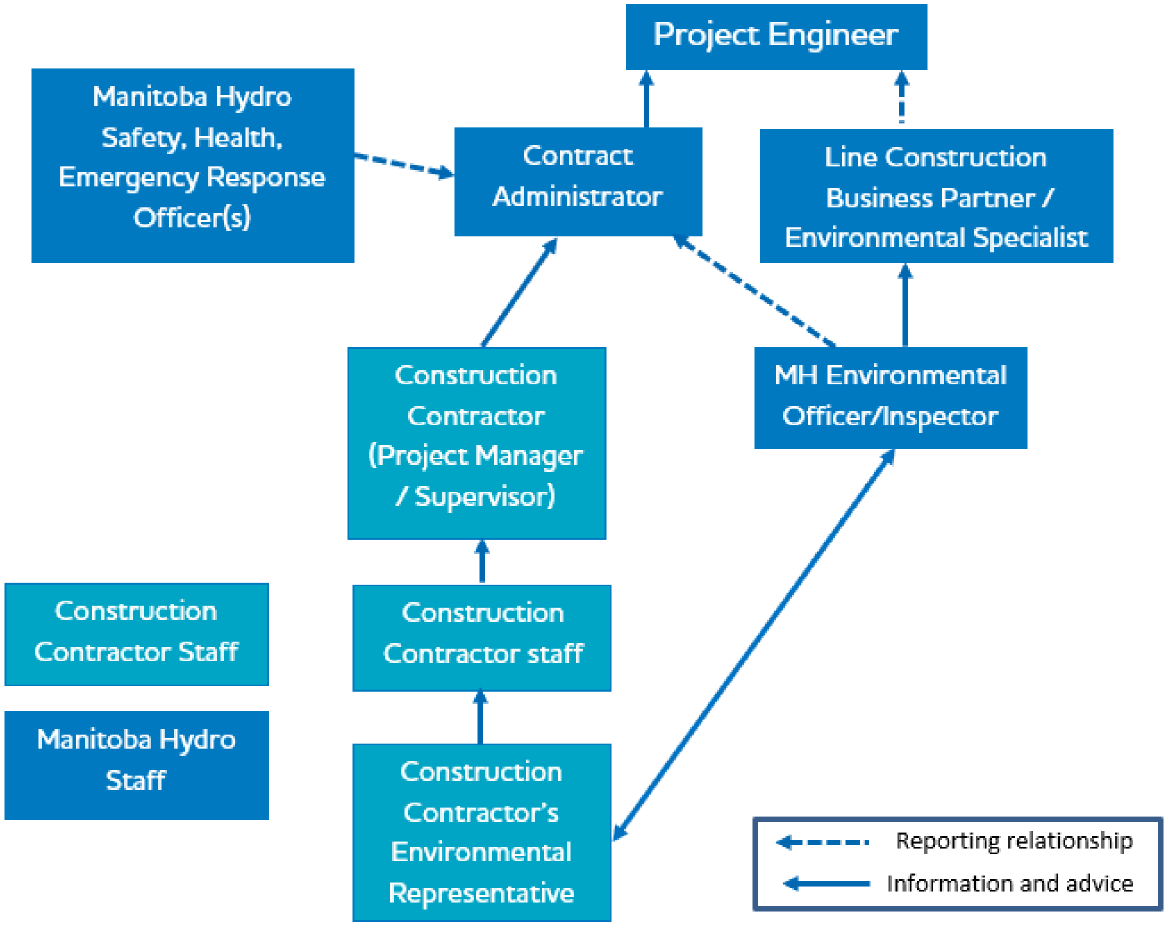

Figure 2: Environmental communication reporting structure

2.0 Regulatory context

In Manitoba, the control of noxious weeds is regulated by The Noxious Weeds Act, C.C.S.M. c. N110 (including amendments from The Noxious Weeds Amendment Act, S.M. 2015, c. 38) and the Noxious Weeds Regulation (42/2017). Through recent amendments to the Act, the list of regulated noxious weeds has been updated and noxious weeds have been designated as tier 1, tier 2, or tier 3 noxious weeds based on prevalence, distribution, and invasiveness.

3.0 Implementation

The intent of this section is to provide for implementation instructions to Manitoba Hydro and contractor project staff. The main project components that may require rehabilitation and invasive species management include the following:

- Right-of-way (RoW)
- Access routes and by-pass trails
- Borrow pits and quarries
- Marshalling yards (material and/or equipment storage, fly yards)
- Construction camps
- Station sites

3.1 Assessment

The contractor shall conduct a rehabilitation assessment as described in the guidelines of rehabilitation by land cover below. The assessment will be documented though the use of the rehabilitation assessment checklist (Appendix A).

3.2 Timing

The timing of when rehabilitation activities occur is key to preventing erosion, invasive species establishment, and preventing damage to rehabilitation measures. The contractor is required to implement rehabilitation measures as soon practicable or as required by MH environmental inspector/officer, rehabilitation is not to be deferred until construction is complete.

3.3 Guidelines for rehabilitation by land cover

3.3.1 Wetlands and riparian areas

Trigger(s) for the assessment for rehabilitation by contractor:

- Any construction activity that affects surface water drainage directly into a water body (watercourse and/or wetland) without sufficient erosion and sediment control measure in place
- When the depth of rutting exceeds 10 cm for more than 15 m in length
- Admixing (mixing of topsoil and subsoils)

- Any excessive soil disturbance within wetland outside of tower footprint and stringing corridor
- Removal of riparian buffer shrub and understorey vegetation
- Debris from clearing or stream crossing below high-water mark

Criteria to be assessed by contractor (Manitoba Hydro may conduct its own assessment):

- Proximity to weed seed source
- Current ground and aquatic conditions
- Existing erosion and sediment control measures
- Accessibility to project site(s)
- Safety
- Adjacent land use
- Timing of rehabilitation activities

Rehabilitation measures may include (site-specific rehabilitation measures will be developed by the contractor and proposed to Manitoba Hydro for review):

- Flag or place barriers to mitigate further disturbance
- Implementation of erosion and sediment control measures where required
- Allow for passive revegetation
- Implement active revegetation through planting or seeding of native/traditional species
- Flag or place barriers after rehabilitation measures implemented to mitigate further disturbance
- Debris removal
- Other rehabilitation measures as approved by Manitoba Hydro

3.3.2 Access routes and trails

Trigger(s) for the assessment for rehabilitation by contractor:

- Any evidence of access route / trail structure damage occurring, such as admixing, or the creation of ruts that impedes local vehicle traffic
- Any excess construction materials (granular, clay, waste) within route/trail or ditches including rider pole installations
- Removal of snow fill approaches within access route / trail right of way prior to spring thaw

Criteria to be assessed by contractor (Manitoba Hydro may conduct its own assessment):

- Proximity to weed seed source
- Current ground conditions
- Current access route / trail use
- Existing erosion and sediment control measures
- Accessibility to project site(s)
- Safety
- Adjacent land use
- Timing of rehabilitation activities

Rehabilitation measures may include (site-specific rehabilitation measures will be developed by the contractor and proposed to Manitoba Hydro for review):

- Flag/sign or place barriers to mitigate further disturbance
- Implementation of erosion and sediment control measures where required
- Allow for passive revegetation
- Implement active revegetation through planting or seeding of native/traditional species
- Back blading or grading to remove ruts/level surface
- Construction material and debris removal
- Adding or replacing gravel surface material
- Contouring or re-sloping
- Flag/sign or place barriers after rehabilitation measures implemented to mitigate further disturbance
- Excess construction material removal
- Other rehabilitation measures as approved by Manitoba Hydro

3.3.3 Forest and grasslands

Trigger(s) for the assessment for rehabilitation by contractor:

- When rutting depth exceeds 30 cm for more than 15 m in length
- Any travel off existing designated access routes
- Any excess construction materials (granular, clay, waste)
- Disturbance to existing in-field drainage
- Installation of tower or poles

Criteria to be assessed by contractor (Manitoba Hydro may conduct its own assessment):

- Proximity to weed seed source
- Current ground conditions
- Current farming practices
- Existing erosion and sediment control measures
- Accessibility to project site(s)
- Safety
- Adjacent land use
- Timing of rehabilitation activities

Rehabilitation measures may include (site-specific work modifications will be developed by the contractor and proposed to Manitoba Hydro for review):

- Flag/sign or place barriers to mitigate further disturbance
- Implementation of erosion and sediment control measures where required
- Allow for passive revegetation
- Implement active revegetation through planting or seeding of native/traditional species
- Back blading or grading to remove ruts
- Construction material and debris removal
- Flag/sign or place barriers after rehabilitation measures implemented to mitigate further disturbance
- Addition, spreading or removal of topsoil
- Other rehabilitation measures as approved by Manitoba Hydro

3.3.4 Borrow pits and quarries

Trigger(s) for the assessment for rehabilitation by contractor:

- When borrow pits or quarries are no longer required for foundation installation

Criteria to be assessed by contractor (Manitoba Hydro may conduct its own assessment):

- Proximity to weed seed source
- Current ground conditions
- Existing erosion and sediment control measures
- Safety

- Adjacent land use
- Timing of rehabilitation activities

Rehabilitation measures may include (site-specific work modifications will be developed by the contractor and proposed to Manitoba Hydro for review):

- Contouring or re-sloping
- Implementation of erosion and sediment control measures where required
- Allow for passive revegetation
- Implement active revegetation through planting or seeding of native/traditional species
- Back blading or grading to remove ruts
- Addition of topsoil
- Construction material and debris removal
- Flag/sign or place barriers after rehabilitation measures implemented to mitigate further disturbance
- Other rehabilitation measures as approved by Manitoba Hydro

3.4 Erosion and sediment control

Project activities may result in the disturbance or removal of topsoil and modification of the landscape. Where possible, removal of ground plant cover and soil disturbance should be minimized during project activities. Vegetation provides a protective cover for underlying soil and reduces surface runoff. Removal of vegetation cover exposes soil and can result in soil losses from wind and water erosion. In locations of rapid run-off, rills may develop. Soil erosion near watercourses can reduce water quality by causing sedimentation, resulting in a reduction of aquatic ecosystem health.

Erosion control of disturbance sites may be necessary prior to re-establishment of vegetation. Erosion control prescriptions will vary considerably based on the conditions found at the site. Refer to the Erosion and Sediment Control Plan for any measures that may need to be put in place prior to rehabilitation.

3.5 Site preparation

Site preparation for rehabilitation may vary with site conditions. Site preparation methods will depend largely on the degree of disturbance, soil conditions, and existing vegetation remaining and regenerating in sites.

Site preparation options include the following:

- **Contouring** – Site preparation may involve contouring of an area where a disturbance has occurred (e.g., borrow pits) prior to implementing other efforts.
- **Addition or removal of topsoil** – Where topsoil has been removed for project activities, site preparation should involve the replacement of topsoil. The salvage of topsoil is a priority that should be considered in the planning stages of a project. Topsoil is the uppermost layer of soil that is important for nutrient cycling and is a source for native plants. The amount of topsoil required for replacement should ideally match the depth of topsoil as to what was there before, or a minimum depth of 30 cm. Effective topsoil management is an essential component of rehabilitation success. Note: that should the addition of topsoil be required onsite, refer to the Biosecurity Management Plan to minimize biosecurity risk.
- **Grading of ground material** – Site preparation may involve grading of soils where a disturbance has occurred (e.g., rutting). On terrain with slopes, it is recommended that grading occur across a slope to reduce erosion, and grading of materials should not result in slopes steeper than a 5:1 ratio.
- **Soil de-compaction** – Equipment continually driving over an area may result in compaction. Soil compaction is the squeezing together of soil particles, reducing the space available for air and water which could reduce the capacity of the soil to support desired vegetation. Site preparation may involve treatment for soil compaction prior to re-establishment of vegetation by light discing or tilling to avoid loss of soil moisture and soil structure.
- **Seedbed Preparation** – Site preparation may also include preparing the seedbed prior to revegetation to enhance germination success. Seeding options discussed below.

3.6 Revegetation

Revegetation is the process of plants growing again on land previously disturbed. This may be a passive process by plant colonization and succession or an active accelerated process (e.g., seeding, planting) designed to repair a disturbance to the landscape.

3.6.1 Passive

Passive revegetation is a viable means of rehabilitation by natural seeding, sprouting, suckering or layering of vegetation. Where conditions are ideal regarding seedbank, propagules, topography, slope, moisture, time of year, and condition of surrounding vegetation, natural regeneration will occur.

3.6.2 Active

Where conditions are not ideal for passive revegetation such as lack of seedbank or propagules, rehabilitation should involve active revegetation by planting or seeding.

3.6.2.1 Planting options

Options for rehabilitation by planting include the following:

- **Tree seedlings** – Tree seedlings may be obtained as either bare root or containerized stock. Bare root stock needs to be handled carefully while in storage and during planting, and exposed roots can dry out quickly. Containerized stock provides root protection and increased flexibility as to timing of planting. Spacing for seedlings can be variable. Seedlings are recommended for large-scale plantings. Common seedlings for rehabilitation may include jack pine and red pine, white and black spruce.
- **Transplanting** – Transplanting is a form of artificial regeneration where plants are removed from one location and planted in another. Transplanting is a useful means of re-establishing native species quickly. Preferably, transplanting should occur from similar habitats and nearby sources to increase growing success. Vegetation transplanted in disturbed sites may increase the rate of natural regeneration by capturing seeds and organic material from surrounding plant cover. Transplanting is a recommended method for vegetation rehabilitation near watercourse crossings. Species such as hybrid poplar and willow cuttings are commonly planted because of their good rooting ability and fast growth rate.

- **Sprigging** – Plant sections cut from rhizomes or stolons that include the vegetation crowns and roots. Sprigging can be an effective method for disturbed and erodible stream crossing sites.

3.6.2.2 Seeding options

Options for rehabilitation by seeding include the following:

- **Drill Seeding** – Drill seeding involves a tractor-pulled seed drill. In larger areas, equipment can furrow soil, plant seed and pack soil over seed in one pass. Native seed drills are most efficient and accurate at placing seed. Drill seeding should be done into well-cultivated soil, free of lumps and debris, and firmly roller packed.
- **Broadcast seeding** – Broadcast seeding is accomplished by dispersing seed by machine or hand. Broadcasting is effective where the access of large machinery is not possible or recommended, although requires the use of more seed. An attempt should be made to incorporate the seeds into the soil as an additional step after broadcasting.
- **Hydroseeding** – Hydroseeding is a method that uses a slurry of seed, mulch, water and tackifier which is transported by a water tank that may be mounted on a truck or trailer and sprayed over prepared ground. Hydroseeding is an alternative to traditional broadcasting or drilling seeding.

3.7 Other important considerations and options

3.7.1 Using native/traditional use species

Native species are plants occurring within their historic range bounded by the dispersal potential of the plant. These native/traditional use species are favoured for rehabilitation for several reasons, including resource use, ecological compatibility, palatability, and adaptation to local soils and climate. Native/traditional plant material will be used for rehabilitation of a disturbance area where the goal is to re-establish a native/traditional plant community. Appendix B is a selection of commercially available traditional plant species.

3.7.2 Ecological context

Rehabilitation prescription needs to be appropriate for the site under consideration. Manitoba is comprised of six ecozones representing large generalized ecological units characterized by interactive and adjusting abiotic and biotic factors. Selecting vegetation for rehabilitation needs to be suitable to the site. Appendix C identifies characteristic vegetation of Manitoba’s ecozones.

3.7.3 Seed mix recommendations

This section identifies native seed mixes for disturbances in Manitoba. Establishing long-term plant communities requires forethought as to appropriate species to use. Actual amounts of species present in a seed mix may vary depending upon seed availability. The best adapted species will result from seed collections in the region. If seed availability is an issue, it would be preferable to use the correct species, rather than the prescribed seed rates. Species listed in Appendix D can be chosen as a baseline mix and are generally commercially available. Both upland and lowland mixes are provided for northern, west central, and southern Manitoba. Species listed in Appendix E are commercially available in Manitoba and may be added for diversity.

3.7.4 Commercial seed and plant providers

Purchasing native seed from commercial providers is a practical option for large rehabilitation sites. Where seed will be purchased, the following information should be considered:

- Species selection for seeding should be undertaken in conjunction with recommended seed mixes, generally with a dominance of native graminoids and subdominant native broadleaf herbs.
- Seed acquisition should be determined through consultation with a vegetation specialist, using readily available native local seed, wherever possible.
- Forage grasses should not be seeded as they are developed for maximum forage production and may destroy habitat by taking over native plant communities.
- The genetic origin of the seeds should be from Manitoba or nearby provinces, from a region with similar ecological conditions.
- Commercial seed providers should produce certificates of analysis from an accredited laboratory that provides seed purity and germination values.

3.7.5 Seeding dates

There are two timing windows for seeding. The preferred time to seed occurs during the spring as soon as the ground has reached a desirable temperature (5°C) and the danger of a killing frost has past. The second and less successful time is dormant seeding in the fall once the ground temperature has lowered to 5°C, where seeds will germinate the following growing season. For sites with a high risk of erosion, seeding could occur at anytime.

3.7.6 Rates for seeding

Seeding rates can vary depending on method of seeding and applicator. Seeding rates may need to be adjusted for wind loss, animal consumption, slope, seed weight, germination rate, annual survivorship, and intended density of mature plants. General seeding rates include the following:

- Drill seeding <15 kg/ha
- Broadcast seeding 30 to 85 kg/ha
  - broadcast seeding involves scattering of seed manually by hand (or hand-held seeder) or mechanically.
- Hydroseeding 75 to 100 kg/ha
- Cover crops 2.2 to 5.5 kg/ha (seeded lightly to reduce competition with native species)

The seeding rate calculation for a species that occupies 10% of a seed mix (e.g. 84 kg/ha) includes the following: 84 kg/ha x 0.10 = 8.4 kg/ha.

3.7.7 Rates for planting tree seedlings

Spacing of tree seedlings can be variable within disturbance areas. In general, spacing to achieve about 2,500 seedlings per hectare requires spacing of 2.1 m between rows and 1.8 m between seedlings.

Transplanting cuttings such as poplar or willow species can be used. Cuttings should be a minimum length of 30 cm and buried in the ground at least half its length. Cuttings are most successfully transplanted in the spring and fall. Both poplar and willow species have good propagation success because of their rooting ability and are desirable for erosion control.

3.7.8 Fertilizers

Fertilizers can be added to the soil to supply one or more plant nutrients essential to the growth of plants that may be lacking in the soil at the site prescribed for rehabilitation. Fertilization may improve productivity of a rehabilitation effort during early growth stages. Applying excessive amounts of fertilizer can have negative environmental effects (e.g. seed damage, run-off, encourage invasive species, etc.). The storage, handling, and application of fertilizers are legislated in Manitoba (*The Water Protection Act*, *The Pesticides and Fertilizers Control Act*). This legislation is intended to protect Manitoba's water quality. It is important to consult this legislation prior to applying nutrients to rehabilitation sites.

4.0 Invasive species management

Many Invasive species in Manitoba are so common now that they are often mistakenly considered native, these species have become widely naturalized through intentional and accidental introductions. Invasive species reduce biological diversity and threaten native ecosystems. Examples of invasive species in Manitoba include purple loosestrife, ox-eye daisy and leafy spurge. Plants listed by the Invasive Species Council of Manitoba are provided in Appendix F.

Once invasive species become established control measures can be costly to implement. Therefore, a successful invasive species management should involve taking preventative measures, early detection, and rapid management response.

The management of invasive species must consider the ownership of the land. The responsibilities for management on different ownership types are described below:

- **ROW on private/municipal lands**: As Manitoba Hydro has only an easement the responsibility of invasive species management lies with the landowner. If invasive weeds are introduced to the right-of-way as a direct result of Manitoba Hydro activities it will work with the landowner to implement control options.
- **ROW on railway, road allowance or highway lands**: As Manitoba Hydro does not have an easement the responsibility of invasive species management lies with the landowner. If invasive weeds are introduced to the right-of-way as a direct result of Manitoba Hydro activities it will work with the landowner to implement control options.
- **ROW on Manitoba Hydro-owned lands**: Manitoba Hydro is responsible for invasive species management to comply with the *Manitoba Noxious Weeds Act*.
- **ROW on Crown lands (including lands with third-party interests)**: As Manitoba Hydro has only an easement the responsibility of invasive species management lies with the Crown (landowner) or the third-party interest. If invasive weeds are introduced to the right-of-way as a direct result of Manitoba Hydro activities Manitoba Hydro would consult with local weed supervisors and Manitoba Agriculture and/or Environment and Climate departments to implement control options.

4.1 Prevention

An initial step in controlling invasive plant species is preventing their establishment. Prevention is relatively cost-effective when compared to invasive species control and management efforts. Detailed biosecurity measures are outlined in the biosecurity management plan for the project. Preventative measures may include the following:

- Education on how to identify invasive species and infestations.
- Avoid driving or walking through areas of invasive species.
- Clean and wash equipment and boots before entering and leaving a site to prevent transport of seeds.
- Design seed mixes with species that have differing growth forms to occupy the variety of niches available, and seed native species that are known to be competitive.
- Record early detection of invasive species problem areas on adjacent lands.
- A combination of promoting natural re-vegetation and re-establishment of vegetation cover, where required, using species suited to the post-construction land use to provide competition for germinating weeds.

4.2 STEP 1: Weed management thresholds and priority levels

Weed management conducted prior to and during construction will focus on managing weeds identified during pre-construction surveys, as necessary, as well as occurrences identified during construction.

The list of weeds designated as tier 1, tier 2, and tier 3 noxious weeds under the Noxious Weeds Regulation (42/2017) is found in Appendix G.

The management thresholds for weed species for the project are as follows:

- Invasive weed species (Appendix G of Reference i) must be maintained or reduced to a density and distribution level equivalent to or less than levels observed on adjacent lands with equivalent or similar land use and land management. The comparison should be made to the invasive weed conditions found during pre-construction surveys and as compared to adjacent lands during/after construction.
- Weeds must be treated and managed in compliance with the Manitoba Noxious Weeds Act and Regulation. Under the regulation, a person must:

- o destroy all tier 1 noxious weeds as listed in the Regulation that are on land that the person owns or occupies
- o destroy all tier 2 noxious weeds as listed in the Regulation that are on land that the person owns or occupies if the area colonized by the weeds is less than five acres
- o control all tier 2 noxious weeds as listed in the Regulation that are on land that the person owns or occupies if the area colonized by the weeds is five acres or more
- o control a tier 3 noxious weed as listed in the Regulation that is on land that the person owns or occupies if the weed's uncontrolled growth or spread is likely to negatively affect an aspect of Manitoba's economy or environment in the land or the well-being of residents in proximity to the land

The priority for managing sites where the threshold as described above has been reached will be determined by the level of risk of increasing the density and distribution of weed species. Criteria for the site priority levels are outlined in Table 2.

Table 2: Priority levels for weed management

Priority level	Purpose or intent
High	To destroy Tier 1 and Tier 2 noxious weeds (<5 acres) currently threatening non-infested or highly susceptible sites within Project footprint.
Moderate	To control Tier 2 noxious weeds (>5 acres) and invasive species on sites in less susceptible areas of the Project footprint. This includes areas adjacent to lands such as treed pasture lands that have a well-established vegetation cover and, therefore, are less susceptible to weed species introduction.
Low	To control a tier 3 noxious weed on within the Project footprint if the weed's uncontrolled growth or spread is likely to negatively affect an aspect of Manitoba's economy or environment in the area of the land or the well-being of residents in proximity to the land

4.3 STEP 2: Determine whether management threshold has been reached

Compare the density and distribution of each weed species observed on the construction right-of-way to the density and distribution of the same species off-site or as outlined in the pre-construction weed survey report, to determine whether the management threshold has been reached.

4.4 STEP 3: Review treatment criteria

Choose an appropriate management option (i.e., mechanical, biological, or chemical) or a combination of treatments that will provide effective weed management, based on the data collected at weed occurrence sites. The criteria used to select a treatment method that balances the potential environmental impacts while providing adequate and cost-efficient weed management are:

- Effectiveness of previous treatments
- Biology of target weed species, area, and density
- Existing land use
- Land ownership
- Proximity of organic farms, water sources, bodies of water and environmentally sensitive sites
- The possibility of adverse impacts to wildlife, fish, surrounding land, workers, and adjacent residents
- Economic impacts of weeds on surround land use
- Timing of treatment
- Existing soil type
- Site accessibility
- Cost and availability of treatment options
- The consequences of no treatment

4.5 STEP 4: Select weed management treatment method

4.5.1 Manual / mechanical treatment option

Manual/Mechanical treatments are preferred for weeds located adjacent to cultivated or agricultural lands, organic farmlands and near waterbodies (e.g., drainages, wetlands). Manual/Mechanical options include:

- Mowing: mowing of weeds before weeds go to seed. Mowing may be combined with a pre-mowing herbicide treatment, ensuring that the herbicide has had sufficient time to absorb into the plants.
- Burning: targeted burning of weeds with torches or prescribed controlled burns
- String trimmers: to cut weeds at the ground surface to remove herbaceous vegetation at locations where access limits the use of larger equipment.
- Hand pulling: pulling of weeds in riparian and environmentally sensitive locations for annual and certain perennial weeds where all roots can be easily removed and weed density is sufficiently low enough to make hand pulling effective.
- When selecting a treatment, consideration should be made for the cultural, medicinal or commercial value of a plant to local communities.

Manual/Mechanical treatment options may be considered for use within 30 m of a watercourse, wetland or MH's ESSs.

4.5.2 Biological / cultural / native treatment option

Biological/cultural/native treatments are an alternative option near watercourses, within pastures, public recreation areas; where chemical application is not approved; or where manual/mechanical methods may not be effective. Biological options include:

- Biological insects and fungi: Canadian Food Inspection Agency approved insects and fungi might be considered to manage weed infestations where other methods have not proven successful.
- Grazing: High intensity livestock grazing has also proven an effective method for limiting weed infestations in select applications.
- Revegetation and erosion control: The use of erosion control measures such as blankets or the establishment of competitive vegetative cover on disturbances to stabilize soils and provide competition to weeds.

Biological/cultural/native treatment options may be considered for use within 30 m of a watercourse, wetland or MH's ESSs.

4.5.3 Chemical treatment option

Chemical treatments may be a necessary option when:

- Weed density and distribution has reached levels that other management options are not viable to control the weed infestation
- Weed management in areas where mechanical and biological methods are not feasible or practical
- Where chemical management is the preferred option of the landowner or Weed Supervisor as designated under the Manitoba Noxious Weeds Act regulations

Chemical treatments may be considered for use within 30 m of a MH's ESSs, but NOT within 30 m of watercourses or wetlands.

4.5.4 No control management option

In some instances, the implementation of a "no control" option and ongoing monitoring is the most practical and environmentally responsible course of action. In instances where "no control" is being considered as the treatment option, discussions with landowner and government regulators will occur. The No Control option may be considered for use within 30 m of a watercourse, wetland or MH's ESSs.

4.6 Treatment options for common species

The following identifies an overview of treatment options for some common invasive species.

4.6.1 Leafy spurge

- Manual control (hand-pulling) is effective for small infestations
- Mechanical control (mowing) will reduce the plants' ability to seed but has little long-term effect on the plant
- Chemical control is effective in spring and fall
- Biological control is considered a long-term management strategy
- A combination of control measures in an integrated approach is recommended for this species

4.6.2 Common tansy

- Manual control (hand-pulling) is effective for small infestations
- Mechanical control (mowing) will reduce seed production but requires repeat treatment
- Chemical control is effective
- Biological control is anticipated to be an effective measure for this species in the future
- Native species competition has been effective for small infestations

4.6.3 Scentless chamomile

- Manual control (hand-pulling) is effective for small infestations
- Mechanical control (mowing) is effective but requires repeat treatment
- Chemical control is effective. Earlier applications have greater success
- Biological control has had some success
- Native species competition has been effective
- A combination of control measures in an integrated approach is recommended for this species

4.6.4 Purple loosestrife

- Manual control (hand-pulling) is effective for small infestations
- Chemical control is effective in uplands. No herbicides are currently approved in Canada for treatment near or in water
- Biological control is the most effective measure for large infestations near water

4.6.5 Ox-eye daisy

- Manual control (hand-pulling) is effective for small infestations, if the roots are removed
- Mechanical control (mowing) stimulates shoot growth and requires repeat treatment
- Chemical control is effective

4.6.6 Sweetclover

- Manual control (hand-pulling) is effective for small infestations if the roots are removed
- Mechanical control (mowing) should occur before seed production

- Chemical control is effective
- Native species competition has been effective as part of a management strategy including native seeding, burning, and mowing

4.6.7 Canada thistle

- Manual control (hand-pulling) is effective for small infestations if the roots are removed
- Mechanical control (mowing) is effective but requires repeat treatment
- Chemical control is effective

4.7 Training and documentation

Training, documentation, and communication form a critical component of the implementation of this plan. Manitoba Hydro and the contractor(s) each have responsibility to ensure that their respective personnel are appropriately trained to carry out their role in rehabilitation, and that proper documentation and communication is being conducted throughout the project.

Manitoba Hydro will hold a Contractor Environmental Pre-Construction Requirements Orientation meeting to review project specifics and key environmental requirements with all its contractors at a supervisory level. A summary of this plan, implementation requirements, roles and responsibilities, and Manitoba Hydro’s expectations will be presented at that time. Manitoba Hydro will also hold a separate pre-construction environmental meeting to provide the opportunity for Manitoba Hydro and contractor environmental representatives to discuss project specifics and environmental requirements in more depth.

5.0 Monitoring and follow-up

Monitoring and follow-up is an important component for rehabilitation and invasive species management. Monitoring will verify the implementation and effectiveness of rehabilitation measures and invasive species management. Successful rehabilitation of disturbed areas will be defined by the establishment of native species, no evidence of erosion, and resilience to the disturbance. The following should be completed during monitoring of disturbance areas:

- Disturbance areas should be inspected frequently in the first year and monitored annually thereafter until vegetation re-established.
- Monitoring may include an assessment of erosion control.
- Monitoring will include an assessment of vegetation to measure plant growth.
- Monitoring will be conducted by Manitoba Hydro Environmental Officer and/or vegetation specialists.

Environmental monitoring will determine if follow-up maintenance activities are required. Maintenance activities may include additional erosion control, re-seeding or further plantings, protection from browsing, and invasive species control.

6.0 References

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Appendix A

Rehabilitation checklist

Appendix A: Rehabilitation checklist

Date (yyyy mm dd)	
Name of recorder	Company (*if different from Manitoba Hydro*)
Location GPS Coordinates *(UTM 14N)*	
Closest Structure Number if applicable #	
Description of disturbance (*type, size, sensitivity i.e. riparian area*)	
Proximity to weed sources *(closest invasive weed ESS)*	
Severity of disturbance *(e.g., erosion is occurring, disturbance is stable)*	
Slope of site (level 0-0.5%, nearly level 0.5-2.5%, very gentle to gentle 2-9%, moderate 10-15%, strong 16-30%, very strong to steep 31-100%)	
Current Ground conditions (*dry, moist, wet*)	
Timing of rehabilitation activities *(Immediate/once surface disturbance activities are complete and ground conditions allow)*	
Post disturbance vegetation conditions (*e.g., vegetation is removed, or little is remaining*)	
Surrounding vegetation (*e.g. grassland, forest, riparian, wetland*) and predominant species if known	
Adjacent land uses (*e.g. agriculture/forest/residence*)	
Safety *(Are there any safety concerns?)*	
Accessibility *(Is the site accessible year-round/winter/summer, is there alternate access to avoid site)*	
Existing Sediment and Erosion Control Measures *(silt fence, blanket)*	

Appendix B

Selection of traditional plant species commercially available for rehabilitation

Appendix B: Selection of traditional plant species commercially available for rehabilitation

Provincial Scientific Name	Traditional Use Plant Name	Provincial Rank	Commercial Availability	Rehabilitation Potential	Location of Use
Abies balsamea	balsam fir	S5	yes	yes	forest
Achillea millefolium	yarrow	S5	yes	low	forest, grassland
Acorus americanus	weke	S5	yes	yes	wetland
Actaea racemosa	black snakeroot	not listed by MBCDC	plant unknown	unknown	unknown
Actaea rubra	baneberry	S5	potential to transplant	low	forest
Agastache foeniculum	giant hyssop	S5	yes	low	moist meadow, forest
Alnus incana	speckled alder	S5	yes	yes	riverbank, moist forest
Amelanchier alnifolia	saskatoon berry	S5	yes	yes	forest
Apocynum androsaemifolium	dogbane	S5	potential to transplant	low	forest
Aquilegia sp.	columbine	–	yes	low	forest
Aralia nudicaulis	wild sarsaparilla	S5	yes	low	forest
Arctostaphylos uva-ursi	common bearberry	S5	yes	yes	forest
Artemisia sp.	sage	–	yes	low	grassland
Asarum canadense	wild ginger	S3S4	yes	low	moist forest
Asclepias incarnata	swamp milkweed	S4	yes	low	wetland
Asclepias syriaca	common milkweed	S4	potential to transplant	low	riverbank, grassland
Betula papyrifera	paper birch	S5	yes	yes	forest
Caltha palustris	marsh marigold	S5	yes	low	wetland
Campanula sp.	harebell	–	yes	low	grassland, forest
Cannabis sativa	hemp	SNA	potential to transplant	low	forest
Chamerion angustifolium	fireweed	S5	yes	yes	forest
Conyza canadensis	Canada fleabane	S5	potential to transplant	low	grassland
Cornus canadensis	bunchberry	S5	yes	low	forest
Cornus sericea	red osier dogwood	S5	yes	yes	forest
Corylus americana	American hazelnut	S4	yes	yes	forest

Appendix B: Selection of traditional plant species commercially available for rehabilitation

Provincial Scientific Name	Traditional Use Plant Name	Provincial Rank	Commercial Availability	Rehabilitation Potential	Location of Use
Corylus cornuta	beaked hazelnut	S5	yes	yes	forest
Corylus sp.	hazelnut	–	yes	yes	forest
Cratagus sp.	hawthorn	–	yes	yes	forest
Dasiphora fruticosa	shrubby cinquefoil	S5	yes	yes	forest
Fragaria virginiana	wild strawberry	S5	yes	low	forest
Geranium bicknellii	Bicknell's geranium	S5	potential to transplant	low	forest
Geum aleppicum	yellow avens	S5	potential to transplant	low	moist meadow, forest
Heuchera richardsonii	alumroot	S5	yes	low	grassland, forest
Hierochloe odorata	sweet grass	S5	yes	yes	grassland, forest
Hypericum perforatum	St. John's wort	SNA	yes	low	moist meadow, forest
Larix laricina	tamarack	S5	yes	yes	forest, wetland
Rhododendron groenlandicum	Labrador tea	S5	potential to transplant	low	forest
Lilium philadelphicum	wood lily	S4	yes	low	grassland, forest
Lycopus uniflorus	northern bugle-weed	S5	potential to transplant	low	wetland
Maianthemum canadense	Canada mayflower	S5	potential to transplant	low	forest
Mentha sp.	wild mint	–	yes	low	moist meadow
Oenothera flava	yellow evening primrose	SNA	potential to transplant	low	grassland, riverbank
Polygala senega	Seneca	S4	potential to transplant	low	grassland, forest
Populus balsamifera	balsam poplar	S5	potential to transplant	yes	forest
Potentilla arguta	tall cinquefoil	S5	potential to transplant	low	grassland
Prenanthes sp.	rattlesnake root	–	potential to transplant	low	forest
Prunella vulgaris	self-heal	S4	potential to transplant	low	grassland, forest
Prunus nigra	Canada wild plum	S4	yes	yes	forest
Prunus pensylvanica	pin cherry	S5	yes	yes	forest
Prunus pumila	sand cherry	S4	yes	yes	grassland, forest

Appendix B: Selection of traditional plant species commercially available for rehabilitation					
Provincial Scientific Name	**Traditional Use Plant Name**	**Provincial Rank**	**Commercial Availability**	**Rehabilitation Potential**	**Location of Use**
Prunus sp.	plum	–	yes	yes	grassland, forest
Prunus virginiana	choke cherry	S5	potential to transplant	yes	forest
Pyrola sp.	wintergreen	–	potential to transplant	low	forest
Quercus macrocarpa	bur oak	S5	yes	yes	forest
Ribes americanum	wild black currant	S5	yes	yes	forest
Ribes oxyacanthoides ssp. *oxyacanthoides*	northern gooseberry	S5	potential to transplant	yes	forest
Rosa arkansana	prairie rose	S4	potential to transplant	yes	grassland
Rosa sp.	wild rose	–	yes	yes	grassland, forest
Rubus pubescens	dewberry	S5	potential to transplant	low	forest
Rubus sp.	blackberry	not listed by MBCDC	potential to transplant	low	forest
Rubus idaeus	raspberry	–	yes	yes	forest
Rubus sp.	wild raspberry	–	yes	yes	forest
Sibbaldiopsis tridentata	three-toothed cinquefoil	S5	potential to transplant	low	forest
Solidago canadensis	Canada goldenrod	S5	yes	low	grassland
Solidago gigantea	smooth goldenrod	S5	potential to transplant	low	grassland, forest
Spiraea alba	meadowsweet	S5	yes	yes	forest
Stachys palustris	marsh hedge-nettle	S5	potential to transplant	low	moist meadow
Symphoricarpos albus	snowberry	S5	yes	yes	forest, grassland
Thuja occidentalis	cedar	S4	yes	yes	forest
Trifolium pratense	red clover	SNA	yes	yes	forest, grassland
Vaccinium sp.	blueberry	–	yes	low	forest
Viburnum opulus	highbush cranberry	S5	yes	yes	forest
Viburnum rafinesquianum	downy arrow-wood	S4	yes	yes	forest
Vitis riparia	wild grapes	S3S4	yes	low	forest
Zizania palustris	wild rice	S4	yes	low	wetland

Appendix B: Selection of traditional plant species commercially available for rehabilitation

Provincial Scientific Name	Traditional Use Plant Name	Provincial Rank	Commercial Availability	Rehabilitation Potential	Location of Use

Notes:

1. A list of suppliers is available upon request
2. Traditional use plant names taken from the *Aboriginal Traditional Knowledge Study Community Report* submitted by Black River First Nation, Long Plain First Nation, and Swan Lake First Nation for the Manitoba-Minnesota Transmission Project (Manitoba Hydro 2015).

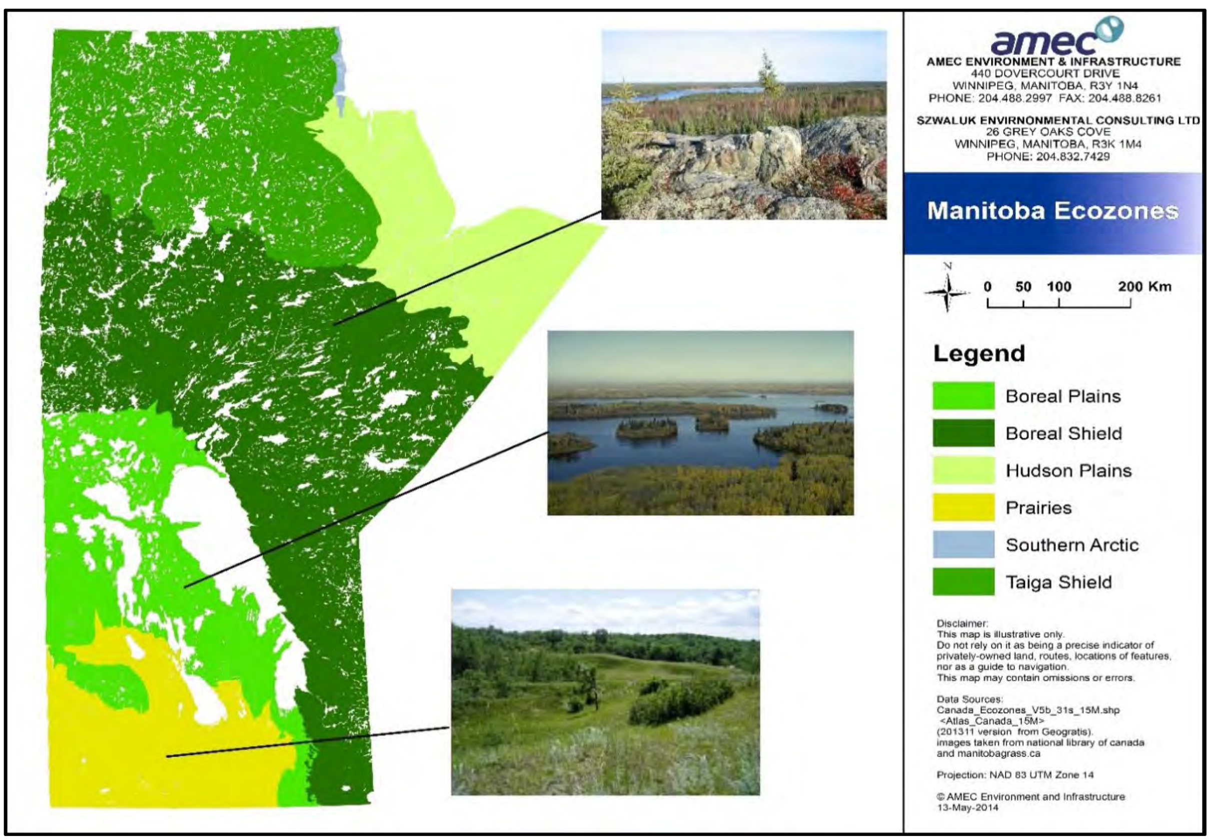
Appendix C

Characteristic vegetation of Manitoba's ecozones

Appendix C: Characteristic vegetation of Manitoba's ecozones

Manitoba ecozone	**Characteristic vegetation**
Southern Arctic	Occasional forest stands, dwarf birch, willows, ericaceous species, various herbs, mosses and lichens.
Hudson Plains	Black spruce, white spruce, tamarack, ericaceous shrubs, sedges, mosses and lichens. Closer to the coast there are marine marshes, shallow fens, and extensive mud flats with little vegetation.
Taiga Shield	Black spruce, white spruce, tamarack, and ground cover of dwarf birch, willows, northern Labrador tea, cotton grass, mosses, and lichens. Paper birch, balsam poplar and trembling aspen may be found. Bog and fen complexes are present.
Boreal Shield	Single-species forest stands, or mixed stands of white and black spruce, balsam fir, tamarack and jack pine. White birch, trembling aspen, and balsam poplar can be found. Understory is dominated by shrubs, forbs and lichen cover over bedrock outcrops.
Boreal Plains	White spruce, black spruce, jack pine and tamarack are the main coniferous species, while deciduous trees include white birch, trembling aspen and balsam poplar
Prairies	Predominantly agricultural crops and rangeland. Stands of trembling aspen, balsam poplar and bur oak occur.

Source: Smith et al. (1998)



Appendix D

Recommended Baseline Native Seed Mixes

Appendix D: Recommended baseline native seed mixes		
Common name	**Scientific name**	**Percent in mix (total 100%)**
Northern Manitoba – upland mesic to dry soils		
Short-leaved Fescue	*Festuca brachyphylla*	10
Canada Wild Rye	*Elymus cananadensis*	20
Tickle-grass	*Agrostis scabra*	10
Hairy Wild Rye	*Leymus innovatus*	20
June Grass	*Koeleria macrantha*	10
Rocky Mountain Fescue	*Festuca saximontana*	10
Richadson Needle Grass	*Achnatherum richardsonii*	15
Common Vetch	*Vicia americana*	5
Northern Manitoba – lowland wet meadow soils		
Fowl Blue Grass	*Poa palustis*	30
Marsh or Northern Reed Grass	*Calamagrostis canadensis or C. stricta*	10
Slough Grass	*Beckmannia syzigachne*	50
Tufted Hairgrass	*Deschampsia caespitosa*	10
West Central Manitoba – upland mesic to dry soils		
Tickle-grass	*Agrostis scabra*	10
Big Bluestem	*Andropogon gerardii*	20
Purple Prairie Clover	*Dalea purpurea var. purpurea*	5
Canada Wild Rye	*Elymus canadensis*	30
Hairy Wild Rye	*Leymus innovatus*	10
Rocky Mountain Fescue	*Festuca saximontana*	5
Awned Wheatgrass	*Elymus trachycaulus spp. subsecundus*	10
June Grass	*Koeleria macrantha*	5
Common Vetch	*Vicia americana*	5
West Central Manitoba – lowland wet meadow soils		
Slough Grass	*Beckmannia syzigachne*	50
Marsh or Northern Reed Grass	*Calamagrostis canadensis or C. stricta*	5
Tufted Hairgrass	*Deschampsia caespitosa*	30
Baltic Rush	*Juncus arcticus var. balticus*	5
Fowl Blue Grass	*Poa palustis*	10
Southern Manitoba – upland mesic to dry soils		
Awned Wheatgrass	*Elymus trachycaulus spp. subsecundus*	10

Appendix D: Recommended baseline native seed mixes		
Common name	**Scientific name**	**Percent in mix (total 100%)**
Big Bluestem	*Andropogon gerardii*	30
White Prairie-clover	*Dalea candida*	5
Purple Prairie Clover	*Dalea purpurea var. purpurea*	5
Canada Wild Rye	*Elymus canadensis*	20
June Grass	*Koeleria macrantha*	5
Little Bluestem	*Schizachyrium scoparium*	10
Indian Grass	*Sorghastrum nutans*	10
Common Vetch	*Vicia americana*	5
Southern Manitoba – lowland wet meadow soils		
Slough Grass	*Beckmannia syzigachne*	50
Marsh or Northern Reed Grass	*Calamagrostis canadensis or C. stricta*	10
Tufted Hairgrass	*Deschampsia caespitosa*	10
Fowl Blue Grass	*Poa palustis*	10
Prairie Cord Grass	*Spartina pectinata*	20

Appendix E

Selection of plant species commercially available for rehabilitation

Appendix E: Selection of plant species commercially available for rehabilitation

Note: A list of suppliers is available upon request

Scientific name	Common name	Seed	Seedling
Abies balsamea	Balsam Fir		X
Achnatherum hymenoides	Indian Rice Grass	X	
Achnatherum richardsonii	Richardson Needle Grass	X	
Agrostis scabra	Tickle-grass	X	
Andropogon gerardii	Big Bluestem	X	
Arctagrostis latifolia	Polar Grass	X	
Astragalus canadensis	Canada Milkvetch	X	
Beckmannia syzigachne	Slough Grass	X	
Bouteloua curtipendula	Side-oats Grama	X	
Bouteloua gracilis	Blue Grama	X	
Bromus anomalus	Nodding Brome	X	
Bromus ciliatus	Fringed Brome	X	
Buchloe dactyloides	Buffalo Grass	X	
Calamagrostis canadensis	Marsh Reed Grass	X	
Calamagrostis stricta ssp. inexpansa	Northern Reed Grass	X	
Calamolvilfa longifolia	Sand Grass	X	
Carex bebbii	Bebb's Sedge	X	
Dalea candida	White Prairie-clover	X	
Dalea purpurea var. purpurea	Purple Prairie Clover	X	
Deschampsia caespitosa	Tufted Hairgrass	X	
Distichlis spicata	Alkali Grass	X	
Elymus alaskanus ssp. latiglumus	Alaska Wild Rye	X	
Elymus canadensis	Canada Wild Rye	X	
Elymus glaucus	Smooth Wild Rye	X	
Elymus lanceolatus ssp. lanceolatus	Thickspike Wheatgrass	X	
Elymus lanceolatus ssp. psammophilus	Sand-dune Wheatgrass	X	
Elymus trachycaulus	Slender Wheat Grass	X	
Elymus trachycaulus spp. subsecundus	Awned Wheatgrass	X	
Elymus virginicus	Virginia Wild Rye	X	
Festuca brachyphylla	Short-leaved Fescue	X	

Appendix E: Selection of plant species commercially available for rehabilitation

Note: A list of suppliers is available upon request

Scientific name	**Common name**	**Seed**	**Seedling**
Festuca halii	Plains Rough Fescue	X	
Festuca saximontana	Rocky Mountain Fescue	X	
Glyceria grandis	Tall Manna Grass	X	
Helianthus maximiliani	Narrow-leaved Sunflower	X	
Hesperostipa comata ssp. comata	Spear Grass	X	
Hesperostipa curtiseta	Western Porcupine Grass	X	
Juncus arcticus var. balticus	Baltic Rush	X	
Koeleria macrantha	June Grass	X	
Leymus innovatus	Hairy Wild Rye	X	
Nassella viridula	Green Needle Grass	X	
Panicum virgatum	Switch Grass	X	
Pascopyrum smithii	Western Wheat Grass	X	
Picea glauca	White Spruce		X
Picea mariana	Black Spruce		X
Pinus banksia	Jack Pine		X
Pinus resinosa	Red Pine		X
Pinus strobus	Eastern White Pine		X
Poa alpina	Alpine Blue Grass	X	
Poa glauca	Glaucous Spear-grass	X	
Poa palustris	Fowl Blue Grass	X	
Poa secunda ssp. secunda	Curly Bluegrass	X	
Populus spp.	Hydbrid Poplar		X
Pseudoroegneria spicata ssp. spicata	Bluebunch Wheat Grass	X	
Quercus macrocarpa	Bur Oak		X
Salix spp.	Hybrid Willow		X
Schizachyrium scoparium	Little Bluestem	X	
Scolochloa festucacea	Sprangletop	X	
Sorgastrum nutans	Indian Grass	X	
Spartina gracilis	Alkali Cord Grass	X	
Spartina pectinata	Prairie Cord Grass	X	

Appendix E: Selection of plant species commercially available for rehabilitation

Note: A list of suppliers is available upon request

Scientific name	**Common name**	**Seed**	**Seedling**
Sporobolus cryptandrus	Sand Dropseed	X	
Thuja occidentalis	Eastern White Cedar		X
Trisetum spicatum	Spike Trisetum	X	
Vicia americana	Common Vetch	X	

Appendix F

Invasive terrestrial plant species listed by the Invasive Species Council of Manitoba

Appendix F: Invasive terrestrial plant species listed by the Invasive Species Council of Manitoba**.**

Refer to Invasive Species Council of Manitoba Field Guide (2013) and website for identification

Category 1-Manitoba Wide Alert Weeds	
Common name	**Scientific name**
Common crupina	*Crupina vulgaris*
Diffuse knapweed	*Centaurea diffusa*
Jointed goat grass	*Aegilops cylindrical*
Kudzu vine	*Pueraria montana*
Mile-a-minute weed	*Persicaria perfoliata*
Paterson's curse	*Echium plantagineum*
Purple nutsedge	*Cypernus rotundus*
Russian knapweed	*Centaurea repens*
Salt Cedar	*Tamarix spp.*
Spotted knapweed	*Centaurea stoebe L.*
Woolly Cupgrass	*Eriochloa villosa*
Yellow Starthistle	*Centaurea solstitialis*
Category 2-Localized presence-Manitoba Wide Alert Weeds	
Common name	**Scientific name**
Blue weed	*Echium vulgar*
Bouncing bet	*Saponaria officinalis*
Common tansy	*Tanacetum vulgare*
Dalmation toadflax	*Linaria dalmatica)*
Downy Brome	*Bromus tectorum*
European buckthorn	*Rhamnus cathartica*
Field scabious	*Knautia arvensis*
Flowing rush	*Butomus umbellatus*
Himalayan balsam	*Impatiens glandulifera*
Invasive Phragmities	*Phragmites australis spp. australis*
Japanese brome	*Bromus japonicus*
Leafy spurge	*Euphorbia esula*
Nodding thistle	*Carduus nutans*
Ox-eye daisy	*Chrysanthemum leucanthemum syn. Leucanthemum vulgare*
Purple loosetrife	*Lythrum salicaria L.*
Red barista	*Odontites serotina*
Scentless chamomile	*Matricaria perforata*
St. John's wort	*Hypericum perforatum*
Yellow toadflax	*Linaria vulgaris*

Appendix F: Invasive terrestrial plant species listed by the Invasive Species Council of Manitoba**.**

Refer to Invasive Species Council of Manitoba Field Guide (2013) and website for identification

Other terrestrial invasive plants	
Common name	**Scientific name**
Baby's breath	*Gypsophila paniculata*
Bird vetch	*Vicia Cracca*
Bull thistle	*Cirsium vulgare*
Canada thistle	*Cirsium arvense*
Common burdock	*Arctium minus*
Cow cockle	*Saponaria vaccaria*
Creeping bellflower	*Campanula rapunculoides*
Dame's rocket	*Hesperis matronalis*
Field bindweed	*Convolvulus arvensis*
Garlic mustard	*Alliaria petiolata*
Giant hogweed	*Heracleum mantegazzianam*
Hoary alyssum	*Berteroa incana*
Hound's tongue	*Cynoglossum officinale*
Japanese knotweed	*Fallopia japonica*
Orange hawkweed	*Hieracium aurantiacum*
Perennial sow thistle	*Sonchus arvensis*
Puncture vine	*Tribulus terrestris*
Scotch thistle	*Onopordum acanthium*
Tall buttercup	*Ranunculis acris*
Tansy ragwort	*Jacobaea vulgaris*
White cockle	*Lychnis alba*

Notes: Invasive plant species listed may also be listed under The Noxious Weeds Act of Manitoba. Invasive Species Council of Manitoba, Early Detection and Rapid Response invasive species list current as of June 2023.

Appendix G

Noxious Weeds Regulation Species List

Appendix F: Noxious Weeds Regulation Species List

Designated Tier 1 Noxious Weeds		
Common name	**Scientific name**	**Area for which Designation applies**
Amaranth, Palmer	*Amaranthus palmeri*	All areas of the province outside the Municipality of Bifrost-Riverton and the Rural Municipalities of Armstrong, Fisher, Gimli, Rockwood, St. Andrews and St. Clements
Bartsia, red	*Odontes vernus*	Whole province
Crupina, common	*Crupina vulgaris*	Whole province
Cupgrass, woolly	*Eriochloa villosa*	Whole province
Goatgrass, jointed	*Aegilops cylindrical*	Whole province
Hawkweed, orange	*Hieracium aurantiacum*	Whole province
Hogweed, giant	*Heracleum mantegazzianum*	Whole province
Hound’s-tongue	*Cynoglassum officinale*	Whole province
Knapweed, diffuse	*Centaurea diffusa*	Whole province
Knapweed, Russian	*Acroptilon repens*	Whole province
Knapweed, spotted	*Centaurea stoebe*	Whole province
Knapweed, squarrose	*Centaurea virgata*	Whole province
Knotweed, Japanese	*Fallopia japonica*	Whole province
Mile-a-minute weed	*Persicaria perfoliate*	Whole province
Mustard, garlic	*Allaria petiolate*	Whole province
Patterson’s curse	*Echium plantagineum*	Whole province
Pigweed, smooth	*Amaranthus hybridus*	Whole province
Saltcedar	*Tamarix spp.*	Whole province
Star-thistle, yellow	*Centaurea solstitialus*	Whole province
Tussock, serrated	*Nassella trichotoma*	Whole province
Waterhemp, tall	*Amaranthus turbriculatus*	Whole province

Designated Tier 2 Noxious Weeds		
Common name	**Common name**	**Common name**
Alyssum, hoary	Alyssum, hoary	Alyssum, hoary
Baby's-breath	Baby's-breath	Baby's-breath
Bartsia, red	Bartsia, red	Bartsia, red
Bouncingbet	Bouncingbet	Bouncingbet
Brome, downy	Brome, downy	Brome, downy
Brome, Japanese	Brome, Japanese	Brome, Japanese
Campion, bladder	Campion, bladder	Campion, bladder
Chamomile, scentless	Chamomile, scentless	Chamomile, scentless
Common reed, invasive	Common reed, invasive	Common reed, invasive
Daisy, ox-eye	Daisy, ox-eye	Daisy, ox-eye
Nutsedge, yellow	Nutsedge, yellow	Nutsedge, yellow
Scabious, field	Scabious, field	Scabious, field
Spurge, Cypress	Spurge, Cypress	Spurge, Cypress
Spurge, leafy	Spurge, leafy	Spurge, leafy
St. John's-wort	St. John's-wort	St. John's-wort
Tansy, common	Tansy, common	Tansy, common
Thistle, nodding	Thistle, nodding	Thistle, nodding
Toadflax, Dalmatian	Toadflax, Dalmatian	Toadflax, Dalmatian

Designated Tier 3 Noxious Weeds		
Common name	**Scientific name**	**Area for which Designation applies**
Absinth	*Artemisia absinthum*	Whole province
Barberry	*Berberis vulgaris*	Whole province
Barley, foxtail	*Hordeum jubatum*	Whole province
Bellflower, creeping	*Campanula rapunculoides*	Whole province
Buckthorn, European	*Rhamnus frangula*	Whole province
Burdock, common	*Arctium minus*	Whole province
Burdock, greater	*Arctium, lappa*	Whole province
Burdock, woolly	*Arctium, tomentosum*	Whole province
Campion, biennial	*Silene dioica*	Whole province
Catchfly, night-flowering	*Silene noctiflora*	Whole province
Cleavers	*Galium aparine*	Whole province
Cleavers, false	*Galium spurium*	Whole province
Cockle, white	*Silene alba*	Whole province
Dandelion	*Taraxacum officinale*	Whole province
Dodder	genus *Cuscuta*	Whole province
Fleabane, Canada	*Conyza canadensis*	Whole province
Flixweed	*Descurainia Sophia*	Whole province
Hawk's-beard, narrow-leaved	*Crepis tectorum*	Whole province
Hemlock, poison	*Conium maculatum*	Whole province
Hemp-nettle	*Galeopsis tetrahit*	Whole province
Hoary-cress	*Cardaria draba*	Whole province
Jimsonweed	*Datura stromonium*	Whole province
Kochia	*Kochia scoparia*	Whole province
Lamb's quarters	*Chenopodium album*	Whole province
Lettuce, prickly	*Lactuca seriola*	Whole province
Milkweed, common	*Asclepias syriaca*	Whole province
Milkweed, showy	*Aslepias speciosa*	Whole province
Mustard, wild	*Sinapis arvensis*	Whole province
Nightshade, American black	*Solanum Americanum*	Whole province
Nightshade, cutleaf	*Solanum triflorum*	Whole province
Nightshade, hairy	*Solanum sarachoides*	Whole province
Parsnip, wild	*Pastinaca sativa*	Whole province
Ragweed, common	*Ambrosia artemisifolia*	Whole province
Ragweed, false	*Iva xanthifolia*	Whole province
Ragweed, giant	*Ambrosia trifida*	Whole province
Sow-thistle, annual	*Sonchus oleraceus*	Whole province

Designated Tier 3 Noxious Weeds		
Common name	**Scientific name**	**Area for which Designation applies**
Sow-thistle, perennial	*Sonchus arvensis*	Whole province
Sow-thistle, spiny annual	*Sonchus asper*	Whole province
Stinkweed	*Thlaspi arvense*	Whole province
Stork's bill	*Erodium cicutarium*	Whole province
Thistle, bull	*Cirsium vulgare*	Whole province
Thistle, Canada	*Circium arvense*	Whole province
Thistle, Russian	*Salsola pestifer*	Whole province
Toadflax, yellow	*Linaria vulgaris*	Whole province
Water hemlock, bulb-bearing	*Cicuta bulbifera*	Whole province
Water hemlock, northern	*Cicuta virosa*	Whole province
Water hemlock, spotted	*Cicuta maculate*	Whole province
Water hemlock, western	*Cicuta douglasii*	Whole province
Whitetop, hairy	*Cardaria pubescens*	Whole province
Whitetop, lenspod	*Cardaria chalepensis*	Whole province

Note: For more information see The Noxious Weeds Act (C.C.S.M. c. N110) Noxious Weeds Regulation.
List current as of June 2023.

Appendix O

Waste and Recycling Management Plan

Manitoba Hydro

Radisson to Henday (R44H)

230 kV Transmission Project

Waste and Recycling Management Plan

Prepared by Manitoba Hydro

Transmission & Distribution Environment
and Engagement Department

Project Management Division

December 2023

Preface

This document presents the Waste and Recycling Management Plan (WRMP; the plan) for the construction of the Radisson to Henday 230 kV transmission project (the project). It is intended to provide information and instruction to contractors and Manitoba Hydro employees as well as information to regulators and members of the public.

The plan provides considerations and guidance, including an implementation plan and actions required to proactively address the issue of waste management during construction of the project.

Manitoba Hydro employees and contractors are encouraged to contact the onsite Manitoba Hydro Environmental Inspector/Officer if they require information, clarification, or support. Regulators and the public are to direct any inquiries about this plan to:

Manitoba Hydro
Transmission & Distribution Environment and Engagement
360 Portage Avenue
Winnipeg, MB
Canada R3C 0G8
1-877-343-1631

Projects@hydro.mb.ca

Document Owner
Transmission & Distribution Environment and Engagement
Project Management Division
Manitoba Hydro

Version

List of Revisions

Number	Nature of revision	Section(s)	Revised by	Date

Table of contents

Figures

Tables

1.0 Introduction

Consistent with its corporate Environmental Management Policy, Manitoba Hydro has committed within the project Construction Environmental Protection Plan to developing a Waste and Recycling Management Plan (WRMP) as part of a larger suite of mitigation measures to minimize potential negative environmental and socio-economic effects. This document outlines the procedures to be employed by contractors to proactively address the issue of waste management.

This document is intended to provide measures to manage waste during the construction of the project. Waste generated during the construction activities of a transmission project will be collected, sorted, isolated, stored and disposed of or recycled. This document identifies some of the common waste materials generated during different construction activities.

Note that the methods presented here are not exhaustive and alternative methods may be proposed by the contractor but would require approval from a Manitoba Hydro environmental officer prior to implementation.

1.1 Commitment to environmental protection

Manitoba Hydro integrates environmentally responsible practices in all aspects of our business. Environmental protection can only be achieved with the involvement of Manitoba Hydro employees, consultants, contractors, Indigenous communities and organizations and the public at all stages of the project from planning and design through construction and operational phases.

The use of a WRMP is a practical and direct implementation of Manitoba Hydro's environmental policy and its commitment to responsible environmental and social stewardship. It is a proactive approach to manage potential effects of access related to the construction activities of the transmission line project.

Manitoba Hydro is committed to implementing this WRP and requiring contractors to follow the terms of this and other applicable plans within the Environmental Protection Program.

1.2 Purpose and objectives

This plan is intended to be used as a reference document in the field, during construction activities to addresses waste management while ensuring compliance with Manitoba Hydro's Construction Environmental Protection Plan requirements, industry best practices, and provincial/federal regulations and legislation. To effectively manage waste during construction activities, a variety of methods are available for implementation. The appendix outlines waste management techniques along with a description of the situations where each technique may be employed and directions for correct implementation.

Should a contractor wish to deviate from the techniques or implementation described in this document they must first obtain approval from a Manitoba Hydro environmental officer.

The objectives of this plan are as follows:

- To establish a process prior to the start of construction that can be used to identify potential waste streams and plan for proper handling and disposal. This process will meet regulatory requirements, industry standards and best practices with regards to waste management during construction activities.
- To provide guidance on the correct handling and management of waste.

1.3 Potential effects of waste

To manage and reduce waste from the project, Manitoba Hydro requires all contractors to utilize the Waste and Recycling Management Plan (WRMP) to reduce the volume of materials going to landfill and facilitate reuse and recycling. Where applicable, this WRMP will also address wastes developed in the operation of construction camps.

1.4 Roles and responsibilities

This section outlines the major roles and responsibilities of those involved in the implementation of the plan. The plan forms a component of the Environmental Protection Program (EPP), which provides the framework for the delivery, management, and monitoring of environmental and socio-economic protection measures for the project. The EPP describes how Manitoba Hydro is organized and functions to deliver timely, effective, and comprehensive solutions and mitigation measures to address potential environmental effects from project activities. A visual reference for how the plan fits into the overall EPP organization structure is provided in Figure 1.

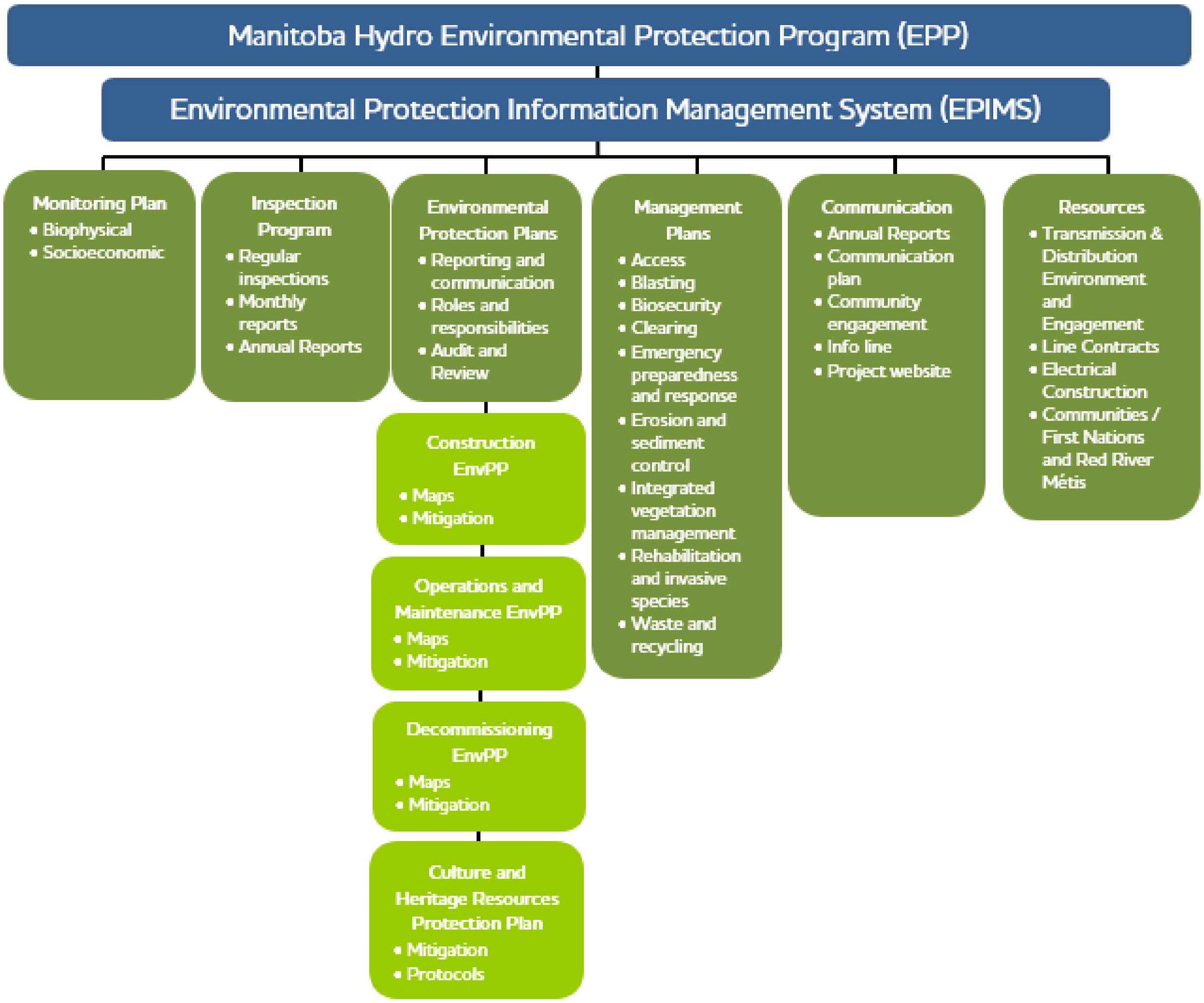


Figure 1: Transmission Environmental Protection Program

A summary of roles and key responsibilities is found in Table 1. Communication and reporting on environmental issues, monitoring and compliance will be as outlined in Figure 2.

Table 1: Roles and responsibilities

Role	Key Responsibilities
Manitoba Hydro	• Develops and amends the WRMP. • May delegate this responsibility to other construction professionals to implement, maintain and inspect /monitor for the duration of the undertaking

Table 1: Roles and responsibilities

Role	Key Responsibilities
	• Signs agreements, approvals, permits and authorizations to which compliance is legally binding • Ensures contractors are aware of their responsibilities • Appoints an environmental inspector/officer to confirm that regulatory criteria are being met • The Manitoba Hydro environmental inspector/officer will regularly inspect waste management measures to confirm effectiveness.
Construction contractor(s)	• Ensure that all activities comply with the requirements of the WRMP. • Ensure that all activities comply with applicable regulatory requirements. • Responsible for acquiring any applicable regulatory permits related to waste management and submitting copies to MH. • Responsible for implementation, coordination and verification of pre-project employee environmental orientation. • Ensure all contractor project staff are adequately trained/informed of pertinent requirements and of the project related to their position. • Ensure that only adequately trained personnel are permitted to handle hazardous materials. • Ensure that hazardous material storage areas are only accessible to adequately trained personnel. • Ensure all staff will be trained in Work Hazardous Materials Information Systems (WHMIS) and have access to MSDS sheets. • Report any discoveries of non-compliance, accidents or incidents to MH. • Respond and act promptly to resolve if any activities are identified as not in compliance with the WRMP or any regulatory requirements. • Ensure that adequate equipment and materials are on hand to safely store, segregate and manage waste products • Ensure that all documentation is maintained and copies submitted to MH in a timely manner. • Responsible for implementation of the emergency response and hazardous materials plans, and other related topics. • Ensure that food waste is carefully sorted and stored in wildlife proof containers. Seek clarification from environmental inspector/officer and/or hydro field safety officers as necessary.

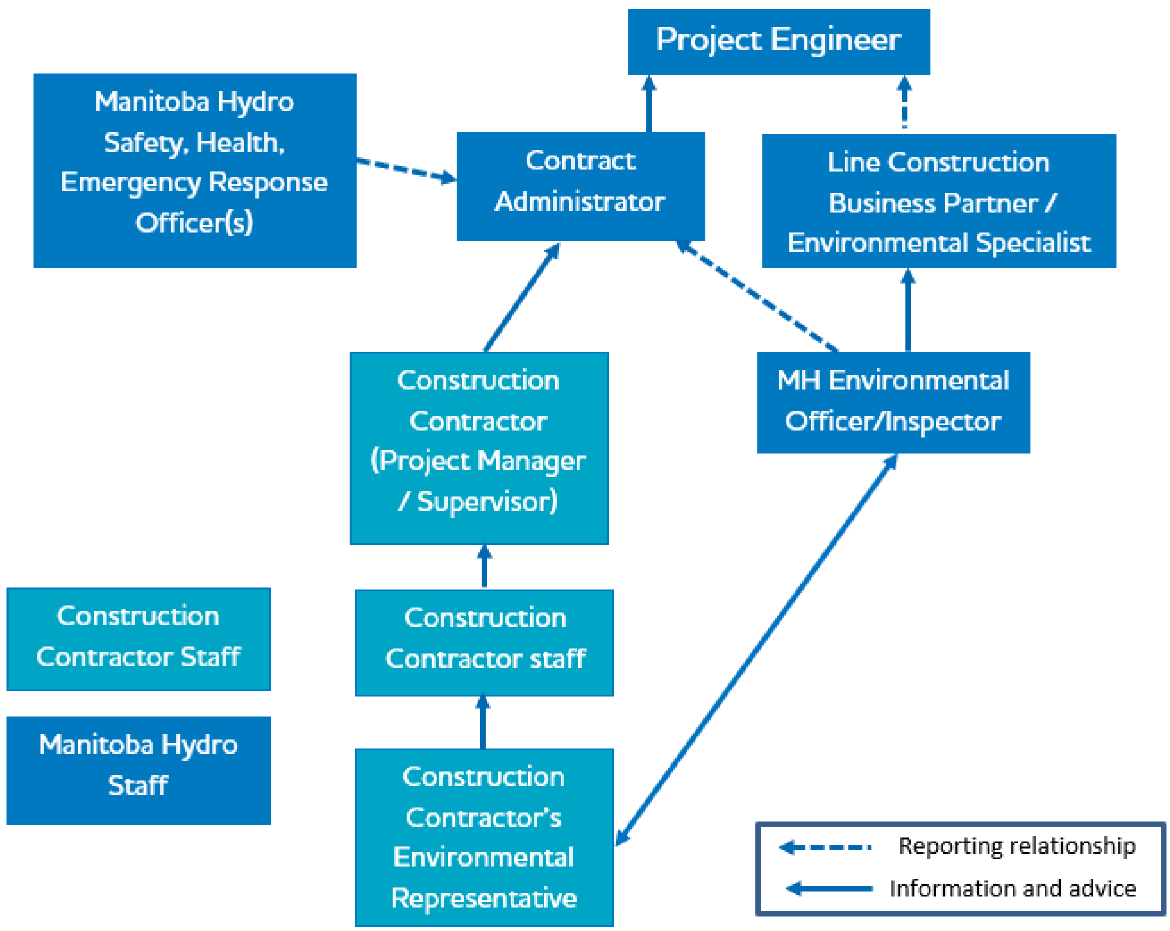


Figure 2: Environmental communication reporting structure

2.0 Regulatory context

Below is a list of the applicable legislation regarding waste and recycling practises:

2.1 Provincial

- The Workplace Health and Safety Act and Regulations
- The Waste Reduction and Prevention Act and Regulations
- The Ozone Depleting Substance Act
- The Dangerous Goods Handling and Transportation Act
  - Dangerous Goods Handling and Transportation Regulation
  - Hazardous Waste Regulation
- Environment Act (C.C.S.M. E125)
  - MR 37/2016 Waste Management Facilities Regulation
  - MR 83/2003 Onsite Wastewater Management Systems Regulation
  - MR 92/88R Litter Regulation

2.2 Federal

- Transportation of Dangerous Goods Act
- Fisheries and Oceans Regulations and Legislation

3.0 Implementation

3.1 Waste identification

Waste will be categorized and segregated by the contractor, examples of waste that are expected to be produced by the project and be covered by this plan are found in Table 2 (Note: this is not an exhaustive list).

Table 2: Examples of commonly produced waste during construction

Category	**Items**
Hazardous waste	Motor oils, fuels, solvents, coolants, lead-acid batteries, hydraulic fluid, oil filters, pesticides, solids, and liquids (water/snow, soils, clean-up materials) contaminated by petroleum products or other hazardous materials, other chemicals
Construction materials	Wood, aluminum, copper, steel, cardboard, plastic
Food services	Beverage containers (aluminum, plastic, and glass), cardboard, boxboard, plastics, newsprint, office paper
Domestic solid waste	Organic material, non-recyclable waste
E-waste	Computers, circuitry, general purpose batteries (lithium, nickel-cadmium)
Construction equipment	Rubber tires, equipment parts etc.
Wastewater	Sewage, grey water

3.2 Waste management

This Waste and Recycling Management Plan takes a hierarchical approach to waste management. The purpose of the hierarchy is to assess each waste item for opportunities to avoid waste, then opportunities to reuse, followed by opportunities to recycle prior to disposal. This hierarchy will be as follows:

- Compliance with federal and provincial waste management legislation (i.e., Acts and Regulations)
- Waste avoidance

- Waste re-use
- Waste recycling
- Waste disposal (as a final option)

Prior to the start of construction, the contractor must ensure that the local waste management facilities are willing and have the capacity to accommodate the projected waste volume. Only waste management facilities that are approved by MH may be used by the contractor.

3.3 Training

As part as their pre-job training and site orientation, work crews must participate in formal training. Prior to starting work on the project, staff and subcontractors must have training in:

- Workplace Hazardous Materials Information Systems (WHIMIS)
- When applicable, the Transportation of Dangerous Goods (TDG)
- Environmental awareness (environmental orientation)
- Waste management procedures
- Spill response procedures

3.4 General mitigation measures

General mitigation measures that are particular to waste management and construction activities are found in the Construction Environmental Protection Plan, General mitigation tables:

- EI-13 Concrete wash water and waste
- EI-4 Hazardous materials
- EI-5 Petroleum products
- EI-10 Waste management
- EI-12 Wastewater

3.5 Documentation

The list below outlines the documentation requirements that the contractor is responsible for as part of the implementation of the plan.

- Submit a copy of a valid hazardous waste generator licence to MH.
- Maintain an accurate and detailed inventory of various hazardous waste types being generated and submit a copy to MH on a bi-weekly basis.

- Submit all copies of manifests and waste receipts related to transport and/or disposal of hazardous waste materials to MH
- Complete required reporting to regulatory agencies and either copy MH on all correspondence or provide copies of all correspondence to MH in a timely manner
- Submit copies of all valid TDG certificates to MH for all contractor staff that require.
- Submit to MH in writing the valid Sewage Haulers Provincial Registration Number for any individuals/companies completing this service for the contractor.
- Submit in writing to MH the name/company of any subcontractors involved in transport of project related recycling and/or waste transport to recycling and/or disposal sites and notify MH in writing if any changes are made.
- Receive approval from MH prior to hauling of project related waste to a recycling and/or disposal site and submit a request to MH in writing if would like to propose any changes.

4.0 Communication

Any contractor-proposed additions, location modifications or plan requirement revisions will be submitted in writing to Manitoba Hydro and include a map containing legal land description and GPS location. Any Manitoba Hydro-required revisions to the plan will be communicated to the contractor's project manager for distribution to project staff.

5.0 Monitoring and follow-up

Monitoring, inspection, and adaptive management are necessary to ensure the effectiveness of waste management and the Waste and Recycling Management Plan. It is the duty of the contractor to ensure that the storage requirements and processes described in this plan are being followed. Regular monitoring of worksites and storage facilities will take place to track and document compliance. To accomplish this, the contractor's environmental representative will conduct monitoring that includes the following:

- Ensure that proper general housekeeping practices are being followed and that any unnecessary waste/mess at work and/or storage sites is being cleaned up daily
- Ensure waste is not exceeding the capacity of containers and coordinating transport/disposal as required
- Ensure that general waste, recycling, and hazardous waste are being appropriately segregated and labelled
- Ensure that general waste, recycling, and hazardous waste containers are very clearly signed accordingly
- Ensure that all hazardous waste storage has adequate secondary containment.
- Ensure that all hazardous waste storage is adequately covered and protected from precipitation
- Ensure that all hazardous waste storage areas are appropriately ventilated
- WHMIS procedures are being followed and MSDS sheets are accessible
- Check the capacity of containers, determining and reporting on levels and determine if transport to a waste management facility is needed
- Ensure tracking documentation is being completed by site personnel

6.0 Environmental management practices

Below is a list of environmental management practices applicable to waste and recycling. An appendix is provided for each that provides material examples, methods, reduction techniques, applicable legislation for each.

- WR_01 Hazardous materials handling
- WR_02 Hazardous materials – storage and facility requirements
- WR_03 Construction waste
- WR_04 Wastewater
- WR_05 Concrete waste
- WR_06 Biosecurity waste

Appendix A

Environmental management practices

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Hazardous materials-Handling   ID-WR_01

Material examples

□ Motor oils, oil filters, lead-acid batteries, hydraulic fluid, fuels, solvents, coolants, pesticides, soil and water impacted by hazardous materials, other chemicals and their containers.

Waste management method

Materials will be shipped to an approved Recycling facility or Hazardous waste management facility.

Waste reduction technique

•Non-hazardous products will be used in place of hazardous substances to the extent possible. Such as the use of Industrial soaps can be used instead of solvents when similar results can be achieved
•Where possible order hazardous materials in a container type that can be returned to the vendor when emptied

Applicable Legislation

•Waste Management Facilities Regulation 37/2016, Feb 23, 2016)
•Transportation of Dangerous Goods Act and Regulations
•The Workplace Health and Safety Act and Regulations
•The Ozone Depleting Substance Act
•Fisheries and Oceans Regulations and Legislation
•Hazardous Waste Regulation (MR 195/2015)

Handling

- Contractor personnel will be trained in emergency response procedures in accordance with provincial legislation.
- Contractor personnel will receive WHMIS training in accordance with provincial legislation. Controlled substances will be labeled in accordance with WHMIS requirements.
- Hazardous substances management procedures will be communicated to all project staff and a copy will be made available at the project site.
- Orientation for Contractor and Manitoba Hydro employees working in construction areas will include hazardous substance awareness.
- For instruction on handling and disposal of soil and water impacted by soil see the "Guidance document for the Identification and Management of soils, surface waters or groundwater suspected to be impacted by Hazardous Materials" Found in Appendix G of the CEnvPP

Treatment

- All Batteries (lithium, nickel-cadmium and lead-acid) will be segregated and stored.
- Waste materials will be categorized and segregated Non-Hazardous and Hazardous
- In the even that hazardous and non-hazardous material are mixed, the entire mixture must be managed as hazardous material.
- Rags, cloths and clean up debris that have been used to apply or remove hazardous materials are also considered to be hazardous waste and should be treated as such.
- Sludge from solvent parts cleaning must be shipped with the solvent being recycled
- Used oil storage tanks or drums will be clearly marked as "Used Oil" with nothing else added to them including waste solvents and antifreeze
- Waste Oils, fluids and filters from vehicle maintenance will be stored in drums
- Used oil filters removed from equipment while still warm will be punctured and placed on a drain rack, once drained will be placed in a labeled drum and shipped for recycling
- Containers will be weatherproof

Transportation and Disposal

- Waste oil will be transported by licensed carriers to licensed or approved waste oil recycling facilities.
- Empty hazardous waste containers will be removed to a licensed or approved disposal site by the contractor.
- All Batteries (lithium, nickel-cadmium and lead-acid) will be transported to licensed or approved waste recycling facilities.
- Transportation of Hazardous materials off-site is to be performed by licensed regulated waste transporter and disposal off-site should be accommodated by a regulated waste receiver, for recycling or proper disposal.
- Material Safety Data Sheets (MSDS) will be available for transportation

Record Keeping

- Record kept of amounts of waste generated
- Manifesting transportation of wastes
- Inventory and account for hazardous waste leaving collection areas

Hazardous materials-Storage facility requirements ID-WR_02

Facility Design

- Hazardous substances storage areas will be located a minimum of 100 m from the ordinary high water mark of a waterway and above the 100-year flood level.
- Temporary hazardous material storage containers will be located on level ground and within a structure that is covered by roofing preventing precipitation from entering the storage area or the secondary containment system
- Indoor storage of flammable and combustible substances will be in fire resistant and ventilated enclosed storage area or building in accordance with national codes and standards.
- Bulk waste oil will be stored in approved aboveground tanks provided with secondary containment in accordance with provincial legislation.
- Hazardous materials shall be stored in a secondary a containment system that is designed to contain at least 110% of the volume stored
- Access to hazardous materials storage areas will be restricted to authorized and trained Contractor and Manitoba Hydro personnel.
- Ensure Emergency response provisions are available and employees working with Hazardous Materials are trained in Emergency response
- The contractor employees will monitor the level of used oil in storage tanks or drums to ensure that the container isn't at risk of overflow.

Documentation

- An inventory of WHMIS controlled substances and their Material Safety Data Sheets (MSDS) will be prepared by the Contractor and maintained at each project site and updated as required by provincial legislation.
- Hazardous materials storage sites will be secured, and signs will be posted that include hazard warnings, as well as contacts in case of a release, access restrictions and under whose authority the access is restricted.

Treatment

- Hazardous waste materials will be segregated and stored by type in approved containers within a secondary containment system.
- Pesticide storage will be in accordance with provincial legislation and Manitoba Hydro guidelines.
- Hazardous waste can be stored temporarily for no longer than 30 days before removal to a licensed or approved disposal site.
- All batteries will be segregated by type.

Monitoring

- The Contractor will monitor containers of hazardous substance containers regularly for leaks and to ensure that labels are legible and prominently displayed.
- The MH Environmental Inspector\Officer will make routine inspections of hazardous substance storage facilities to confirm that environmental protection measures are implemented and effective.
- Hazardous materials storage facilities will undergo regular inspections to inspect storage containers and records of inspections be maintained by the contractor

Applicable Legislation

- Waste Management Facilities Regulation 37/2016, Feb 23, 2016)
- Transportation of Dangerous Goods Act and Regulations
- The Workplace Health and Safety Act and Regulations
- The Ozone Depleting Substance Act
- Fisheries and Oceans Regulations and Legislation
- Hazardous Waste Regulation (MR 195/2015)

Construction waste ID-WR_03

Material examples	• Aluminum, copper, steel, scrap conductors • Cardboard packing and boxes • Plastic bags and plastic packaging
Waste management method	Collected and segregated on-site, transported for off-site recycling.
Waste reduction technique	Observe the 4 R's (reduce, reuse, recycle and repurpose). Minimize waste by producing or using only the amount necessary. Where possible, be re-used or re-purposed and recycle.
Material examples	Wood - timber off cuts, pallets, wooden boxes
Waste management method	Off cuts and pallets to be burnt on-site or disposed of in landfills licensed by Sustainable Development with capacity to accept and separate construction wastes.
Material examples	Equipment and vehicle tires
Waste management method	Tires that cannot be returned to the vendor will be sent to the local receiving waste management facility where it will be collected for recycling
Material examples	Electronic Wastes, Computers, circuitry appliances
Waste management method	Electronic waste will be stored and transported off-site to a licensed e- waste receiver for recycling or disposal.

Applicable Legislation

Waste Management Facilities Regulation 37/2016, Feb 23, 2016)

Wasterwater ID-WR_04

Material examples	Sewage or grey water
Waste management method	• Sewage and grey water will be collected in holding tanks and chemical toilets. • In remote locations, an appropriate number of portable toilets will be made available to ensure that each crew has ready access to washroom facilities. The facilities will be serviced and cleaned regularly, and will be adequately secured. All site personnel are to use portable toilets, as provided. • On-site disposal of septic waste if employed, must be in accordance with the on-site waste disposal systems regulation (MR 83/2003). • Wastewater holding tanks will be installed as per provincial legislation and regulation and a minimum of 100 m from the ordinary high water mark of any waterbody. • Wastewater will be removed from holding tanks when they are no more than 90% full by a registered sewage hauler and disposed of at a licensed wastewater treatment facility. • All sewage haulers will be registered with the Manitoba Sustainable Development. A copy of the hauler registration will be provided to MH environmental inspector/officer upon request. • Septic and solid wastes from work sites must be disposed of at *Environment Act* licensed wastewater treatment facilities and waste disposal grounds that have sufficient capacity to accept the waste stream.
Applicable Legislation	On-site waste disposal systems regulation (MR 83/2003).

Concrete waste ID-WR_05

Material examples	• Concrete wash water (water remaining from the process of washing concrete from equipment) • Remaining cured or partially cured concrete
Waste management method	• Wash water will not be discharged onto the ground at the project site, washout pits will be constructed to cure concrete and settle out wash water. • All water from chute washing activities will be contained in leak proof containers or in an approved settling pond that are situated at least 100 meters from a waterbody. • Contain wash out in a temporary plastic-lined (10-mil polyethylene minimum) pit • Maintain at least 4" (aboveground) or 12" (below ground) of freeboard in pits • All water that has been used for wash out purposes and associated activities will be disposed in an appropriately sized settling pond(s) treated to meet turbidity (total suspended solids [TSS]) and pH requirements prior to discharge. Turbidity will be treated by settlement or filtration; pH will be treated by use of acid, dry ice, carbon dioxide gas or other methods. • All water that has been used for wash out purposes and associated activities will be treated to meet the Manitoba Water Quality Standards, Objectives, and Guidelines (Tier 1) for municipal wastewater effluents of 25 mg/L TSS prior to discharge. • All water that has been used for wash out purposes and associated activities will be treated to meet the Manitoba Water Quality Standards, Objectives, and Guidelines (Tier 3) for the protection of aquatic life for pH 6.5-9.0, prior to discharge into a watercourse.

Concrete waste ID-WR_05

Material examples	Remaining cured or partially cured concrete
Waste management method	• Cured or partially cured concrete will not be discharged onto the ground at the project site, washout pits will be constructed to cure concrete and settle out wash water. • High density polyethylene geomembrane liners (10-mil polyethylene minimum) and either earth or physical berms may be used for a temporary concrete washout for uncured or partially cured concrete. • Pits should be of sufficient volume for site requirements • Maintain at least 4" (aboveground) or 12" (below ground) of freeboard in pits • Regularly break-up cured concrete can be transported in non- hazardous waste containers and disposed of at a licensed facility. • Any uncured and partly cured concrete will be kept isolated from watercourses/ditches.
Waste reduction technique	Minimize waste by producing only the amount necessary.
Applicable legislation	• Fisheries and Oceans Regulations and Legislation • Waste Management Facilities Regulation 37/2016, Feb 23, 2016)

Biosecurity waste ID-WR_06

Material examples	Waste disinfectants, waste water from biosecurity cleaning
Waste management method	Sediment released from the washing process will be fully contained (i.e., sump pit, berm). When cleaning station sump pits, sump materials (dirt, water and disinfectant solution from washing activities) must be either: • Disposed of at an MH approved disposal facility; • Or remain on the field where it was used; mixed and buried on-site at a minimum depth of 2 m (requires landowner permission) at least ten metres from a drain or drainage ditch.
Waste reduction technique	Minimize waste by producing only the amount of disinfection solution necessary to be used prior to solution expiry.

Appendix P

Clearing Management Plan

(to be developed)

Manitoba Hydro