Manitoba-Minnesota Transmission Line

Operation and Maintenance Environmental Protection Plan

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Prepared by:

Licensing and Environmental

Assessment Department

Manitoba Hydro



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Version Control

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SUMMARY

This Operation and Maintenance Environmental Protection Plan (OMEnvPP) is a specific EnvPP for the operation and maintenance phase of the transmission line. This OMEnvPP is a living document and will be updated as regulation, legislation, and environmental practices progress. This document covers transmission lines and associated infrastructure, with a section in the appendix that identifies license clauses and how those concerns are satisfied or mitigated.

The OMEnvPP:

- Describes Manitoba Hydro's Environmental Management System (EMS);
- Provides field personnel with clear instructions on the mitigation measures to be implemented and on the appropriate lines of communication and means of reporting to be followed;
- Intended to provide information to Manitoba Hydro employees as well as contractors and regulators; and
- Summarizes the environmental sensitivities and mitigation actions and emergency response plans and reporting protocols.

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LIST OF ACRONYMNS

ASTM	American Society for Testing and Materials standards
CCA	Chromated Copper Arsenate
CER	Canadian Energy Regulator
CSA	Canadian Standards Association
DFO	Fisheries and Oceans Canada
EnvPP	Environmental Protection Plan
FMCSA	Federal Motor Carrier Safety Administration
HPDD	High Pressure Directional Drilling
ISO	International Organization for Standardization
LEA	Licensing and Environmental Assessment Department (Manitoba Hydro)
LPT	Licensed Petroleum Technician
MH	Manitoba Hydro
MI	Manitoba Infrastructure
MCC	Manitoba Conservation and Climate
MSDS	Materials Safety Data Sheet
ROW	Right-of-Way
SOP	Standard Operating Procedure
TDG	Transportation of Dangerous Goods
TLM	Transmission Line Maintenance
WHMIS	Workplace Hazardous Materials Information System

1.0 INTRODUCTION

The Transmission Operation and Maintenance Environmental Protection Plan (OMEnvPP) is a consolidated document of environmental mitigation measures for various operation and maintenance activities anticipated to be carried out by the Transmission Line Maintenance Department (TLM) and contractors. It was developed by Manitoba Hydro to provide practical guidance and highlight regulatory requirements for Manitoba Hydro field staff and contractors while conducting activities on the Transmission rights-of-way. The direction and guidance provided in this document applies to all lands related to the both private land and crown land. The line consists of a 213 km single-circuit, 500 kV AC transmission line starting at the existing Dorsey Converter Station northwest of Winnipeg, connecting at the Manitoba-Minnesota border to the Great Northern Transmission Line

The map sheets and specific mitigation tables are presented in Appendix D of this document in a "map book" format. The map sheets provide an overview of specific Environmentally Sensitive Sites (ESS) and their mitigation. To reduce the size of the document, commonly identified mitigation measures such as "water crossings" are described in the back of each mapbook, which are linked by mitigation ID.

1.1 PURPOSE OF DOCUMENT

Recognizing that work activities have the potential to impact the environment, this document has been created to provide environmental mitigation measures and instruction to prevent or mitigate impact from Manitoba Hydro work activities.

This document provides information and guidance on environmental, regulatory and social considerations in carrying out Manitoba Hydro transmission maintenance work. The information is to be used in job planning and implementation activities. The intended audience includes supervisors, inspectors, patrollers, and environmental staff.

The OMEnvPP document serves several purposes including:

- Provide instruction to field staff on environmental requirements;
- Training purposes for staff and contractors;
- Interaction with regulators on permits and modifications to work; and
- Fulfilling licence requirements

1.2 ORGANIZATION

The OMEnvPP describes reporting and communication, summary of applicable acts and regulations, mitigation concerns with associated summary sheets, and appendices. Mitigations are an action or activity intended to remedy, reduce, or offset known negative impacts on the surrounding environment from operation and maintenance activities. Section 7 outlines the environmental mitigation by means of mitigation summary sheets which includes instruction and guidance on conducting various work activities. Each sheet is organized into a broad category with subcategories to allow quick access to desired information. Every environmental mitigation measure is assigned a number for reference.

Features of the mitigation sheets include:

- Title of the mitigation summary sheet;
- Component description; and
- Environmental protection objectives.
- Unique mitigation identification number
- Mitigation measures

The component description is a summary of the mitigation sheet topic and provides examples of where it may be applied. The environmental protection objectives identify what the goal of mitigation is and what is being protected.

1.3 INSTRUCTIONS FOR USE

This document provides general and specific mitigation measures to reduce the potential for environmental effects that may occur during operation and maintenance activities. 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 with details on 'where to' implement environmental protection measures.

This document is to be used to plan work and select mitigation measures for the intended work activity. To enable this, a comprehensive work description is required to ensure complete environmental coverage of the planned work.

1.4 TRANSMISSION LINE MAINTENANCE ACTIVITIES

The operation of a transmission line facility requires ongoing maintenance and repair. Some activities include:

- Vegetation management
- Foundation repair
- Tower maintenance and repair
- Structure replacement
- Conductor repair
- Spacer damper replacement
- Re-conductoring
- Thermal upgrades
- Beaver dam removal
- Ground and areal inspection surveys
- Remote Permanent and Temporary Camps
- Ground Testing
- Integrated Pole Management
- Explosives (implodes)
- Patrolling
- Access maintenance
- Field site visits
- For other activities not listed consult the TLM Environmental Specialist for advice

1.5 REGULATORY CONTEXT

Environment Act Licence No. 3288 (Appendix C) was issued to Manitoba Hydro for the construction, operation, and decommissioning of the Manitoba-Minnesota Transmission (Dorsey international power line), which includes a 213 km long, 500 kilovolt alternating current, international power line from the Dorsey Converter Station (located near Rosser, Manitoba) to the United States border crossing near Piney, Manitoba, and modifications to the existing Dorsey Converter Station, the existing Riel international power line and the Riel Converter Station (located near the intersection of Provincial Trunk Highways 101 and 15), and the existing Glenboro international power line and the Glenboro Station (located south of Glenboro, Manitoba), in accordance with the Proposal filed under The Environment Act dated November 21, 2014, the Environmental Impact Statement (EIS) dated September 2015, and the response to information requests dated April 29, 2016, in consideration of the September 2017 Clean Environment Commission Report on Public Hearings.

In Manitoba, as part of operation and maintenance, vegetation management activities are primarily regulated through The Crown Lands Act, The Environment Act, The Pesticide and Fertilizers Control Act and their related regulations. Manitoba Hydro applies to Manitoba Conservation and Climate for applicable work and pesticide use permits when vegetation management treatments are planned on the ROW. As a result of the above regulations, vegetation management activities are subject to compliance inspections by Manitoba Conservation and Climate Conservation or Environment Officers.

Additionally, by way of the Reliability Standards Regulation 25/2012 under The Manitoba Hydro Act, Manitoba Hydro must comply with North American Electric Reliability Corporation (NERC) standard FAC-003. The FAC-003 Transmission Vegetation Management Standard's purpose is:

"To maintain a reliable electric transmission system by using a defense- in-depth strategy to manage vegetation located on transmission rights of way (ROW) and minimize encroachments from vegetation located adjacent to the ROW, thus preventing the risk of those vegetation- related outages that could lead to Cascading."

In addition to the following License conditions related to maintenance mitigations, please be informed that Manitoba Hydro must comply with all other applicable federal, provincial and municipal regulations and by-laws. As stated in condition 64 of *The Environment Act* licence for the line, "The Licencee shall obtain written approval from the Director of the Environmental Approvals Branch for any proposed alteration to the Development before proceeding with the alteration."

The Environment Act licence also imposes the conditions below. Mitigation associated with each of these conditions is also noted.

Manitoba-Minnesota Transmission Line Environmental Act Licence Conditions related to Operation and Maintenance				
Licence Condition Headings	Licence Condition	Manitoba Hydro Guidance and Implementation		
Environmental Protection Plan	 10. The Licencee shall submit, for approval of the Director of the Environmental Approvals Branch, a construction Environmental Protection Plan prior to construction, and an operations Environmental Protection Plan at least 90 days prior to in-service of the Development. The plans shall describe the approach to be used by the Licencee to ensure that mitigative measures are applied systematically, and in a manner consistent with the commitments made in the EIS and supporting information, during construction or operation of the Development. The plans shall: a) include information obtained from Indigenous communities prior to and during construction and operation of the Development regarding the locations of specifically identified sites used for the exercise of Aboriginal rights-based activities in the vicinity of the line (such as plant harvesting, ceremonial practices, hunting, and trapping); b) include mitigation measures and/or buffer zones for the specific sites identified to minimize impacts to the sites from construction and operation activities; c) for specifically identified plant harvesting sites, identify measures to minimize impacts to the sites from construction and operation activities; c) for specifically identified plant harvesting sites, identify measures to the sites by implementing mitigation measure such as flagging of the area, buffers zones, selective clearing, construction management; and d) include mitigation measures to reduce adverse effects on wildlife and wildlife 	The information required by this condition is satisfied by the production and implementation of this plan		

Manitoba-Minnesota Transmission Line Environmental Act Licence Conditions related to Operation and Maintenance				
Licence Condition Headings	Licence Condition	Manitoba Hydro Guidance and Implementation		
	habitat (e.g., timing windows, setbacks, and buffers).			
	11. The Licencee shall continue to engage with Indigenous communities during construction and operation of the Development to provide opportunities for the identification of culturally sensitive sites to inform the Environmental Protection Program as described in the EIS	For guidance on the implementation of mitigation to satisfy this condition see the procedures outlined in the Handbook for the Identification of Heritage Sites and Features booklet (DRAFT) for Transmission Line Maintenance.		
Water Crossings	33. The Licencee shall, during construction and operation of the Development, manage activities within riparian areas as described in the EIS and supporting information.	For guidance on implementation of mitigation to satisfy this condition see #8 Clearing, #38 Wildlife Protection from the Mitigation Sheets in Appendix D and the OMEnvPP Mapbook found in Appendix F.		

Manitoba-Minnesota Transmission Line Environmental Act Licence Conditions related to Operation and Maintenance				
Licence Condition Headings	Licence Condition	Manitoba Hydro Guidance and Implementation		
Wetlands	35. The Licencee shall carry out activities associated with the Development that may disturb wetlands in the Caliento, Sundown, and Piney Bogs only under frozen ground conditions. Maintenance activities within these bogs shall be conducted under frozen ground conditions unless required to ensure the safe and reliable operation of the Development, in which case mitigation measures to reduce impacts to the bogs shall be implemented.	For guidance on implementation of mitigation to satisfy this condition refer to ESS polygons found in the OMEnvPP Mapbook found in Appendix F.		
Golden- Winged Warbler Habitat Management Plan	37. The Licencee shall implement the plan titled "Right-of-Way Habitat Management Plan for Managing Critical Golden- winged Warbler Habitat during Construction and Operation of the Manitoba-Minnesota Transmission line" submitted as suppoliing information on April 29, 2016, or any subsequent versions approved by the Director of the Environmental Approvals Branch.	The document "Right-of-Way Habitat Management Plan for Managing Critical Golden-winged Warbler Habitat during Construction and Operation of the Manitoba-Minnesota Transmission line" will be implemented in ESS "Wild-110-117, Wilid-119,120 and Wild-122 found in the OMEnvPP Mapbook (Appendix F).		
Invasive Species	38. The Licencee shall, during construction and operation of the Development, prevent the introduction and spread of foreign aquatic biota. Equipment shall be cleaned in accordance with the requirements of Manitoba Regulation 173/2015 respecting Aquatic Invasive Species, or any future amendment thereof.	For guidance on implementation of mitigation to satisfy this condition see polygon ESS's found in the OMEnvPP Mapbook (Appendix F), as well as a general mitigation measure table on Aquatic Invasive Species mitigation table (Appendix D).		
Pesticide Application	40. The Licencee shall adhere to Pesticides Regulation 94/88 R, or any future amendment thereof, for the storage, handling and application of pesticides in conjunction with the Development.	For guidance on implementation of mitigation to satisfy this condition see the procedures outlined in the Vegetation Management Plan for the line		

Manitoba-Minnesota Transmission Line Environmental Act Licence Conditions related to Operation and Maintenance				
Licence Condition Headings	Licence Condition	Manitoba Hydro Guidance and Implementation		
Petroleum Storage and Handling	 41. The Licencee shall locate fuel storage and equipment servicing areas established for the construction and operation of the Development a minimum distance of 100 metres from any waterbody, and shall comply with the requirements of Manitoba Regulation 188/2001 respecting Storage and Handling of Petroleum Products and Allied Products, or any future amendment thereof. 42. The Licencee shall, during construction and operation of the Development, operate, maintain, and store all materials and equipment in a manner that prevents any deleterious substances including fuel, oil, grease, hydraulic fluid, coolant, and other similar substances from contaminating soil or entering any waterbody. Emergency spill kits for both land and in-water use shall be readily available on site during construction. 	For guidance on implementation of mitigation to satisfy this condition see #34 Vehicle and Equipment Maintenance and #29 Petroleum Products General mitigation tables found in Appendix D.		
Erosion Control	47. The Licencee shall, during construction and operation of the Development, take all appropriate measures to prevent erosion and the deposition of sediment into any waterbody.	For guidance on implementation of mitigation to satisfy this condition see general mitigation measure table #19 Erosion and Sediment Control- from the Environmental Mitigation Measure tables found in Appendix D		
Noise Nuisance	48. The Licencee shall not cause or permit a noise nuisance to be created as a result of the construction, operation, or alteration of the Development, and shall take such	For guidance on implementation of mitigation to satisfy this condition see general mitigation measure table #6 Built-up and populated areas found in Appendix D		

Manitoba-Minnesota Transmission Line Environmental Act Licence Conditions related to Operation and Maintenance				
Licence Condition Headings	Licence Condition	Manitoba Hydro Guidance and Implementation		
	steps as the Director may require to eliminate or mitigate a noise nuisance.			
Vegetation Management	52. The Licencee shall provide notification to local Indigenous communities a minimum of 30 days prior to the application of herbicides within the transmission right-of-way of the Development.	For guidance on implementation of mitigation to satisfy this condition see the procedures outlined in the Vegetation Management Plan and the Communication Plan for line.		

2.0 MANITOBA HYDRO ENVIRONMENTAL COMMITMENT

Manitoba Hydro supports and embraces the need to protect and preserve the environment affected by its transmission lines, operations and facilities. This goal can only be achieved with the full commitment of staff and contractors at all stages of work, from planning and design through construction and operation. Manitoba Hydro is committed to protecting the environment. In full recognition of the fact that corporate facilities and activities affect the environment, Manitoba Hydro integrates environmentally responsible practices into its business. This is demonstrated in Manitoba Hydro's environmental policy (Appendix A).

Additionally, Manitoba Hydro has an Environmental Management System (EMS) that is consistent with ISO 140001 standards (Appendix B). The EMS enables our corporation to identify its environmental impacts, set goals to manage them, implement plans to meet those objectives, evaluate performance, and make continual improvements to the system.

3.0 PLAN MANAGEMENT AND IMPLEMENTATION

Manitoba Hydro is committed to regulatory compliance and implementing all terms and conditions of work approvals, permits, licenses, authorizations, and environmental mitigation measures as specified in this document. This requires assignment of responsibilities, communication, and inspection and compliance activities to ensure appropriate environmental mitigation measures are implemented and effective.

3.1 ORGANIZATION

Manitoba Hydro is organized and structured to implement environmental mitigation measures requirements and environmental commitments (See Figure 1). The overall responsibility for OMEnvPP compliance rests with the Transmission Construction and Line Maintenance Division Director and the Transmission Line Maintenance (TLM) Department Manager. The TLM Supervisors, Inspectors, and Patrollers are responsible for implementing applicable measures in the OMEnvPP and ensuring that all requirements within it are followed by staff and contractors.

The OMEnvPP contact for contractors will be their main Manitoba Hydro Contract as identified in the pre-job meeting and in daily Job Work Plans. For TLM staff, the OMEnvPP contact will be the TLM Environmental Specialist (ES) or delegate. Additionally, in the absence of an ES or delegate, the Licencing and Environmental Assessment (LEA) Department can be contacted.



Figure 1: Environmental Program Support and Responsibilities Flow Chart

3.2 **RESPONSIBILITIES**

The assigning of responsibilities is essential to effective environmental mitigation measures and compliance. The following table outlines responsibilities for those involved in work activities.

Role	Key Responsibilities									
TLM	Accountable for all aspects of Transmission Line Maintenance, Operation and ROWs and associated electrical equipment									
Department Manager	Oversees Environmental Specialists, Line Maintenance Supervisors and Utility Supervisors, and Administrative Support Staff									
	Reports to the Department Manager									
	Responsible for the development of and training for OMEnvPPs									
	Liaises with Manitoba Sustainable Development on work permits and licences									
	Liaises with Licensing and Environmental Assessment Department if required									
Environment	Liaises with regulatory authorities such as the Fisheries and Oceans Canada (DFO) and Canada Energy Regulator (CER). Environment and Climate Change Canada (ECCC) where required or applicable									
Specialist	Provides advice and guidance to Field Supervisors/Staff									
	May complete site audits and may issue environmental improvement and stop work orders for environmental non-compliance situations and incidents									
	Liaise with Environmental Auditors									
	Provides support and guidance to contractors regarding OMEnvPP documents									
	Responsible for implementing, and ongoing compliance monitoring to ensure department compliance									
	Reports to the Department Manager									
	Reports non-compliances/non-conformances to Environmental Specialist									
	Ensures all site work is in compliance and adheres to environmental mitigation measures in O&M OMEnvPP' s									
Supervisors	Reviews environmental audit reports with the site personnel and any contractors, and ensures remedial actions or responses to non-compliance situations or incidents are implemented as required									
	Works with the Environment Specialist to ensure implementation of OMEnvPP and environmental mitigation measures									
	Ensures that appropriate authorities are notified in emergency or incident situations.									
	Ensure work permits are submitted and obtained as required									
	Issues environmental improvement and stop work orders as required for non-compliance situations									
Contractors	Accountable for all regulatory and environmental prescriptions (i.e., follow OMEnvPP and mitigation measures prescribe)									
	Ensure all contractor staff are adequately trained/informed of pertinent environmental requirements related to their position.									
	Report any discoveries of non-compliance, accidents or incidents to the Construction									

 Table 1:
 Transmission Line Maintenance Description of Roles and Responsibilities

Role	Key Responsibilities									
	Supervisor									
	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 Construction Supervisor									
	Responsible for other permits as outlined in Appendix C									
	Reports to the Line Supervisors and provides advice and guidance to the Field Personnel									
	Monitors the line for compliance of the OMEnvPP, <i>Environment Act</i> Licence and other									
	environmental regulatory requirements (if applicable)									
	Assist the Contractor in ensuring that all necessary information is covered in the									
	Contractor's pre-work employee orientation									
	Provides daily information and guidance on work at daily tailboard meetings									
	The Live Line Inspectors and Patrollers will be responsible for following OMEnvPP									
Live Line	Conducts site inspections regularly and reports deficiencies/non-conformances to their									
Inspectors and	Assista in developing solutions for environmental issues on site where explicitly with the									
Patrollers	input from their supervisor and/or Environment Specialist									
	Prescribes and ensures follow-up environmental mitigation measures are implemented									
	when required									
	Ensures all Environmentally Sensitive Sites (ESS) are correctly identified, delineated and									
	flagged/marked in the field									
	Complete and submit required permits									

3.3 COMMUNICATION AND NOTIFICATION

Communication between Manitoba Hydro field staff and contractors is essential for implementing environmental mitigation measures and preventing environmental damage. Depending on the transmission line work activity, contractors may or may not be involved.

The standard protocol for OMEnvPP communication may include the following items:

- Pre-job meetings
- Site start-up meeting
- Regular progress meetings
- Daily job planning meetings

Managers and/or Supervisors are also responsible for notifying the local community where work has the potential to affect local people through noise, traffic or limitation on resource use or access.

3.3.1 PRE-JOB ORIENTATION MEETING

A Pre-Job Orientation (PJO) meeting will be held by Manitoba Hydro with field crews prior to the initiation of work to ensure that they are aware of the environmental requirements of the work at that location. Should conditions dictate a change in work location, another start-up meeting may be convened.

The meeting will include Manitoba Hydro's on-site Supervisor, field crews conducting the work, and key environmental personnel.

The environmental portion of a PJO meeting may include the following:

- A review of Manitoba Hydro's Environmental Policy and all environmental specifications of the contract or work description;
- Transfer of further relevant information or precautions that Manitoba Hydro is aware of and which pertain to the job (example: sensitive species, sensitive sites, riparian);
- Procedures/requirements for dealing with the environmental stop work orders or improvement orders;
- Reporting protocols for environmental incidents and emergencies;
- Documentation needs including the review of all pertinent forms (i.e. job planning form); and
- Requirement to educate/train all employees with respect to the requirements of the OMEnvPP.

The following shall be communicated with all Field Supervisors, subcontractors, and work crews: the work specifications, environmental requirements, other information provided during the pre-job

meeting, and instructions to notify their Manitoba Hydro contact in writing that the pre-job meeting has been completed.

The minutes, attendance records, and all other pertinent information should be recorded and distributed.

In situations where a new individual joins the work activities, it is the responsibility of the Field Supervisor to ensure that employee has been provided with the necessary information and/or training related to the environmental aspects of the transmission line. All instances of new employees coming to site must be documented to demonstrate that they have received the necessary training.

3.3.2 REGULAR PROGRESS MEETINGS

Depending on the duration of the work activities staff may meet on a regular basis to review and discuss progress to date and planned upcoming work. These meetings will also review environmental requirements of the job and environmental precautions necessary. Manitoba Hydro will be responsible for the maintenance of minutes/documents related to these meetings.

3.3.3 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 be used to review safety and environmental requirements of the job and necessary environmental mitigations. The Field Supervisors shall document all job-planning meetings, including the environmental content.

Managers and Supervisors are also responsible for any community notification required about work that might affect the public through noise, traffic, or affect resource use and access.

4.0 INSPECTION, AUDIT, WORK STOPPAGES, EMERGENCY RESPONSE, AND REPORTING

Environmental inspection and site audits are a key element of environmental protection. The activity serves not only to verify that environmental mitigation measures are in place, functioning as designed and maintained, but also to anticipate potential environmental threats so that preventative measures can be taken. Verification of environmental compliance with the OMEnvPP, permits and licences are also important functions of inspection and require appropriate documentation and reporting. The inspection/audit process also includes an evaluation and response mechanism for non-compliance situations or where there is potential for imminent environmental impact or damage. Manitoba Hydro and its contractors each have specific responsibilities for inspection and reporting as per their roles and responsibilities listed in Section 3.2.

4.1 INSPECTION

Manitoba Hydro's Environmental Specialist/Staff may inspect a work location at any given time or on a predetermined schedule. The Manitoba Hydro Field Supervisor will inspect the site regularly to ensure that the site is managed in accordance with contract documentation and the OMEnvPP. The Supervisor will ensure that the installation and maintenance of environmental mitigation measures are in accordance with work specifications. This individual will be fully familiar with work permit(s), local environmental, landowner sensitivities, and environmental protection requirements for the work activities. The Supervisor, in conjunction with the Environmental Specialist, will implement, document, and enforce environmental protection actions. Any non-compliance issues and changes to existing plans will be reviewed with Manitoba Hydro's Department Manager and Environmental Specialist. Property issues are to be dealt with by the Supervisor, Line Inspector, or Environmental Specialist through Manitoba Hydro's Property Department.

4.2 AUDIT

Third party auditors may audit work sites and are usually escorted by Field Supervisor or Environmental Specialist.

Full cooperation will be given to representatives of government environmental and regulatory authorities conducting compliance inspections and to Manitoba Sustainable Development staff with interests in protecting natural resources from impacts due to operation and maintenance activities.

4.3 WORK STOPPAGES

Work may be suspended in the event of a hazardous materials spill or environmental accident, ineffective mitigation, discovery of artifacts of cultural or heritage value, or non-compliance with the OMEnvPP or Work Permit. The Department Manager, Field/Line Supervisor, Patrollers and the Environmental Specialist will all have authority to issue stop work orders. Contractors should also immediately stop work and immediately notify their Manitoba Hydro contact where circumstances indicate a serious environmental issue or the discovery of cultural and heritage artifacts.

4.4 EMERGENCY RESPONSE

Quick and effective response to contingencies and environmental emergencies is essential to prevent further environmental damage. An environmental emergency response plan (example: spill response plan) is required for all fieldwork and will provide contact information and response protocols. Field Supervisors are responsible for taking appropriate action under the plan as soon as an emergency situation is observed or brought to their attention. All staff and contractors on a work site must be familiar with the plan, contacts and actions to take upon discovery of an emergency situation.

Any hazardous material spills of fuels, solvents, hydraulic fluid, antifreeze, etc. will be immediately reported by staff and/or contractor to their Manitoba Hydro Supervisor/contact for immediate containment and clean-up. In the case of an environmental incident requiring notification under Manitoba Regulation 439/89 respecting Environmental Accident Reporting (e.g. spills), the time and reporting requirements specified in the Regulation will be followed. This information can be found in the Transmission Construction and Line Maintenance (TLM) and Licensing and Environmental Assessment (LEA) Spill Response Plan. Regardless of quantities releases are to be reported to that departments Area Spill Response Coordinator at Manitoba Hydro.

Contractors must have their own spill response plan. Contractors are responsible for reporting their spills to Manitoba Hydro immediately and to complete reporting requirements and remediation. Manitoba Hydro field personnel must provide contractor and staff spill reports to the Area Spill Response Coordinator identified in the Manitoba Hydro spill response plan.

4.5 REPORTING

For all work activities in the field where an environmental audit is completed, an audit report will be submitted to the Line Maintenance Supervisor and Department Manager. Inspections, recommendations and actions will all be recorded and saved electronically. Any non-compliance or emergency situations must be reported immediately to Environmental Specialist for regulatory notification/reporting and initiation of response.

5.0 ENVIRONMENTAL LEGISLATION AND REGULATIONS, AND WORK PERMITS

Knowledge of regulatory requirements is an essential part of job planning to ensure appropriate approvals, environmental mitigation measures, and scheduling are in place. The mitigation sheets are created from a combination of legislation, regulation, best management practices, previous licence and permit conditions, and guidelines. Supervisors should contact local communities directly for any potential municipal by-law requirements for the work area, as a part of job planning and before any work takes place.

5.1 WORK PERMITS

Work permits in the form of federal Authorization may be required, for example, from Department of Fisheries and Oceans or Environment (DFO), Climate Change and Environment Canada (removal of migratory bird nests). There are several provincial acts that require work permits to be issued to allow work on or access to Crown lands. The main applicable legislation is the *Crown Lands Act*, but the *Forest Act*, *Wildfires Act* and *The Provincial Parks Act* also require work permits for work on Crown land. Many existing transmission line ROWs may be owned by Manitoba Hydro, but access and disturbance can occur to adjacent Crown land from work activities. Manitoba Hydro will obtain the work permits required by the province of Manitoba for the maintenance of the transmission lines on Crown Lands. Consult with the Manitoba Hydro Environmental Specialist to identify and acquire any the necessary work permits, however, if you have a relationship established with the local Conservation Officers, Regional Lands Manager, and or Parks staff (for inside a park) the permits may be acquired directly.

6.0 SPECIAL ENVIRONMENTAL CONSIDERATIONS

6.1 Environmentally Sensitive Sites

Important environmental considerations for work activities are required at environmental sensitive sites (ESS), which include locations, features, areas, activities or facilities that were identified in the Transmission line's environmental impact statement to be ecologically, socially, economically or culturally important or sensitive to disturbance. These ESS may require protection and mitigation during work activities. 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). These Environmental Sensitive Sites have been consolidated into a site-specific Environmental Protection Plan Mapbook (Appendix F) that augments this Operation and Maintenance Environmental Protection Plan.

Where the work activities overlap or are adjacent to the following types of previously unidentified sites they should be designated as ESS and protected:

- Historic, heritage, or archeological sites as determined by existing inventories maintained by Historic Resources Branch (Manitoba Government);
- Water crossings and Wetlands
- Designated resource use protection areas for plant harvest (berries, medicinal or traditional use plants);
- Threatened or endangered species locations or habitat;
- Mammal dens (e.g. bear dens)
- Access trails (snowmobile trials, trapper trails etc.); and
- Stick Nests

Guidance on acquiring the relevant data or information to determine protection and mitigation requirements can be obtained from the Environmental Specialist.

6.2 TIMING WINDOWS

6.2.1 WILDLIFE

The "Timing windows" table found in the Appendix E outlines wildlife reduced risk work windows applicable to the work activities. These windows are based on federal and provincial regulatory

requirements as well as best management practices. Timing periods may be expanded or refined based on further data collection and regulatory licence and work permits to be issued for the work activities. 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. Appendix E is intended to assist in scheduling work activities for the time of year when risks of adverse impacts are negligible. Where conflicting timing restraints and work activities exist in a particular area, appropriate mitigation will need to be implemented to reduce effects.

6.2.2 FISH

Fish habitat can be adversely affected by in-stream work 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 work include the following:

- Spawning and egg incubation;
- Movements to or from spawning or overwintering areas; and
- 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 contains general timing windows to avoid during work activities.

6.3 HERITAGE RESOURCES

Known cultural or heritage resources on or near transmission line ROWs or stations were mapped and designated as Site Specific Environmentally Sensitive Sites (ESS) in the OMEnvPP Mapbook (Appendix F). Archeological sites are sites where historic and pre-historic artifacts of human activity have been found. These sites are sensitive to disturbance and loss from ground disturbance activities, such as clearing and excavation. Artifacts may include tools and objects, such as arrowheads, pottery shards or bottles, building remnants, burial sites, or human remains.

Mitigation for protection of any mapped sites depends on the type of heritage resource and has been identified in the OMEnvPP Mapbook and data will be included in the Transmission Geographic Information System (TGIS). For suspected heritage or historic sites that are not mapped any work that could disturb the site or artifact must be stopped until the site can be assessed, and appropriate protection measures put in place. Any discovery of human remains must be immediately reported to RCMP and the Field Supervisor, the site secured, and ground work suspended in that area as per procedures outlined in the Handbook for the Identification of Heritage Sites and Features booklet (DRAFT) for Transmission Line Maintenance.

6.4 CLEARING AND BRUSHING PRACTICES

Mitigation for clearing and brushing aims to maintain ground cover to help limit rutting and erosion as well as minimizing surface damage. Targeted removal of only trees that will violate Manitoba Hydro's Vegetation Clearance requirements leaves a shrub and herbaceous layer which maintains habitat and provides competition for regrowth of those targeted tree species.

A common mitigation used to accomplish this protection is to maintain a "Vegetated (shrubs and herbaceous layer) buffer". Shrubs are woody plants that are smaller than a tree and have several main stems that grow from or near the ground while the herbaceous layer refers to any plants found in the understory that do not have woody stems.

In the majority of cases shrubs do not grow tall enough to violate Manitoba Hydro's Vegetation Clearance Requirements and can remain. The presence of a herbaceous layer prevents bare soil from eroding through wind or rain events. Selective clearing is also prescribed in areas where minimizing surface disturbance is of particular concern.

Examples of equipment and methods considered to be selective clearing are:

Brushing: Brushing is the removal of individual stems of target species that will eventually grow into transmission lines using hand tools such as chainsaws or circular brush saw or by machinery such as a Feller Buncher or Excavator with a rotary drum mulcher head.

Non-selective clearing methods and equipment include:

Mowing/Mulching: Mowing/Mulching is the indiscriminate cutting of all trees/shrubs and herbaceous vegetation with wheeled or track-mounted heavy-duty rotary/flail cutters or rotary/drum mulchers. A heavy-duty tractor or excavator is equipped with the cutting/mulching head and driven over the ROW to cut/mulch target vegetation.

Shear Blading: Shear Blading is the indiscriminate shearing of all trees/shrubs and herbaceous vegetation at ground level. Bulldozers equipped with special shear blades are utilized under frozen ground conditions.

7.0 ENVIRONMENTAL MITIGATION MEASURES

The Mitigation Sheets have been developed to summarize key environmental mitigation measures associated with undertaking Manitoba Hydro transmission line operation and maintenance activities. They are designed to provide important guidance on planning and implementing work in an appropriate manner and in compliance with relevant environmental legislation and practice.

The following matrix illustrates when Environmental Protection Measures are applicable to significant environmental aspects during transmission line maintenance work activities.

		Environmental Aspects													
EMSS #	Environment al Mitigation Summary Sheets	Sensitive Sites	Heritage Resources	Fisheries	Wildlife	Topography and Landscape	Air Quality	Water mgmt. & Quality	Spills & Releases	Waste	Land Users	Soils	Dust	Birds	Fish
1	Access	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х
2	Agricultural Areas	Х	Х		Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	
3	Blasting and Explosives Use	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х
4	Bogs, Swamps and Wetlands	х	х	х	Х	х		х	Х	Х	Х	Х		Х	Х
5	Borrow Pits and Quarries	х	х		Х	х	Х	х	Х	Х	Х	Х	Х	Х	
6	Built Up and Populated Areas	х	х	х		х	х	х	х	х		х	х	х	
7	Burning	Х	Х		Х	Х	Х		Х	Х	Х	Х	Х	Х	
8	Clearing	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х
9	Concrete Washwater and Waste	х	х	х	Х			х	Х		Х	Х			х
10	Construction Camps	Х	Х		Х	Х	Х	Х	Х	Х		Х	Х	Х	
11	Construction Matting	Х	х		Х	Х						Х	Х		
12	Contaminated Soil	Х	Х	x				Х				Х			

Table 2: Environmental Protection Measures

		Environmental Aspects													
EMSS #	Environment al Mitigation Summary Sheets	Sensitive Sites	Heritage Resources	Fisheries	Wildlife	Topography and Landscape	Air Quality	Water mgmt. & Quality	Spills & Releases	Waste	Land Users	Soils	Dust	Birds	Fish
13	Demobilization and Clean-up	Х		Х	Х	Х		Х	Х	Х	Х	Х	Х	Х	Х
14	Directional Drilling	Х	Х	Х				Х	Х	Х	Х	Х	Х		Х
15	Draining	Х	Х	х	х	х	х	Х	Х	Х	Х	Х	Х	Х	Х
16	Drilling	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х
17	Drinking (Potable) Water	Х						Х	Х		Х				
18	Emergency Spill Response	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х
19	Erosion and Sediment Control	х		Х		Х		Х				Х	Х		Х
20	Fish Protection	Х	Х	Х				Х	Х						Х
21	Grading	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х
22	Groundwater	Х	Х	Х				Х	Х						Х
23	Grubbing	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х
24	Hazardous Materials	Х	Х												
25	Heritage Resources	Х	Х							Х	Х	Х			
26	Management Measures	х	х	х	х	х	х	х	х	Х	Х	Х	Х	Х	Х
27	Marshalling Yards	Х	Х		Х	Х	Х	Х	Х	Х		Х	Х		
28	Permafrost											Х			
29	Petroleum Products	Х		х	Х		Х	х	Х	Х		Х	Х	Х	Х
30	Rehabilitation and Re- vegetation	х	х		×	х				Х	х	×			
31	Rights Of Way	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	X
32	Stripping	Х	Х												
33	Towers and	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х

	-	Environmental Aspects													
EMSS #	Environment al Mitigation Summary Sheets	Sensitive Sites	Heritage Resources	Fisheries	Wildlife	Topography and Landscape	Air Quality	Water mgmt. & Quality	Spills & Releases	Waste	Land Users	Soils	Dust	Birds	Fish
	Conductors														
34	Vehicle and														
	Equipment	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х
	Maintenance														
35	Waste Management	Х	Х		Х			Х		Х					
36	Waste Water holding tanks	х	х					x	x						
37	Water Crossing	Х	Х	Х				Х	Х					Х	Х
38	Wildlife Protection	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х

Each sheet provides category information on the particular topic and a reference number for each environmental mitigation measure. The Mitigation Sheets can be assembled on their own for job and site-specific environmental protection planning or the OMEnvPP can be referred to as the environmental protection plan for work activity.

Appendix D provides the full set of Standard Environmental Protection Mitigation Sheets under this OMEnvPP. Revisions and new sheets will be produced as necessary and the document will be updated on a regular basis.

Appendix A: Manitoba Hydro Environmental Policy

Manitoba Hydro Environmental Management Policy

> Manitoba Hydro recognizes that our operations both affect, and are affected by our environment. The energy services we offer Manitobans rely on natural resources that are of critical importance to us all. This is why environmental leadership is identified as a key principle of our business.

> We will 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 the ISO 14001 Standard.

Specifically, Manitoba Hydro strives to protect the environment by:

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

President and Chief Executive Officer



Appendix B: Environmental Management System
Environmental Management System

Manitoba Hydro and the Environment

Manitoba Hydro recognizes that the construction and operations of its facilities has an impact on the environment. To manage these impacts, the corporation has made a commitment to protecting the environment through the implementation of its Environmental Management System (EMS).

What is the EMS?

The EMS is a system used to plan and act upon our environmental objectives. Having an effective EMS enables our corporation to identify its environmental impacts, set goals to manage them, implement plans to meet those objectives, evaluate performance, and make continual improvements to the system. A Improvement Leadership Support B Performance Evaluation C

Manitoba Hydro's EMS has been developed to be consistent with the ISO 14001 Standard.

What is Your Role in the EMS?

Everyone in the corporation plays a role in environmental protection at Manitoba Hydro. This includes those who are working in the field, those who support the work being done in the field and those who make decisions that affect what's happening in the field!



Using a dip net during the fish salvage

Manitoba Hydro



Your Responsibilities

- Identify and understand which environmental activities you are engaged in or have influence over
- Have a basic understanding of which compliance obligations are associated with those activities
- Have controls in place to minimize/mitigate the potential for an impact of the activities you are engaged/influence
- Monitor/measure performance
- * Evaluate compliance
- Implement corrective and preventative actions if required
- * Receive the proper training
- Document/record as required
- Have emergency preparedness plans/requirements are in place

Participate in audits if required

2018-05-22

Key Elements of the EMS

Environmental Impact/Risk

Manitoba Hydro has a <u>list of environmental activities</u> that identifies everything we do to impact the environment. Management and employees should be aware of which activities apply to them and how these can impact the environment.

Operational Controls

Operational controls are processes used to minimize the impact employee activities have on the environment. Employees must be familiar with the controls that apply to their work, such as: operation and maintenance procedures, Safety Data Sheets and spill trays.

Compliance

All work activities must be in compliance with legislation and other requirements we have committed ourselves to. Management and employees can ensure they are in compliance by adhering to their operational controls or consulting guidance documents such as the *Hazardous Materials Management Handbook*, and by having methods in place to evaluate compliance such as site inspections.

Documentation

Documentation is a part of work processes, which may include but is not limited to, work orders, job plans and reports.

Monitoring and Performance Evaluation

Environmental objectives and targets are tracked through a number of methods, including dashboards and reports.



Releasing sturgeon in Numao Lake

For More Information

Please visit the EMS SharePoint Site: http://hrcs.hydro.mb.ca/cem/ems/Pages/default.aspx



Bipole III transmission line construction

Property and Corporate Environment Department

Appendix C:

Environmental Licences, Approvals and Permits

Table 3:Environmental Licences, Approvals and Permits Required for Operations and
Maintenance

Approval required (Applicable Legislation / Regulation)	Type of Approval
Environment Act Licence (Class 3)	Licence Acquired
Crown Lands Act (Work Permit)	Permit
Crown Lands Act (General Permit)	Permit Acquired
Permit to cut timber on Crown Lands (<i>Forest Act</i>)	Permit
Wildfires Act (Work Permit)	Permit
Permit to burn wood (<i>Wildfires Act</i>) – outside of timing windows only	Permit
Storage and Handling of Gasoline and Associated Products Regulation, Generator Registration and Carrier Licencing Regulation (<i>Dangerous Goods Handling and Transportation Act</i>)	Permit
The Heritage Resources Act (when required)	Permit
Rail line crossing at access road intersections	Permit Acquired

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National Energy Board Approvals

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CERTIFICATE EC-059

IN THE MATTER OF the *National Energy Board Act* (NEB Act) and the regulations made thereunder; and

IN THE MATTER OF the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) and the regulations made thereunder; and,

IN THE MATTER OF an application dated 16 December 2016 by Manitoba Hydro, for a permit pursuant to section 58.11 of the NEB Act (Application) to construct and operate the Manitoba-Minnesota Transmission Project (Project), which includes a 500 kV international power line from the Dorsey Converter Station near Rosser, Manitoba to the border of the United States; and other approvals for related changes pursuant to subsection 45(1) of the NEB Act and conditions of Certificate EC-III-16 and Permit EP-196, filed with the National Energy Board (Board) under File OF-Fac-IPL-M180-2015-01 02.

BEFORE the Board on 20 October 2018.

WHEREAS the Application for the Project included construction and operation of a new international power line (IPL), the Dorsey IPL, which is a 500 kV alternating current IPL consisting of 213 kilometres of new transmission line with approximately 121 kilometres of new right-of-way from the Dorsey converter substation in Manitoba to a point on the international boundary south of Piney, Manitoba, connecting to the Great Northern Transmission Line in Minnesota;

AND WHEREAS the Application for the Project was preceded by an Order in Council issued by the Lieutenant Governor of the Province of Manitoba on 6 November 2013, pursuant to section 58.17 of the NEB Act, designating the Minister of Sustainable Development, formerly known as the Minister of Conservation and Water Stewardship, as the provincial regulatory agency for the proposed Dorsey IPL;

AND WHEREAS Order in Council 2017-1693, issued by the Governor in Council on 15 December 2017, designated the Project as an IPL that is to be constructed and operated under and in accordance with a Certificate issued under section 58.16 of the NEB Act;

AND WHEREAS the Board held a public hearing in respect of the Project Application pursuant to Hearing Order EH-001-2017 in Winnipeg, Manitoba on 4-8 June 2018 and 18-22 June 2018;

AND WHEREAS the Board has had regard to all considerations that are directly related to the Application and relevant, pursuant to Part III.1 of the NEB Act, and conducted an environmental assessment of the Project pursuant to CEAA 2012;

AND WHEREAS the Board has examined the Application and all subsequent submissions made by Manitoba Hydro and the participants in the EH-001-2017 proceeding;

AND WHEREAS the Board has decided, taking into account Manitoba Hydro's mitigation measures and those set out in the conditions to this Certificate, that the Project is not likely to cause significant adverse environmental effects;

AND WHEREAS the Board has found that Manitoba-Minnesota Transmission Project is and will be required by the present and future public convenience and necessity;

AND WHEREAS the Board's decisions on the Application, and reasons, are set out in the EH-001-2017 National Energy Board Reasons for Decision;

AND WHEREAS the Governor in Council by Order in Council No. P.C. 2019-784 dated the 13 June 2019 added or amended certain conditions in this Certificate and has approved the issuance of this Certificate;

NOW THEREFORE pursuant to paragraph 58.16(1)(a) of the NEB Act, the Board hereby issues this Certificate in respect of the Project.

This Certificate is subject to the twenty-eight conditions listed below:

1. Condition Compliance

Manitoba Hydro must comply with all of the conditions contained in this Certificate, as well as Order AO-006-EC-III-16 and Order MO-074-2018 unless the Board otherwise directs.

2. Certificate Expiration

Unless the Board otherwise directs prior to 20 October 2021, the Certificate for the new Dorsey IPL as well as amendments for the existing Riel IPL Certificate and the amendments for the existing Glenboro Permit shall expire on **20 October 2021**, unless construction in respect of the Project has commenced by that date.

3. Implementation of Commitments

Manitoba Hydro must implement or cause to be implemented all of the policies, practices, mitigation measures, recommendations, and procedures for the protection of the environment and promotion of safety referred to in its application, or as otherwise agreed to in its related submissions as well as all commitments made to Indigenous groups through its Project application or otherwise on the record of the EH-001-2017.

4. General

Manitoba Hydro must cause the Project to be constructed, operated, and abandoned in accordance with the specifications, standards, and other information referred to in its application or as otherwise agreed to in its related submissions.

5. Implementation of Standards

- a) Manitoba Hydro must design and construct the Project to comply with the current Canadian Electrical Code, Canadian Standards Association and other relevant standards applicable to the design and construction of power lines.
- b) Manitoba Hydro will ensure that any portion of the Riel IPL that may become part of the Project, will comply with the current standards in effect as of the date of construction.

6. Notification of Project Modifications

Manitoba Hydro must seek approval from the Board of any proposed modification to the Project's electrical system that may impact reliable operation for the bulk electrical system, power transfer capabilities, and the specification of the IPL structures, before any modification is made.

7. Quality Assurance and Compliance Program

Manitoba Hydro must file with the Board, **at least sixty (60) days prior to commencing construction**, confirmation by an officer of the company that they have developed and implemented a Quality Assurance and Compliance Program. The program must describe the methods by which Manitoba Hydro will ensure the Project, as described in the application, is designed, constructed, and operated in conformity with the conditions of the Certificate, and the designs, specifications, and undertakings set out in its application or as otherwise adduced in its evidence before the Board. The program must include, but not be limited to:

- a) a process or procedure to identify conditions of approval, company designs, specifications, and undertakings set out in the application or otherwise adduced in Manitoba Hydro's evidence;
- b) processes or procedures to monitor, measure, document, and report on compliance with conditions of approval, company designs, specifications, and undertakings set out in the application or otherwise adduced in Manitoba Hydro's evidence;
- c) the position title and contact information of the person(s) responsible for each aspect of the program;
- d) the qualifications, contact information, description of the job role and the position title of the person(s) authorized to stop work should work be in non-conformity with conditions of approval, company designs, specifications, and undertakings set out in the application or otherwise adduced in Manitoba Hydro's evidence;

- e) a process or procedure to identify and implement any corrective action as a result of any non-conformances that may be necessary before recommencing work;
- f) a process or procedure to evaluate the effectiveness of the corrective actions taken as a result of any non-conformances; and,
- g) the methods by which adherence to the program will be monitored, measured, documented, and reported to Manitoba Hydro's management.

8. Construction Safety Manuals

Manitoba Hydro must file with the Board, at least ninety (90) days prior to commencing construction:

- a) safety manuals related to the construction of the Project that address construction procedures, activities, and public safety; and,
- b) an outline of the safety training program to be implemented for Project operations.

9. Navigation and Navigation Safety Plan

Manitoba Hydro must file with the Board for approval, **at least ninety (90) days prior to commencing construction**, a Navigation and Navigation Safety Plan that includes:

- a) an updated listing of navigable waters to be crossed by all components of the Project described in the Application and subsequent filings;
- b) an updated discussion of effects of the Project to navigation and navigation safety;
- c) evidence and a summary of Manitoba Hydro's consultation with potentially affected waterway users and Indigenous communities regarding navigation use, including any concerns that were raised and how those concerns have been addressed; and,
- d) for each navigable waterway, a description of mitigation measures to be implemented to address the Project's potential effects on navigation and navigation safety.

Manitoba Hydro must incorporate the Navigation and Navigation Safety Plan into the updated Construction Environmental Protection Plan (CEPP) required by Condition 10.

10. Construction Environmental Protection Plan

Manitoba Hydro must file with the Board for approval, **at least ninety (90) days prior to commencing construction**, an updated Project-specific Construction Environmental Protection Plan (CEPP) which includes:

- a) all environmental protection, mitigation and monitoring measures and commitments, as set out in its Application, draft CEPP, or otherwise agreed to in its subsequent filings during both the Manitoba Clean Environment Commission hearing process and the Board's EH-001-2017 proceeding, and including any criteria that will be used to implement those measures;
- b) any updates from outstanding pre-construction surveys;
- c) the following plans:

- i) clearing management plan
- ii) blasting plan
- iii) erosion protection and sediment control plan
- iv) golden-winged warbler habitat management plan
- v) cultural and resource heritage protection plan
- vi) navigation and navigation safety plan (see Condition 9)
- vii) waste and recycling management plan
- viii) emergency preparedness and response plan (see Condition 14)
- ix) rehabilitation and invasive species management plan
- x) biosecurity management plan
- xi) access management plan
- xii) environmental monitoring plan
- xiii) integrated vegetation management plan;
- d) orthophoto maps of the Project footprint, which include the identification of environmental features, Manitoba Hydro's Environmentally Sensitive Sites, and mitigation measures to be applied; and,
- e) evidence and a summary of Manitoba Hydro's consultation with potentially affected persons, organizations, Indigenous communities, and federal and provincial authorities regarding the updated CEPP, including any concerns that were raised, steps that Manitoba Hydro has taken or will take to address those concerns, and/or explanations as to why no further action is required, if applicable.

11. Indigenous Knowledge Studies Report

Manitoba Hydro must file with the Board for approval, **at least sixty (60) days prior to commencing construction**, a report outlining a plan for completing outstanding Indigenous Knowledge studies. The report must include:

- a) a summary of the status of the Indigenous Knowledge studies undertaken for the Project, including group-specific studies or planned supplemental surveys;
- a description of how Manitoba Hydro has considered and addressed information from any Indigenous Knowledge studies that it did not report on during the Board's EH-001-2017 proceeding;
- c) a description of any outstanding concerns raised by potentially-affected Indigenous communities regarding potential effects of the Project on the current use of lands and resources for traditional purposes, including a description of how these concerns have been or will be addressed by Manitoba Hydro;
- d) a summary of any outstanding Indigenous Knowledge studies or follow-up activities that will not be completed prior to commencing construction, including an estimated

completion date and an explanation as to why these will not be completed prior to construction, if applicable;

- e) a description of how Manitoba Hydro has already identified, or will identify, any potentially-affected traditional land use sites or resources if the outstanding studies will not be completed prior to construction; and,
- a description of how Manitoba Hydro has revised its CEPP as a result of the Indigenous Knowledge studies or follow-up activities. At the same time as this report is filed with the Board, Manitoba Hydro must send a copy to each of the Indigenous communities included in consultation activities.

12. Reliability, Safety, and Security of IPLs

Manitoba Hydro must:

- a) ensure that the new Dorsey IPL will operate within reliability limits of its nominal design voltage of 500 kV AC;
- b) comply with the provisions of the Board Order MO-036-2012 electric reliability;
- c) file with Board a list of reliability standards applicable to the Project, at least sixty (60) days prior to commencement of construction;
- d) report to the Board any event involving electrical contact between energized IPL components and terrain, vegetation, structures, vehicles, animals or people within forty-eight (48) hours of such event occurring; and,
- e) file with Board within sixty (60) days after occurrence of a reportable event under b) or d), a written report that must include:
 - i) the reasons why the deviation occurred;
 - ii) analysis of potential negative implications of the deviation; and,
 - iii) mitigation strategies for the implications identified and when the mitigation was or will be implemented.

13. Design and Interconnection Compliance

Manitoba Hydro must file with the Board for approval, **at least sixty (60) days prior to commencing construction**, a report confirming that the design of facilities, construction plan, and planned operations comply with the following:

- a) With the new Dorsey IPL and with the Project alterations in place, Manitoba Hydro may export up to 3058 MW of power to the U.S. and import up to 1473 MW of power from the U.S. over all of its international power lines without prior notification to any Canadian utility.
- b) Confirmation that SaskPower and the Ontario Independent Electric System Operator have reviewed the impact of both steady state and transient operation under the full set of permutations and combinations of availability of the Dorsey IPL, Riel IPL and Glenboro IPL after the Project is in service, and confirmation that none of the reviewed operating scenarios will impose unacceptable operating conditions upon the Saskatchewan or Ontario Provincial electric systems.

14. Construction Emergency Response Plan

Manitoba Hydro must file with the Board, **at least forty-five (45) days prior to commencing construction**, a Construction Emergency Response Plan for the Project that contains:

- a) a response plan for spills of fuels and fluids associated with construction;
- b) a response plan for medical incidents that includes provision for 24-hour emergency transport to hospital;
- c) a plan for fire response and evacuation;
- d) a security plan; and,
- e) an emergency contact list and emergency notification plan for government and response agencies and communities (including Indigenous and Métis) adjacent to the right-of-way and/or impacted by work sites.

15. Commitments Tracking Table

Manitoba Hydro must:

- a) file with the Board and post on its website, **at least thirty (30) days prior to commencing construction**, a commitments tracking table listing all commitments it made in its application, including all commitments made to Indigenous communities, and otherwise agreed to during questioning or in its related submissions in the Board's EH-001-2017 proceeding, as well as commitments from the Clean Environment Commission hearing process that are of federal interest, and that includes references to:
 - i) the document in which each commitment appears (for example, the application, responses to information requests, hearing transcripts, permit requirements, condition filings, or other document);
 - ii) the accountable lead for implementing each commitment; and,
 - iii) the estimated timeline associated with the fulfillment of each commitment;
- b) file with the Board, at the following times, an updated commitments tracking table:
 - i) within ninety (90) days after the Certificate is issued; and,
 - ii) at least thirty (30) days prior to commencing construction;
- update the status of the commitments and file those updates with the Board, on a monthly basis starting ninety (90) days after the Certificate date until commencing operations, and quarterly during operations until all commitments are satisfied (except those that involve filings for the Project's operational life);
- d) post on its website, the same information required by b) and c), within the same indicated timeframes; and,
- e) maintain at each of its construction offices:
 - i) the relevant environmental portion of the commitments tracking table listing all of Manitoba Hydro's regulatory commitments, including those described

in its application and subsequent filings, and conditions from permits, authorizations, and approvals it has received;

- ii) copies of any permits, authorizations, and approvals for the Project issued by federal, provincial, or other permitting authorities that include environmental conditions or site-specific mitigation or monitoring; and,
- iii) copies of any subsequent variances to any permits, authorizations, and approvals in e) ii).

16. Heritage Resources

Manitoba Hydro must file with the Board, at least thirty (30) days prior to commencing construction:

- a) confirmation, signed by an officer of the company, that it has obtained all of the required archaeological and heritage resource permits and clearances from the Manitoba Historic Resources Branch;
- b) a description of how Manitoba Hydro will meet conditions and respond to comments and recommendations contained in the permits and clearances referred to in a); and,
- c) a description of how Manitoba Hydro has incorporated additional mitigation measures, as applicable, into its CEPP as a result of conditions or recommendations referred to in b).

17. Landowner Advisory Committee Plan

Manitoba Hydro must file with the Board, **at least thirty (30) days prior to commencing construction**, a plan for developing a Landowner Advisory Committee (LAC) for the Project. The plan must include:

- a) a summary of how potentially-affected landowners and/or their representative organizations were consulted, including a description of the design of the consultation and activities undertaken;
- b) a summary of the results of consultation, in terms of input from the landowners, including whether or not there is any interest from landowners in forming a LAC; and,
- c) if there is interest in forming a LAC, a description of the scope of activities that will be undertaken, in consultation with the LAC, during construction and operation of the Project, including but not limited to:
 - i) the standard mitigation measures to be implemented by Manitoba Hydro during construction to protect landowner interests and reduce effects to agricultural activities;
 - ii) measures to be implemented when site-specific issues arise during construction; and,
 - iii) third party monitors, including the activities and geographic locations where third-party monitoring have been proposed.

18. Operations Safety Manuals

Manitoba Hydro must file with the Board, at least ninety (90) days prior to commencing operations:

- a) safety manuals related to operations activities for the Project that address routine operation procedures, activities, and public safety issues that might be encountered during the IPL operations; and,
- b) an outline of the safety training program to be implemented for Project operations.

19. Operations and Maintenance Manual

Manitoba Hydro must file with the Board, **at least sixty (60) days prior to the commencing operations**, an Operations and Maintenance Manual for the Project. The manual must require Manitoba Hydro to conduct documented audits of its records and inspections of the Manitoba Hydro electrical system and right-of-way to confirm company conformity to the manual's requirements. The manual must also include a schedule or procedure for its yearly review and update, as appropriate, to remain current with regulatory requirements and accepted industry practice. The manual, and the programs and procedures on Manitoba Hydro's records as required by the manual, must be made available to the Board for periodic review, upon request. The manual must also include:

- a) the type of maintenance followed by Manitoba Hydro;
- b) maintenance schedules according to the selected maintenance practice;
- c) operational procedures for steady state and transient conditions;
- d) a public awareness program for the life of the Project that:
 - i) promotes public awareness of ongoing hazards associated with the Project; and,
 - ii) provides contact numbers for the public to report issues and concerns;
- e) training requirements for personnel implementing the manual; and,
- f) the maintenance and operations records that will be produced during operations, including during the performance of maintenance tasks and routine inspections.

20. Construction Progress Reports

Manitoba Hydro must file with the Board **monthly**, during construction, construction progress reports for the Project that include:

- a) a summary of the Project's construction;
- b) a summary of the safety, security, or environmental concerns encountered;
- c) details of each incident of environmental non-compliance; and,
- d) details of the adaptive management applied to achieve resolution of each non-compliance.

21. Issues Tracking

Manitoba Hydro must create and maintain records that chronologically track complaints by Indigenous communities, including complaints raised through the MMTP Monitoring Committee, landowners, and municipal and regional governments relating to the Project, beginning with the commencement of construction and continuing for five years after the commencement of operations. The records must be retained for five years after the commencement of operations. The complaint tracking records must include:

- a) the date the complaint was received;
- b) the form in which the complaint was received (for example, telephone, mail, email, or other communication methods that may evolve over time);
- c) a detailed description of the complaint;
- d) the date and summary of all subsequent telephone calls, visits, correspondence, site monitoring/inspections, follow-up reports and other related documentation;
- e) updated contact information for all persons involved in the complaint; and,
- f) any actions taken or to be taken or an explanation why no further action is required.

Manitoba Hydro must maintain these records for audit purposes and make them available to the Board upon request. Manitoba Hydro must make available to the complainant, upon request, the records related to the specific complaint(s) that the affected party has made to Manitoba Hydro.

22. Crown land Offset Measures Plan

Manitoba Hydro must file with the Board, for approval, **30 days prior to commencing operations**, a Crown Land Offset Measures Plan (the Plan) that outlines how permanent loss of crown lands available for traditional use by Indigenous Peoples resulting from the Project will be offset or compensated for. The Plan must include:

- a) a description of site-specific details and maps showing the locations where Crown land is no longer available for traditional use as a result of Project activities at Dorsey Converter Station and the transmission tower locations, as well as any other locations;
- b) a list of the offset or compensation measures that will be implemented to address the permanent loss of crown lands identified in a) above;
- c) an explanation of the expected effectiveness of each offset measure described in b) for each Indigenous community;
- d) the decision-making criteria for selecting specific offset measures that would be used and under what circumstances;
- e) a schedule indicating when measures will be implemented and the estimated completion date(s);
- f) summary of consultation by Manitoba Hydro with any impacted Indigenous communities and with relevant provincial and federal authorities regarding the Plan; and,

g) this summary must include a description of any issues or concerns raised regarding the plan by Indigenous communities and how Manitoba Hydro has addressed or responded to them.

23. Post Construction Monitoring Reports

Manitoba Hydro must file with the Board, on or before 31 January following the first year of Project operations and for a period of at least ten (10) years after commencing operations, annual post-construction monitoring reports. These reports must include:

- a) a description of monitoring methods used;
- b) identification, including on a map or diagram, of any reclamation or other environmental issues which arose during construction or in the course of the previous year;
- c) a description of the valued components or issues that were assessed or monitored, as outlined in Manitoba Hydro's Environmental Monitoring Plan (see Condition 10);
- d) the monitoring results, including a comparison to measurable goals;
- e) an assessment of the effectiveness of the mitigation measures implemented and the accuracy the environmental assessment predictions;
- f) a description of any corrective actions taken, their observed success and current status; and,
- g) a schedule outlining when further corrective actions will be implemented or monitoring conducted to address any unresolved issues.

Notwithstanding the requirement for filing on or before 31 January above, if the Provincial Minister responsible for issuing a Provincial Licence to Manitoba Hydro does grant such a Licence, and such a Licence requires annual submission of post-construction monitoring reports, Manitoba Hydro may submit post-construction monitoring reports to the Board in accordance with any timing requirements set out in that Provincial Licence, provided that the submission of the reports to the Board commences within the first year of operations and occurs annually for ten (10) years.

24. Compliance Reporting

Manitoba Hydro must file with the Board, within thirty (30) days after commencing operations, confirmation, signed by an officer of the company, that the Project was completed and constructed in compliance with all applicable conditions in the Certificate. If compliance with any of the Board's conditions cannot be confirmed, the officer of the company must provide details as to why compliance cannot be confirmed. The filing required by this condition must include a statement confirming that the signatory to the filing is an officer of the company.

25. As-built Drawings

Manitoba Hydro must file with the Board, within sixty (60) days after commencing operations, as-built drawings of structures and major equipment identifying the location and

configuration of the new Dorsey IPL, altered Riel IPL, and altered Glenboro IPL facilities, and including:

- a) the termination structure at Dorsey substation;
- b) transmission structures from Dorsey substation to the international border;
- c) existing Riel IPL structures that will be incorporated into the new Dorsey IPL;
- d) any transition structures linking the new Dorsey IPL segments with the old Riel IPL segment;
- e) Bipole III crossing structures and conductor elevations;
- f) configurations and elevations at all locations where the new Dorsey IPL crosses existing high-voltage transmission lines;
- g) typical right-of-way cross-sections for both self-supporting and guyed structures; and,
- h) right-of-way cross-sections of the structures for the segment through which the new Dorsey IPL runs parallel with the Riel IPL and/or any other high-voltage transmission lines and any other major assets comprising the new Dorsey IPL facilities.

26. Wetland Offset Measures Plan

Manitoba Hydro must file with the Board for approval, **within ninety (90) days of commencing operation of the Project**, a Wetland Offset Measures Plan which outlines how permanent loss to wetlands resulting from the Project will be offset or compensated for. This plan must include:

- a) a description of site-specific details and maps showing the locations of permanent wetland loss as a result of Project activities at Dorsey Converter Station and the transmission tower locations, as well as any other locations where wetlands were affected by the Project;
- b) an explanation of how wetland function will be measured during the post-construction monitoring program, and any resulting accidental permanent loss to wetlands quantified and reported to the Board as part of Condition 23;
- c) a list of the offset or compensation measures that will be implemented to address permanent loss of wetlands as identified in a) and b) above;
- d) an explanation of the expected effectiveness of each offset measure described in c) and the relative value of each offset measure towards achieving the offset;
- e) the decision-making criteria for selecting specific offset measures and offset ratios that would be used under what circumstances;
- a schedule indicating when measures will be implemented and estimated completion date(s);
- g) evidence and summary of consultation with provincial and federal authorities, any nongovernmental expert bodies, and any impacted Indigenous communitiesregarding the plan; and,

h) this summary must include a description of any issues or concerns raised regarding the plan by Indigenous communities, and how Manitoba Hydro has addressed or responded to them.

27. Conductors

Manitoba Hydro shall design and construct the Project in accordance with its application or as otherwise agreed to in its related submissions such that:

- a) the transmission towers shall support one set of triple conductor bundles for each of the three phases suspended from insulators;
- b) each of the nine sub conductors shall be aluminum conductor steel reinforced (ACSR) type with the following specifications:
 - i) Type: 1192.55 MCM 45/7 aluminum to steel stranding ACSR, code name "Bunting"
 - ii) Diameter 33 mm
 - iii) Bundle spacing: 460 mm
 - iv) Steel Shield Wire: Size 10 (11 mm) Steel 7 Strand Grade 1300.

28. Annual Filing Requirements

Manitoba Hydro must file with the Board, prior to 31 January after commencing Project operation, and by that date on an annual basis thereafter for the life of the Project:

- a) confirmation that Manitoba Hydro is still the owner and operator of the Project;
- b) Manitoba Hydro's current contact information, including:
 - i) corporate headquarters' street and mailing addresses;
 - ii) phone number;
 - iii) fax number;
 - iv) email address;
 - v) the name and job title of an officer of the company for the Board to serve documents on, as required; and,
 - vi) the name and job title of a secondary contact at Manitoba Hydro;
- c) a filing that complies with the provisions of the Board's General Order MO-036-2012 for Electricity Reliability Standards;
- d) an updated commitments tracking table as per Condition 15; and,
- e) confirmation that no changes were made to Manitoba Hydro's compliance program, safety manual, or operations and maintenance manual or, if changes have been made, provide a rationale and description of the change(s), if not already provided to the Board.

Issued at Calgary, Alberta on the 18 day of June 2019.

NATIONAL ENERGY BOARD

Original signed by L. George

for Sheri Young Secretary of the Board National Energy Board



Office national

de l'énergie

Final 1.0 2020-05-14

ORDER AO-006-EC-III-16

IN THE MATTER OF the *National Energy Board Act* (NEB Act) and the regulations made thereunder; and,

IN THE MATTER OF the *Canadian Environmental Assessment Act*, 2012 (CEAA 2012) and the regulations made thereunder; and,

IN THE MATTER OF an application dated 16 December 2016 by Manitoba Hydro, for a permit pursuant to section 58.11 of the NEB Act (Application) to construct and operate the Manitoba-Minnesota Transmission Project (Project), which includes a 500 kV international power line from the Dorsey Converter Station near Rosser, Manitoba to the border of the United States; and other approvals for related changes pursuant to subsection 45(1) of the NEB Act and conditions of Certificate EC-III-16 and Permit EP-196, filed with the National Energy Board (Board) under File OF-Fac-IPL-M180-2015-01 02.

BEFORE the Board on 20 October 2018.

WHEREAS on 1 September 1977, the Board issued Certificate of Public Convenience and Necessity (CPCN) EC-III-16 to Manitoba Hydro in respect of an international power line (IPL) between Canada and the United States of America pursuant to section 44 of the NEB Act, as it was then;

AND WHEREAS on 12 January 1978, the Board issued Order AO-1-EC-III-16 altering the route of the IPL approved in CPCN EC-III-16;

AND WHEREAS on 19 November 1992, the Board issued Order AO-2-EC-III-16 pursuant to subsection 58.16(2) of the NEB Act, as approved by the Governor in Council by Order in Council No. P.C. 1992-2372, authorizing the Applicant to make certain changes to terminal facilities at Dorsey Station associated with the IPL;

AND WHEREAS on 11 February 2003, the Board issued Order AO-3-EC-III-16 pursuant to subsection 21(2) of the NEB Act, as approved by the Governor in Council by Order in Council No. P.C. 2003-79 dated 30 January 2003, to authorize the Applicant to alter the Dorsey Station facilities and the power transfer notification limits;



AND WHEREAS on 8 May 2009, the Board issued Order MO-10-2009, approving a deviation to the Dorsey IPL;

AND WHEREAS on 14 June 2010, the Board issued Order AO-4-EC-III-16 pursuant to subsection 21(2) of the NEB Act, as approved by the Governor in Council by Order in Council No. P.C. 2010-745 dated 10 June 2010, authorizing the variation of Conditions 2, 3, 4 and 8 of CPCN EC-III-16;

AND WHEREAS on 22 June 2010, the Board issued an Erratum to Order AO-4-EC-III-16 to correct the drawing number of the approved plan and profile;

AND WHEREAS on 12 September 2017, the Board issued Order MO-045-2017, approving alterations to the Dorsey IPL;

AND WHEREAS on 12 February 2018, the Board issued Order AO-5-EC-III-16 pursuant to subsection 21(2) of the NEB Act, as approved by Governor in Council by Order in Council No. P.C. 2018-60 dated 2 February 2018, varying the Certificate to reflect the modifications relating to a deviation to the Dorsey IPL;

AND WHEREAS the Application for the Project included a request for authorization pursuant to condition 8 of the amended CPCN EC-III-16 to relocate a segment of the Riel IPL and, pursuant to subsection 45(1) of the NEB Act, authorization for the plan, profile and book of reference showing the proposed alteration;

AND WHEREAS the Board held a public hearing in respect of the Project Application pursuant to Hearing Order EH-001-2017 in Winnipeg, Manitoba on 4-8 June 2018 and 18-22 June 2018;

AND WHEREAS the Board has had regard to all considerations that are directly related to the Application and relevant, pursuant to Part III.1 of the NEB Act, and conducted an environmental assessment of the Project pursuant to CEAA 2012;

AND WHEREAS the Board has examined the Application and all subsequent submissions made by Manitoba Hydro and the participants in the EH-001-2017 proceeding and considers it to be in the public interest to grant the relief set out in this Amending Order;

AND WHEREAS the Board has decided, taking into account Manitoba Hydro's mitigation measures and those set out in the conditions to Certificate EC-059, that the Project is not likely to cause significant adverse environmental effects;

AND WHEREAS the Board's decisions on the Application, and reasons, are set out in the EH-001-2017 National Energy Board Reasons for Decision;

AND WHEREAS the Board issued Certificate EC-059 for the Dorsey IPL as part of the Manitoba-Minnesota Transmission Project, dated the 18 June 2019, as amended and approved by the Governor in Council by Order in Council No. P.C.2019-784 dated the 13 June 2019;

AND WHEREAS the Governor in Council by Order in Council No. P.C. 2019-784 dated the 13 June 2019 has approved the issuance of this amendment to Certificate EC-III-16;

IT IS ORDERED THAT, pursuant to condition 8 of the amended Certificate EC-III-16, Manitoba Hydro is authorized to relocate a segment of the Riel IPL as described in the Application for the Project;

IT IS FURTHER ORDERED THAT the Plan and Profile known as:

Drawing Number	Date Issued
1-36070-DD-10120-0002	25 November 2016
1-36070-DE-10220-0001	25 November 2016
1-36010-DE-10220-0006	25 November 2016

and related lines in the Book of Reference, all in the Province of Manitoba are hereby approved;

IT IS FURTHER ORDERED THAT condition 4 of Order AO-4-EC-III-16 is revoked and replaced with the following condition:

4. The total length of the international power line shall be approximately 159.99 kilometres.

IT IS FURTHER ORDERED THAT this Order is subject to the following condition:

- 1. Manitoba Hydro must comply with all of the conditions in Certificate EC-059, unless the Board otherwise directs.
- 2. Manitoba Hydro must file with the Board, within thirty (30) days after commencing operations, confirmation, signed by an officer of the company, that the relocation was completed and constructed in compliance with all applicable conditions in Certificate EC-059. If compliance with any of the Board's conditions cannot be confirmed, the officer of the company must provide details as to why compliance cannot be confirmed. The filing required by this condition must include a statement confirming that the signatory to the filing is an officer of the company.

Issued at Calgary, Alberta on the 18 day of June 2019.

NATIONAL ENERGY BOARD

Original signed by L. George

for Sheri Young Secretary of the Board

ORDER MO-074-2018

IN THE MATTER OF the *National Energy Board Act* (NEB Act) and the regulations made thereunder; and,

IN THE MATTER OF the *Canadian Environmental Assessment Act*, 2012 (CEAA 2012) and the regulations made thereunder; and,

IN THE MATTER OF an application dated 16 December 2016 by Manitoba Hydro, for a permit pursuant to section 58.11 of the NEB Act (Application) to construct and operate the Manitoba Minnesota Transmission Project (Project), which includes a 500 kV international power line from the Dorsey Converter Station near Rosser, Manitoba to the border of the United States; and other approvals for related changes pursuant to subsection 45(1) of the NEB Act and conditions of Certificate EC-III-16 and Permit EP-196, filed with the National Energy Board (Board) under File OF-Fac-IPL-M180-2015-01 02.

BEFORE the Board on 20 October 2018.

WHEREAS on 5 March 2002, the Board issued Electricity Permit EP-196 to Manitoba Hydro for the construction and operation of an international power line and ancillary facilities between Glenboro station in Southern Manitoba and extending to the international boundary near Killarney, Manitoba;

AND WHEREAS on 29 November 2012, the Board issued Order AO-001-EP-196 for Manitoba Hydro to comply with mandatory and enforceable transmission reliability standards;

AND WHEREAS the Application for the Project included a request for authorization pursuant to condition 13 of the amended Permit EP-196 for the addition of two phase-shifting transformers to the terminal facilities of the IPL and relocating a segment of the IPL;

AND WHEREAS the Board held a public hearing in respect of the Project Application pursuant to Hearing Order EH-001-2017 in Winnipeg, Manitoba on 4-8 June 2018 and 18-22 June 2018;

AND WHEREAS the Board has had regard to all considerations that are directly related to the Application and relevant, pursuant to Part III.1 of the NEB Act, and conducted an environmental assessment of the Project pursuant to CEAA 2012;

AND WHEREAS the Board has examined the Application and all subsequent submissions made by Manitoba Hydro and the participants in the EH-001-2017 proceeding and considers it to be in the public interest to grant the relief set out in this Miscellaneous Order;

AND WHEREAS the Board has decided, taking into account Manitoba Hydro's mitigation measures and those set out in the conditions to Certificate EC-059, that the Project is not likely to cause significant adverse environmental effects;

AND WHEREAS the Board's decisions on the Application, and reasons, are set out in the EH-001-2017 National Energy Board Reasons for Decision;

AND WHEREAS the Board issued Certificate EC-059 for the Dorsey IPL as part of the Manitoba-Minnesota Transmission Project, dated 18 June 2019, as amended and approved by the Governor in Council by Order in Council No. P.C. 2019-784 dated the 13 June 2019;

IT IS ORDERED THAT, pursuant to condition 13 of the amended Permit EP-196, Manitoba Hydro is authorized for the addition of two phase-shifting transformers to the terminal facilities of the IPL and to relocate a segment of the Glenboro IPL as described in the Application for the Project;

IT IS FURTHER ORDERED THAT this Order is subject to the following conditions:

- 1. Manitoba Hydro must comply with all of the conditions in Certificate EC-059, unless the Board otherwise directs.
- 2. Manitoba Hydro must file with the Board, within thirty (30) days after commencing operations, confirmation, signed by an officer of the company, that the alterations were completed and constructed in compliance with all applicable conditions in Certificate EC-059. If compliance with any of the Board's conditions cannot be confirmed, the officer of the company must provide details as to why compliance cannot be confirmed. The filing required by this condition must include a statement confirming that the signatory to the filing is an officer of the company.

Issued at Calgary, Alberta on the 18 day of June 2019.

NATIONAL ENERGY BOARD

Original signed by L. George

for Sheri Young Secretary of the Board

Provincial Environment Act Licence

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THE ENVIRONMENT ACT LOI SUR L'ENVIRONNEMENT



Licence No. / Licence n° 3288

Issue Date / Date de délivrance April 4, 2019

In accordance with The Environment Act (C.C.S.M. c. E125) / Conformément à la Loi sur l'environnement (C.P.L.M. c. E125)

Pursuant to Section 12(1) / Conformément au Paragraphe 12(1)

THIS LICENCE IS ISSUED TO : / CETTE LICENCE EST DONNÉE À :

MANITOBA HYDRO; <u>"the Licencee"</u>

for the construction, operation, and decommissioning of the Manitoba-Minnesota Transmission Project (Dorsey international power line), which includes a 213 km long, 500 kilovolt alternating current, international power line from the Dorsey Converter Station (located near Rosser, Manitoba) to the United States border crossing near Piney, Manitoba, and modifications to the existing Dorsey Converter Station, the existing Riel international power line and the Riel Converter Station (located near the intersection of Provincial Trunk Highways 101 and 15), and the existing Glenboro international power line and the Glenboro Station (located south of Glenboro, Manitoba), in accordance with the Proposal filed under The Environment Act dated November 21, 2014, the Environmental Impact Statement (EIS) dated September 2015, and the response to information requests dated April 29, 2016, in consideration of the September 2017 Clean Environment Commission Report on Public Hearings, and subject to the following specifications, limits, terms and conditions:

DEFINITIONS

In this Licence:

"affected area" means a geographical area, excluding the property of the Development;

"cultural resource" means 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;

"Development" means any project, industry, operation or activity, or any alteration or expansion of any project, industry, operation or activity which causes or is likely to cause

- a) the release of any pollutant into the environment, or
- b) an effect on any unique, rare, or endangered feature of the environment, or

- c) the creation of by-products, residual or waste products not regulated by The Dangerous Goods Handling and Transportation Act, or
- d) a substantial utilization or alteration of any natural resource in such a way as to pre-empt or interfere with the use or potential use of that resource for any other purpose, or
- e) a substantial utilization or alteration of any natural resource in such a way as to have an adverse impact on another resource, or
- f) the utilization of a technology that is concerned with resource utilization and that may induce environmental damage, or
- g) a significant effect on the environment or will likely lead to a further development which is likely to have a significant effect on the environment, or
- h) a significant effect on the social, economic, environmental health and cultural conditions that influence the lives of people or a community in so far as they are caused by environmental effects.

(The Environment Act E125)

"Director" means an employee so designated pursuant to The Environment Act;

"Environmental Approvals Branch" means the Environmental Approvals Branch of Manitoba Sustainable Development, or any future branch responsible for issuing licences under The Environment Act;

"Environment Officer" means an employee so designated pursuant to The Environment Act;

"Integrated Resource Management Team (IRMT)" means the regional Integrated Resource Management Team of Manitoba Sustainable Development, or equivalent body, which is organized to review applications and address issues related to the management of natural resources;

"noise nuisance" means an unwanted sound, in an affected area, which is annoying, troublesome, or disagreeable to a person:

- a) residing in an affected area;
- b) working in an affected area; or
- c) present at a location in an affected area which is normally open to members of the public;

if the unwanted sound

- d) is the subject of at least 5 written complaints, received by the Director in a form satisfactory to the Director and within a 90 day period, from 5 different persons falling within clauses (a), (b) or (c), who do not live in the same household; or
- e) is the subject of at least one written complaint, received by the Director in a form satisfactory to the Director, from a person falling within clauses (a), (b) or (c) and the Director is of the opinion that if the

unwanted sound had occurred in a more densely populated area there would have been at least 5 written complaints received within a 90 day period from 5 different persons and who do not live in the same household;

"**Region**" means the geographic areas of the Province of Manitoba in which the Department of Sustainable Development has been divided;

"**riparian area**" means an area of land on the banks or in the vicinity of a waterbody, which due to the presence of water supports, or in the absence of human intervention would naturally support, an ecosystem that is distinctly different from that of adjacent upland areas (The Water Protection Act W65);

"slash" means branches and other woody debris that result from forest clearing;

"transmission line right-of-way" means the corridors for the transmission lines, as defined and described in the EIS;

"waterbody" means any body of flowing or standing water, whether naturally or artificially created, and whether the flow or presence of water is continuous, intermittent or occurs only during a flood, including but not limited to a lake, river, creek, stream, and wetland (slough, marsh, swamp, etc.), including ice on any of them (The Water Protection Act W65); and

"wetland" means

- a) a marsh, bog, fen, swamp or ponded shallow water, and
- b) low areas of wet or water-logged soils that are periodically inundated by standing water and that are able to support aquatic vegetation and biological activities adapted to the wet environment in normal conditions.

GENERAL TERMS AND CONDITIONS

This Section of the Licence contains requirements intended to provide guidance to the Licencee in implementing practices to ensure that the environment is 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 Manitobans.

Future Sampling

- 1. The Licencee shall, in addition to any of the specifications, limits, terms and conditions specified in this Licence, upon the request of the Director:
 - a) sample, monitor, analyse or investigate specific areas of concern regarding any segment, component or aspect of the Development for such duration and at such frequencies as may be specified;

Manitoba Hydro – Manitoba-Minnesota Transmission Project Licence No. 3288 Page 4 of 14

- b) determine the environmental impact associated from the Development;
- c) conduct specific investigations in response to the data gathered during environmental monitoring programs; and
- d) provide the Director, within such time as may be specified, with such reports, drawings, specifications, analytical data, descriptions of sampling and other information as may from time to time be requested.

Reporting Format

2. The Licencee shall submit all information required to be provided to the Director or Environment Officer under this Licence, in written and electronic format, in such form (including number of copies) and of such content as may be required by the Director or Environment Officer, and each submission shall be clearly labelled with the Licence Number and Client File Number associated with this Licence.

Approvals and Permits

- 3. The Licencee shall, prior to construction on Crown land, apply for and obtain the appropriate land tenure allocations in accordance with the Crown Lands Act from the Real Estate Services Division of the Department of Finance.
- 4. The Licencee shall, prior to construction of the Development on Crown Land, obtain a Crown Lands Work Permit from Manitoba Sustainable Development, Parks and Resource Protection, Eastern Region, and comply with the conditions of the permit.

Compliance

- 5. The Licencee shall adhere to the commitments made in the Environmental Impact Statement (EIS), supporting information filed in association with the EIS, and any future approved alterations during construction, operation, and decommissioning of the Development.
- 6. The Licencee shall, during construction of the Dorsey international power line component of the Development, employ qualified environmental inspectors to monitor the work on a daily basis to ensure that all the environmental practices outlined in the EIS, supporting information, and the plans submitted pursuant to this licence are carried out.
- 7. The Licencee shall, prior to construction of the Development, arrange a meeting with the Manitoba Hydro construction project manager(s), the Manitoba Sustainable Development, Parks and Resource Protection, Eastern Region Integrated Resource Management Team (Eastern Region IRMT), and the Environment Officer responsible for the administration of this Licence to review construction related matters.

- 8. The Licencee shall, during construction of the Development, arrange quarterly meetings with the Eastern Region IRMT to discuss construction, environmental protection, and emergency response issues.
- 9. The Licencee shall, during construction of the Development, submit monthly reports regarding construction, environmental protection, and emergency response issues to the Director and the Eastern Region IRMT.

SPECIFICATIONS, LIMITS, TERMS AND CONDITIONS

Environmental Protection Plans

- 10. The Licencee shall submit, for approval of the Director of the Environmental Approvals Branch, a construction Environmental Protection Plan prior to construction, and an operations Environmental Protection Plan at least 90 days prior to in-service of the Development. The plans shall describe the approach to be used by the Licencee to ensure that mitigative measures are applied systematically, and in a manner consistent with the commitments made in the EIS and supporting information, during construction or operation of the Development. The plans shall:
 - a) include information obtained from Indigenous communities prior to and during construction and operation of the Development regarding the locations of specifically identified sites used for the exercise of Aboriginal rights-based activities in the vicinity of the project (such as plant harvesting, ceremonial practices, hunting, and trapping);
 - b) include mitigation measures and/or buffer zones for the specific sites identified to minimize impacts to the sites from construction and operation activities;
 - c) for specifically identified plant harvesting sites, identify measures to minimize impacts to the sites by implementing mitigation measure such as flagging of the area, buffers zones, selective clearing, construction matting, and non-chemical vegetation management; and
 - d) include mitigation measures to reduce adverse effects on wildlife and wildlife habitat (e.g., timing windows, setbacks, and buffers).
- 11. The Licencee shall continue to engage with Indigenous communities during construction and operation of the Development to provide opportunities for the identification of culturally sensitive sites to inform the Environmental Protection Program as described in the EIS.
- 12. The Licencee shall, prior to construction of the Development, submit management plans addressing the following topics for review by the Eastern Region IRMT and approval by the Director of the Environmental Approvals Branch:
 - a) erosion protection and sediment control;
 - b) rehabilitation and invasive species management, and
 - c) waste and recycling.

Manitoba Hydro – Manitoba-Minnesota Transmission Project Licence No. 3288 Page 6 of 14

13. The Licencee shall make available to the public all environmental management plans related to the Development that are developed by contractors.

Communication Plan

14. The Licencee shall submit a communication plan for the Development to the Director of the Environmental Approvals Branch, prior to construction. The plan shall describe how the Licencee will communicate to individuals and communities with an interest in the Development regarding information about activities, such as commencement and completion of construction, clearing, blasting, and vegetation management.

<u>Climate Change Considerations</u>

15. The Licencee shall consider greenhouse gas emissions throughout the supply chain in its selection process for suppliers and contractors for the Development.

Notification

- 16. The Licencee shall, not less than two weeks prior to beginning construction of the Development, provide notification to the Eastern Region IRMT and the Environment Officer responsible for the administration of this Licence of the intended start date of construction and the name of the contractor responsible for the construction.
- 17. The Licencee shall, prior to construction, provide a copy of this Licence to the contractor and subcontractor(s) involved in the Development.
- 18. The Licencee shall notify the Eastern Region IRMT and the Environment Officer responsible for the administration of this Licence, no less than one week prior to the completion of construction of the Development, to allow for a final inspection.

Culture and Heritage Resources

- 19. The Licencee shall provide an opportunity for participation of Indigenous communities in culture and heritage resource surveys conducted in association with the Development and to be contacted should culture and heritage resources be discovered during construction of the Development.
- 20. The Licencee shall comply with the requirements of The Heritage Resources Act and, if heritage resources are encountered during the construction of the Development, suspend construction and immediately notify the Historic Resources Branch.
- 21. The Licencee shall, prior to construction, submit a Cultural and Heritage Resources Protection Plan for the Development, as described in the EIS, for approval of the Director of the Environmental Approvals Branch.

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22. The Licencee shall provide cultural and heritage resource awareness training for staff working in construction areas within the Development. The training shall include recognizing cultural sites and management of any resources encountered.

Access Management

- 23. The Licencee shall, prior to construction of the transmission line component of the Development, submit a construction access management plan for review by the Eastern Region IRMT and approval of the Director of the Environmental Approvals Branch. The construction access management plan shall include, but not be limited to, the anticipated types and locations of roads, trails, and water crossings required to access the Dorsey international power line right-of way for construction purposes and a plan for review and approval of unanticipated new access trails and by-pass trails along the right-of-way. The Licencee shall ensure construction access is not located in specifically identified sites used for the exercise of Aboriginal rights-based activities in the vicinity of the project.
- 24. The Licencee shall, prior to completion of construction of the transmission line component of the Development, submit an operations access management plan for Crown lands for review by the Eastern Region IRMT and approval of the Director of the Environmental Approvals Branch. If changes to the plan are proposed, they shall be reviewed with the Eastern Region IRMT and an updated plan shall be submitted for approval of the Director of the Environmental Approvals of the Environmental Approvals Branch. The plan shall be submitted for approval of the Director of the Environmental Approvals Branch. The plan shall include, but not be limited to:
 - a) the location of roads, trails, and water crossings required to access the Dorsey international power line right-of way for maintenance and ongoing operations purposes;
 - b) the identification of roads, trails, and water crossings to be decommissioned at the completion of construction, and the methods and timeframes for conducting decommissioning and rehabilitation works; and
 - c) access methods to be used for managing vegetation along the Dorsey international power line right-of-way.
- 25. The Licencee shall inform all private landowners whose property is crossed by the Dorsey international power line new right-of way in forested areas that when a specific, related access issue has been identified, measures to limit access to their property from the right-of way (e.g. fencing with a gate and signage), will be included in an agreement with Manitoba Hydro and supplied and installed at the Licencee's expense.
- 26. The Licencee shall annually inspect the Dorsey international power line right-of-way for the effectiveness of access controls implemented in association with the Development, until otherwise directed by the Director of the Environmental Approvals Branch. Annual reports on the results of the inspections shall be submitted to the Director of the Environmental Approvals Branch. Where access controls are not effective, the Licencee shall work with either the private landowners or the Eastern Region IRMT to address the issue.
Construction Camps

27. The Licencee shall, prior to construction of the Development, obtain approval from the Eastern Region IRMT for mobile construction camps located on Crown land and not within the transmission line right-of-way.

Clearing During Construction

- 28. The Licencee shall, prior to construction of the Development, submit a plan for clearing of the transmission line right-of-way for approval of the Director of the Environmental Approvals Branch. The plan shall:
 - a) describe the clearing methods to be used; and
 - b) describe opportunities for retention of low-growth vegetation along the transmission line right-of-way, to the extent possible, without impeding maintenance activities or vegetation clearance requirements.
- 29. The Licencee shall, prior to construction of the Development, consult with the Regional Forester of the Forestry and Peatlands Branch related to the clearing of timber in association with the Development. Where an opportunity exists, a plan for timber operations may be established and timber shall be harvested and delivered to an approved destination identified by a scaling plan. In the event that no market exists, a timber valuation (Timber Damage Appraisal) shall be applied.
- 30. The Licencee shall inform Indigenous communities that firewood cleared from the right-of-way on Crown land will be stockpiled for public access in the vicinity of the Development.
- 31. The Licencee shall minimize the burning of slash generated during clearing of the Development where smoke may affect residences. In these areas, the Licencee shall dispose of slash using environmentally suitable methods such as chipping and mulching where feasible.

Mineral Licks

32. The Licencee shall, prior to clearing of the Development, conduct a survey in the spring and/or early summer to identify mineral licks within the transmission line right-of-way and surrounding area. All mineral lick locations shall be reported to the Eastern Region IRMT. A minimum setback distance of 120 metres shall be maintained between construction activities and mineral licks, unless otherwise approved by the Eastern Region IRMT.

Water Crossings

33. The Licencee shall, during construction and operation of the Development, manage activities within riparian areas as described in the EIS and supporting information.

34. The Licencee shall, prior to initiating construction of any portion of the Development across the Red River Floodway at the control structure, enter into a Memorandum of Agreement with the Minister of Infrastructure, with terms and conditions governing the construction and operation of the portion of the Development at this location.

Wetlands

- 35. The Licencee shall carry out activities associated with the Development that may disturb wetlands in the Caliento, Sundown, and Piney Bogs only under frozen ground conditions. Maintenance activities within these bogs shall be conducted under frozen ground conditions unless required to ensure the safe and reliable operation of the Development, in which case mitigation measures to reduce impacts to the bogs shall be implemented.
- 36. The Licencee shall, within three months of the completion of construction of the Development, submit a plan for approval of the Director of the Environmental Approvals Branch to ensure that there is no net loss of wetland benefits related to Class 3, 4, and 5 wetlands (as defined by the Stewart & Kantrud Classification System) that are altered or destroyed during construction of the Development.

Golden-Winged Warbler Habitat Management Plan

37. The Licencee shall implement the plan titled "Right-of-Way Habitat Management Plan for Managing Critical Golden-winged Warbler Habitat during Construction and Operation of the Manitoba-Minnesota Transmission Project" submitted as supporting information on April 29, 2016, or any subsequent versions approved by the Director of the Environmental Approvals Branch.

Invasive Species

- 38. The Licencee shall, during construction and operation of the Development, prevent the introduction and spread of foreign aquatic biota. Equipment shall be cleaned in accordance with the requirements of Manitoba Regulation 173/2015 respecting Aquatic Invasive Species, or any future amendment thereof.
- 39. The Licencee shall, prior to construction of the Development, submit a detailed biosecurity plan for approval of the Director of the Environmental Approvals Branch. The plan shall describe measures to be implemented to control the spread of invasive species as well as the spread of soil borne diseases from field to field in agricultural areas during construction of the Development.

Pesticide Application

40. The Licencee shall adhere to Pesticides Regulation 94/88 R, or any future amendment thereof, for the storage, handling and application of pesticides in conjunction with the Development.

Petroleum Storage and Handling

- 41. The Licencee shall locate fuel storage and equipment servicing areas established for the construction and operation of the Development a minimum distance of 100 metres from any waterbody, and shall comply with the requirements of Manitoba Regulation 188/2001 respecting Storage and Handling of Petroleum Products and Allied Products, or any future amendment thereof.
- 42. The Licencee shall, during construction and operation of the Development, operate, maintain, and store all materials and equipment in a manner that prevents any deleterious substances including fuel, oil, grease, hydraulic fluid, coolant, and other similar substances from contaminating soil or entering any waterbody. Emergency spill kits for both land and in-water use shall be readily available on site during construction.

Solid Waste Disposal

43. The Licencee shall dispose of all solid waste generated at the Development, which is not recycled, only to a waste disposal ground operating under the authority of a permit issued pursuant to Manitoba Regulation 37/2016 respecting Waste Management Facilities or any future amendment thereof, or a Licence issued pursuant to The Environment Act.

Onsite Wastewater Disposal

44. The Licencee shall, during construction of the Development, dispose of all sewage and septage from on-site sanitary facilities in accordance with the Onsite Wastewater Management Systems Regulation 83/2003, or any future amendment thereof.

Spill Response

- 45. The Licencee shall, in the case of physical or mechanical equipment breakdown or process upset where such breakdown or process upset results or may result in the release of a pollutant in an amount or concentration, or at a level or rate of release, that causes or may cause a significant adverse effect, immediately report the event by calling the 24-hour environmental accident reporting line at 204-944-4888 (toll-free 1-855-944-4888). The report shall indicate the nature of the event, the time and estimated duration of the event and the reason for the event.
- 46. The Licencee shall, following the reporting of an event pursuant to Clause 45, a) identify the repairs required to the mechanical equipment;

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- b) undertake all repairs to minimize unauthorized discharges of a pollutant;
- c) complete the repairs in accordance with any written instructions of the Director; and
- d) submit a report to the Director about the causes of breakdown and measures taken, within one week of the repairs being done.

Erosion Control

47. The Licencee shall, during construction and operation of the Development, take all appropriate measures to prevent erosion and the deposition of sediment into any waterbody.

Noise Nuisance

48. The Licencee shall not cause or permit a noise nuisance to be created as a result of the construction, operation, or alteration of the Development, and shall take such steps as the Director may require to eliminate or mitigate a noise nuisance.

Vegetation Management

- 49. The Licencee shall, within six months of the completion of construction of the Development, submit for review by the Eastern Region IRMT and approval of the Director of the Environmental Approvals Branch, a plan for the management of vegetation along the Dorsey international power line right-of-way. The plan shall describe the methods to be used for vegetation control and for communication to the public and Indigenous communities during operation of the Development.
- 50. The Licencee shall conduct reviews, and report to the Director of the Environmental Approvals Branch, on the results of integrated vegetation management practices implemented on the Dorsey international power line right-of-way of the Development 5 and 10 years after the completion of construction and as determined by the Director thereafter.
- 51. The Licencee shall offer private landowners compensation to plant shrubs or trees outside of the Dorsey international power line right-of-way to replace shelterbelts removed from their property in relation to the Development.
- 52. The Licencee shall provide notification to local Indigenous communities a minimum of 30 days prior to the application of herbicides within the transmission right-of-way of the Development.

Monitoring

53. The Licencee shall, prior to construction, submit a monitoring plan for the Development for the approval of the Director of the Environmental Approvals

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Branch. The plan shall describe monitoring programs to be undertaken in relation to the Development, including proposed programs for:

- a) collection of baseline information;
- b) pre-construction surveys of the eastern tiger salamander and mottled duskywing butterfly obligate plant host, in areas of likely habitat;
- c) inclusion of the least bittern and the short-eared owl in surveys;
- d) pre-construction surveys for traditional use plant species and invasive plant species in areas of the Development where information on these plant species is insufficient; and
- e) monitoring of peregrine falcon interactions with the Dorsey international power line in the vicinity of the Parkland Mews breeding site and reporting of mortalities.
- 54. The Licencee shall consult annually with the Wildlife and Fisheries Branch of Manitoba Sustainable Development on the progress of the monitoring programs approved pursuant to Clause 53 of this Licence, and on any proposed adjustments or amendments to the programs.
- 55. The Licencee shall establish and support a monitoring advisory group composed of nominees of First Nations communities and the Manitoba Metis Federation, which will be invited to provide input into monitoring and management of the Dorsey international power line right-of-way of the Development for the duration of the monitoring programs approved pursuant to Clause 53 of this Licence.
- 56. The Licencee shall submit annual reports to the Director of the Environmental Approvals Branch, on the results of monitoring programs approved pursuant to Clause 53 of this Licence for the duration of the monitoring programs. The reports shall:
 - a) report on the accuracy of predictions made in the EIS and supporting information,
 - b) report on the success of the mitigation measures employed during construction and operation,
 - c) provide a description of the adaptive management measures undertaken to address issues, and commitments for future mitigation;
 - d) identify any unexpected environmental effects of the Development;
 - e) identify additional mitigation measures to address unanticipated environmental effects, if required;
 - f) report on how input from the monitoring advisory group, formed pursuant to Clause 55 of this licence, was incorporated into the monitoring program; and
 - g) propose changes to the monitoring programs based on the results of the annual assessments.
- 57. The Licencee shall provide the data from monitoring programs approved pursuant to Clause 53 of this Licence to the Wildlife and Fisheries Branch of Manitoba Sustainable Development. The data provided shall include sufficient detail to allow for its assessment.

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- 58. The Licencee shall implement additional mitigation measures that are requested by the Director of the Environmental Approvals Branch to address unanticipated environmental effects of the Development identified by the monitoring programs approved pursuant to Clause 53 of this Licence.
- 59. The Licencee shall implement changes to monitoring programs approved by the Director of the Environmental Approvals Branch pursuant to Clause 56 g) of this licence.

Reporting

60. The Licencee shall maintain a frequently updated, project-related website where monitoring advisory group minutes and reports (when approved by the group), reports on monitoring and assessment of mitigation, and other material relevant to the Development will be posted.

Decommissioning

- 61. The Licencee shall decommission temporary infrastructure associated with the Development on Crown land to the satisfaction of the Eastern Region IRMT.
- 62. The Licencee shall, prior to decommissioning of the Development, submit for approval of the Director of the Environmental Approvals Branch, a decommissioning and rehabilitation plan for the Development.

Implementation of Plans

63. The Licencee shall implement the plans submitted and approved pursuant to this licence.

Respecting Alterations to the Development

64. The Licencee shall obtain written approval from the Director of the Environmental Approvals Branch for any proposed alteration to the Development before proceeding with the alteration.

REVIEW AND REVOCATION

- A. If, in the opinion of the Director, the Licencee has exceeded or is exceeding or has or is failing to meet the specifications, limits, terms, or conditions set out in this Licence, the Director may, temporarily or permanently, revoke this Licence.
- B. If construction of the development has not commenced within three years of the date of this Licence, the Licence is revoked.

C. If, in the opinion of the Director, new evidence warrants a change in the specifications, limits, terms or conditions of this Licence, the Director may require the filing of a new proposal pursuant to Section 11 of The Environment Act.

"Original signed by"

Rochelle Squires Minister of Sustainable Development

File: 5750.00

Appendix D: Mitigation Sheets

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1. ACCESS - ENVIRONMENTAL MITIGATION MEASURES



Component Description

Access is required for new or existing rights-of-way (ROW) to allow equipment and personnel onto transmission line ROWs for construction and maintenance activities. Access refers to routes of entry onto existing or new ROWs. Clearing, grading and other measures to create entry on to a ROW may be required to develop new access route or enhance existing access routes. Existing roads, trails or cutlines can all be used as potential access routes. The use of existing access routes is preferred for all work activities. New access routes are treated like new ROW in terms of environmental protection.

Environmental Protection Objective

The environmental mitigation measures are designed to minimize creation of new access and prevent ground, habitat, and wildlife disturbance where existing trails need improvement or new access routes created.

Internal ID	Mitigation
Regulatory	
1.00	When required, Manitoba Conservation and Climate (MCC) work permits will be obtained prior to the commencement of the project, this could take months so plan accordingly.
1.01	Contact the Line Inspector to obtain all necessary MCC and Manitoba Infrastructure (MI) permits, property agreements, right-of-way easements, and local stakeholder concerns, prior to project start-up.
1.02	All constructed access points onto MI roadways (Provincial Roads or Provincial Trunk Highways) will require a permit from MI.
1.03	Heavy equipment will not be allowed access to MI roadways without the appropriate protection and permits.
1.04	All works undertaken within the MI right-of-way (ROW) will adhere to the MI traffic control policies.
Access	
1.05	Where an access management plan hasn't been created, use existing roads, trails, or cut lines. Permission to use existing resource roads (i.e., forestry roads) must be obtained.
1.06	Use existing roads and trails wherever possible. MCC must approve a temporary route before it is cleared. Snow should be compacted and leveled rather than pushing it and organic material aside. Avoid pushing debris and felled trees into standing timber. Consult a Transmission Line Maintenance (TLM) Environmental Specialist for further direction.
1.07	On Agricultural Lands, use existing access where possible. All fences and gates are to be left in an "as-found" condition re-closed upon entering or exiting fence lines.

Internal ID	Mitigation	
1.08	If a prospective access road or trail is located off easement and on private land, a private land agreement must be submitted to Manitoba Hydro (MH) for approval prior to any access use occurring.	
Methods		
1.09	Access roads and trails will be cleared to a minimum length and width to accommodate the safe movement of required equipment.	
1.10	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.	
1.11	Rock utilized for access road construction must not have acid or alkali generating properties unless mitigated for.	
1.12	The work site must be kept tidy at all times. Waste must be collected for proper disposal. All burning and slash disposal must be carried out as stipulated in the Work Permits.	
1.13	Travel on Tundra, permafrost, and areas of high water content and organic soils is restricted to frozen conditions. Avoid excavations of any kind in Permafrost.	
Siting-Sensitiv	e	
1.14	Bypass trails, sensitive sites and buffer areas will be clearly marked prior to clearing, to identify that prescribed selective clearing is to occur (e.g.: as per map sheets).	
1.15	 If sensitive sites or areas of concern are found during clearing of a temporary access route, the Field Supervisor must be notified. New sensitive sites might include: heritage resource sites, rare or medicinal plant areas, trees containing large stick nests, active dens or burrows. 	
1.16	If sensitive sites (such as heritage sites, rare plants, trees containing large stick nests, active dens or burrows) or areas of concern are found, contact the Line Inspector and/or a TLM Environmental Specialist.	
1.17	Helicopter landing pads should be located within the right-of-way as much as possible and away from sensitive sites.	
Siting		
1.18	Avoid wetland areas if possible. 30 m management buffers should be maintained around wetlands and riparian zones.	
1.19	Approach grades to waterbodies will be minimized to limit disturbance to riparian areas.	
1.20	For access roads and trails that use or cross MI roadways, care will be taken to ensure excessive amounts of material are not tracked onto the roadway, with site personnel being responsible for cleanup.	
1.21	Any temporary constructed access and associated debris within an MI right of way will need to be removed seasonally and once the project is completed.	
Riparian Habitat/Stream		
1.22	Surface water runoff will be directed away from disturbed and erosion prone areas but not directly into waterbodies.	
1.23	Stream crossings must be at designated sites only. Where permanent bridges, culverts or ford crossings are needed, they must be approved by Manitoba Conservation and Climate (MCC) and specific Work Permits for their construction must be obtained. Trees that fall in the water must be removed by hand. The debris that results from clearing must be piled above the high water mark.	
1.24	Ice crossings will be constructed and maintained as found in ice thickness chart in	

Internal ID	Mitigation	
	Appendix. Ice thickness must be checked regularly and thickness in cm and date posted.	
1.25	Ice bridges should be located where winter stream flow is slow, where there is minimum approach grade and shortest crossing route. Construct using only snow, ice and de-limbed logs, or by freezing down the waterway. Chain the logs together to facilitate removal. No tree limbs or soil can be used. No disturbance of the stream banks should occur. The ice bridge must be removed or broken up (V-shaped notch) before spring thaw. Please review work permits for further instructions.	
Vegetation Me	anagement	
1.26	Vegetation control along access roads and trails will be in accordance with Rehabilitation and Invasive Species Management Plan.	
Soil Managem	nent service servi	
1.27	Access roads and trails will be provided with erosion and sediment control measures in accordance with the Erosion and Sediment Control Plan.	
1.28	Disturbance to soil should be minimized during construction of access roads. Snow should be compacted and leveled rather than pushing it and organic material aside.	
1.29	During winter work activities, 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.	
Signage		
1.30	Access road signage indicating road or trail number as per signage standard will need to be installed and maintained.	
Decommission	ing	
1.31	Access roads and trails no longer required will be decommissioned and rehabilitated in accordance with the Rehabilitation and Invasive Species Management Plan.	
1.32	When access routes are no longer needed, they should be rehabilitated. If an access route is required for use in the future, it should be left in stable condition. Steps should be taken to limit public access to these routes.	
Non-mitigation		
OMLM11- 1\1.33	Review any applicable Environment Act licenses or existing Environmental Protection Plans that are applicable to the transmission line being worked on (see Appendices).	
OMLM11- 3\1.34	Tailboard meetings shall review and mitigate for environmental concerns.	
OMLM11- 12\1.35	In urban areas, all municipal and local by-laws shall be respected. Review work activities with local authorities. Mitigate impacts to infrastructure, trees, parks and landscaped areas.	



Photo 1:Access trail avoiding steep embankment at a river crossing.



Photo 3: An Environmentally Sensitive Site properly signed along an access trail.



Photo 2: Aerial view of access trail.



Photo 4: An access trail constructed on frozen ground to minimize ground disturbance and rutting.

2. AGRICULTURAL AREAS - ENVIRONMENTAL MITIGATION MEASURES



Application

In agricultural areas there is potential to spread disease, pests and invasive plant species to agricultural land and livestock operations. Soil containing pathogens or weed seeds attached to vehicles, equipment and people are easily transferred from farm to farm without appropriate mitigation. Agricultural biosecurity is essential where equipment or personnel are moving from field to field as part of construction or maintenance activities. All Manitoba Hydro (MH) personnel, contractors and consultants must adhere to the Agricultural Biosecurity Standard Operating Procedure (SOP).

Environmental Protection Objective

To prevent the introduction and spread of disease, pests, and invasive species in agricultural land and livestock operations in Manitoba.

ID	Mitigation	
Access		
EC-1.02/2.00	Any necessary access on agricultural lands will be discussed in advance with the landowner.	
OM16-2/2.01	Existing access will be utilized where possible. Any necessary access on agricultural lands should be discussed with, and approved by the landowner. Vehicular travel should be kept to a minimum.	
EC-1.07/2.02	Required travel off existing roads will be minimized and restricted to previously designated and approved routes.	
EC-1.08/2.03	Vehicle and equipment travel on agricultural lands will follow existing roads, trails and paths to the extent possible.	
EC-1.09/2.04	Where access to agricultural land is necessary the Transmission Agricultural Biosecurity SOP must be followed.	
Regulatory		
EC-1.10/2.05	When work activities take place through agricultural lands, drainage patterns are not to be altered; any anticipated diversions of surface water will require authorization under The Water Rights Act. This applies to creating new drainage, blocking natural drainage or diverting flows around a site.	
OM16-1/2.06	All licenses, permits and landowner authorization/agreements are required prior to project commencement including informing the local government officials (i.e., the municipal council).	
General		
OM16-6/2.07	Any property damages are to be dealt with in accordance with Corporate Policies and Procedures.	

ID	Mitigation		
Methods	Methods		
EC-1.01/2.08	All fences and gates will be left in "as-found" condition.		
	Excess materials (i.e., waste, granular fill, clay) will be removed from work sites and		
EC-1.05/2.09	areas located on agricultural lands. Area will be restored to pre-existing conditions.		
Rehabilitation			
	Work sites impacted by work activities may need to be rehabilitated for compaction		
EC-1.03/2.10	or compensation paid out to the landowner\leasee.		
Non-mitigation			
	Review project plans with all workers to ensure zero impact to other utility		
OM16-5/2.11	infrastructure. Check resources such as click before you dig or the property		
	department		



Photo 2: Clubroot infection in canola plant. Source: Manitoba Agriculture



Photo 2: A tracked-vehicle arriving on site free of soil and other debris.



Photo 3: A worker cleaning equipment in the winter with compressed air.



Photo 4: A worker disinfecting equipment to prevent the spread of bio-hazards.



Photo 5: Truck tires are scrubbed clean of any soil Photo 6: Boots and other clothing containing soil or debris before driving on to the next site.



are sprayed clean.

3. AQUATIC INVASIVE SPECIES - ENVIRONMENTAL MITIGATION MEASURES



Component Description

Noxious Aquatic Invasive Species (AIS) including zebra mussels, spiny water flea and black algae occur in specific Manitoba water bodies. The Manitoba AIS Regulation (173/2015) must

be adhered to when performing work in or adjacent to water that requires the use of watercraft and construction or personal water-related equipment.

Environmental Protection Objective

To prevent the spread of all AIS, from sources both within and outside Manitoba.

Internal ID	Mitigation		
Regulatory	Regulatory		
1.00	Possession, transportation (intentional or not), deposit and release of AIS in Manitoba,		
1.00	is prohibited.		
	Clean, Drain, Dry and Dispose, general cleaning requirements apply to all Manitoba		
1 01	waters. Before transporting watercraft, trailer and/or water-related equipment away		
1.01	from a water body (lake, river, stream, wetland etc) remove all AIS, aquatic plants,		
	debris, and aquatic mud; drain all water; and ensure bait is disposed of in the garbage.		
	Pull the Plug. Watercraft must be transported with all drain plugs pulled out and valves		
1 02	open, ensuring they can dry and water is not inadvertently moved. Ensure all hard to		
1.02	drain compartments and equipment are completely dry or if necessary		
	decontaminated.		
	Know Your Control Zone. Contractors must be familiar with the six Control Zones		
1.03	which have been established in Manitoba, to contain and prevent the further spread of		
	AIS.		
	Decontaminate all watercraft, trailers and water-related equipment used in a control		
1.04	zone, using prescribed methods of hot water, freezing or chemical applications, as per		
-	the AIS Regulation. Decontamination requirements are in addition to the general		
	Clean, Drain, Dry and Dispose provisions, applicable when leaving all water bodies.		
	Apply to Manitoba Conservation and Climate (MCC) for a Transportation Permit to		
1.05	authorize watercraft or water-related equipment encrusted with AIS to be moved away		
	from the source control zone water body, for decontamination at a different location.		
1.06	Ensure decontamination methods are selected, prepared and planned before		
	mobilizing to site, adhering to the AIS Regulation.		
1.07	If moving between multiple water bodies, start work where AIS are not present or		
	furthest point from known AIS occurrence; sequence work locations to ensure work		

Internal ID	Mitigation
	occurs moving from low risk areas to high risk water bodies. Ensure appropriate
	cleaning and/or decontamination is conducted as required, between sites.
	When transporting a watercraft or water-related equipment stop at all operating
1.08	Watercraft Inspection Station en route, identifiable on the highway by signs or
	placards. Submit to all inspections and abide by all orders.
	Reporting is the law. If you find an AIS outside its control zone, or one that is not
1.00	otherwise known to occur in that water body or location, you are required to report it
1.09	to Manitoba Conservation and Climate (MCC) at www.manitoba.ca/StopAIS or calling
	Manitoba's Invasive Species hotline at 1-877-867-2470 (toll-free).
	Do not transport the suspected AIS from the water body, unless instructed by
1 10	Manitoba Conservation and Climate (MCC).
1.10	Take pictures, record GPS coordinates, note location and number of specimens along
	with other relevant information.



Photo 3: Mature zebra mussel. Zebra mussels may be as small as a grain of sand and better detected by feel. The distinctive striped pattern may also be absent.



Photo 2: Mass of spiny waterflea. Individuals measure 1.0-1.5 cm in length when fully grown.



Photo 3: Black algae filaments. Filaments may form large matts that either float or submerge on lake bottoms.



Photo 4: Common places where AIS can be found on a boat and trailer.



Photo 5: Map indicating Waterbodies Invaded by Zebra Mussels

4. BLASTING AND EXPLOSIVES USE - ENVIRONMENTAL MITIGATION MEASURES



Activity Description

Blasting is the use of explosives in construction and maintenance work for conductor splicing, foundation work, and rock quarrying.

Environmental Protection Objective

To minimize disturbance on people, wildlife and aquatic environment while conducting blasting activities.

ID	Mitigation	
Methods		
	Prior to blasting operations and conductor splicing. Activity schedule will be	
PA-1.01\3.00	communicated to affected parties which may include Manitoba Conservation and	
	Climate (MCC), RCMP, municipalities, landowners, and resource users.	
	If blasting and implodes must occur during timing windows established for sensitive	
PA-1 04\3 01	bird breeding, nesting and brood rearing months contact Transmission Line	
FA-1.04\3.01	Maintenance (TLM) Environmental Specialist for further instructions. Refer to Appendix	
	for reduced risk timing windows for wildlife.	
PA-1.06\3.02	Implode compression conductor splicing will be minimized to extent possible on	
PA-1.00\5.02	weekends and after normal working hours in residential areas.	
PA-1.06\3.02 PA-1.07\3.03 PA-1.08\3.04	Quarry blasting operations and conductor splicing will be scheduled to minimize	
PA-1.07\3.03	disturbance to wildlife and area residents, and to ensure the safety of workers.	
	The blasting contractor will be in possession of valid licenses, permits and certificates	
PA-1.08\3.04	required for blasting in Manitoba.	
	The blasting contractor will submit a blasting plan to Manitoba Hydro (MH) for review	
PA-1.08\3.04 PA-1.09\3.05 PA-1.10\3.06	and approval prior to commencement of blasting operations.	
	Use of ammonium nitrate and fuel oil will not be permitted in or near waterways. Only	
PA-1.10\3.06	Fisheries and Oceans Canada (DFO) approved explosives shall be permitted in or near	
	waterways.	
DA 4 44\ 2 07	Warning signals will be used to warn all project personnel and the public of safety	
PA-1.11\3.07	hazards associated with blasting.	
DA 4 40\ 0 00	Written and/or oral notification will be outlined in the communication plan prior to	
PA-1.12\3.08	each blasting period.	
Regulatory		
DA 4 03\ 2 00	Blasting will be conducted and monitored in accordance with DFO Guidelines for the	
PA-1.02\3.09	Use of Explosives In or Near Canadian Fisheries Waters.	
	Explosives will be stored, transported and handled in accordance with federal	
PA-1.05\3.10	requirements through the Explosives Act and Transportation of Dangerous Goods Act	
-	and provincial regulations stated in The Workplace Safety and Health Act.	



Photo 4: Conductor splicing using implosion sleeves.



Photo 3: Crews prepare a site for blasting after all required licences, permits and certificates are obtained.



Photo 2: Rock is blasted and quarried for project use.



Photo 4: Blasting occurring outside of timing windows for sensitive bird breeding, nesting and brood rearing.

5. BOGS, SWAMPS AND WETLANDS - ENVIRONMENTAL MITIGATION MEASURES



Activity Description

Crossing swamps and wetlands is necessary for maintenance activities and involves temporary crossings in winter, ford crossings, installation of bridges and/or culverts, low pressure tracked/tired vehicles, and amphibic vehicles.

Environmental Protection Objective

To plan and execute project avtivites to minimize impacts to wetland ecosystems. Wetlands sometimes referred to as bogs and/or swamps, are a range of sensitive aquatic ecosystems that can be easily impacted by project activitites.

ID	Mitigation	
Methods		
OM10-7\4.00	Although beaver dams can be a nuisance, they create valuable wildlife and aquatic habitat for many species. When possible, work with local area trappers and consult local Conservation Officer for Beaver Dam Removal.	
EC-9.10\4.01	Prior to seeking authorization from Manitoba Conservation and Climate (MCC) 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-8.05\4.02	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.	
OM10-4\4.03	Keep clearing and construction debris/waste out of wetland and riparian zones.	
4.04	DO NOT DEWATER A WETLAND. Contact the Transmission Line Maintenance (TLM) Environmental Specialist regarding de-watering a wetland for regulatory approval.	
OM10-6\4.05	Any dewatering of excavations or alterations to drainage should be done so that it avoids entering the natural water system.	
Riparian Buffer		
EC-8.02\4.06	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.	
Siting		
OM10-5\4.07	Infrastructure placement should be planned to avoid wetland sites. If avoidance is not an option, use of Cromated-Copper Arsenate (CCA) treated poles or steel/concrete (or approved alternate) structures must be used.	
Wildlife		
OM10-3\4.08	Work activities are allowed only within the reduced risk time period for wildlife illustrated (in Appendix). If work within the sensitive time period for wildlife is necessary, further mitigation and approvals would be required.	

Examples of wetlands:



Figure 11: GoogleEarth (2019 Apr 12) Prairie Pothole Wetland



Figure 2: GoogleEarth (2019 Apr 12) Netley Libau Marsh (Wetland)



Figure 3: GoogleEarth (2019 Apr 12) Slough (Wetland)



Figure 4: GoogleEarth (2019 Apr 12) Sting Fen (features, Wetland)



Figure 5: MH stock photo beaver lodge in open wetland.



Figure 6: MH stock photo, grass and open wetland.

6. BORROW PITS AND QUARRIES - ENVIRONMENTAL MITIGATION MEASURES



Component Description

Borrow pits are surface areas excavated for granular and fill material for use in construction or maintenance. Quarries generally refer to pits where rock is excavated and crushed for various construction uses. Collectively they are mineral resource extraction and processing areas subject to provincial regulation.

Environmental Protection Objective

Borrow pits and quarries are construction sites that require mitigation to minimize environmental effects. Groundwater protection is a major objective of for this type of work. Erosion control and heritage resources are also important categories for environmental protection during excavation activities.

ID	Mitigation		
Decommissioni	Decommissioning		
PC-2 01\5 00	Decommissioning of access to abandoned borrow pits and quarries will be managed in		
FC-2.01 \5.00	accordance with the Access Management Plan.		
	Once a borrow pit is no longer required, the pit must be re-contoured to create stable		
012-7501	slopes. Stockpiled slash and soil should be spread over the area to promote the re-		
01013-7 (3.01	establishment of vegetation. The area should be restored to as close to the original		
	state as possible.		
PC-2.02\5.02	All equipment and structures will be removed from borrow pits prior to abandonment.		
Fuel & Hazardo	us Materials		
PC-2.08\5.03	Fuel storage will not be permitted near stockpiles.		
Heritage			
	As marshalling yards, borrow sources, temporary work spaces, work camps are		
	identified, additional heritage monitoring activities may be required to be conducted		
PC-2.27\5.04	prior to approval contact the Transmission Line Maintenance (TLM) Environmental		
	Specialist prior to establishing new borrow pits and quarries.		
OM3-1\5.05	Obtain borrow pit approval and work permit from Manitoba Conservation and Climate		
01013-1 (3.03	(MCC) and make sure all work permit conditions are met.		
	If heritage resource material such as bones, pottery, etc. is discovered during the		
OM3-6\5.06	working of the borrow pit, a stoppage in work will take place and the Field Supervisor		
	must be notified immediately.		
Methods			
	Borrow pits and quarries will be designed, constructed and operated in compliance		
FC-2.03 \3.07	with provincial legislation and guidelines.		
	Drainage water from borrow pits and quarries will be diverted through vegetated		
PC-2.06\5.08	areas, existing drainage ditch(es) or employ a means of sediment control prior to		
	entering a waterbody.		
PC-2 10\5 00	Only water and approved dust suppression products will be used to control dust on		
FC-2.10/3.09	access roads where required. Oil or petroleum products will not be used.		
PC-2.11\5.10	Organic material, topsoil and subsoil with-in borrow pits and quarries will be stripped		

ID	Mitigation	
	and stockpiled for use in future site rehabilitation.	
PC-2.12\5.11	Previously developed borrow sites and quarries will be used to the extent possible	
	before any new sites are developed.	
PC-2.18\5.12	Worked out borrow pits and granular quarries will be left with a slope no steeper than	
	4:1 (horizontal to vertical) side slopes.	
PC-2.24\5.13	The blasting contractor shall check that blast rock does not have acid or alkali	
	generating properties and mitigate for contaminated run-off.	
	Vehicles hauling materials to or from the work site that have the potential for dust	
PC-2.26\5.14	emissions should be hauled with the load enclosed by an anchored tarp, plastic or	
	other material.	
Siting		
	Borrow pits and quarries will not be located within 150 m of a provincial trunk highway	
PC-2.04\5.15	or provincial road unless an effective vegetated berm is provided to shield the area	
	from view.	
OM3-2\5.16	The borrow pit should be located as close to the existing access as possible.	
	Borrow pits and quarries will not be located within established buffer zones and	
PC-2.05\5.17	setback distances from identified environmentally sensitive sites without approval	
	from MH Specialist.	
	The borrow pit must be located more than 100 m away from the high water mark of	
01014\5.18	water bodies.	
Vegetation Ma	nagement	
PC-2.15\5.19	Vegetated buffer areas will be left in place when borrow pits are cleared to help	
	prevent soil erosion, to help enhance wildlife habitat in accordance with provincial	
	guidelines.	
	Vegetation control at borrow pits and quarries will be in accordance with the	
PC-2.16\5.20	Rehabilitation and Invasive Species Management Plan.	
PC-2.17\5.21	Vegetation in active Manitoba Hydro (MH) permitted borrow pits and quarries will be	
	maintained as per the Rehabilitation and Invasive Species Management Plan.	
Waste Management		
PC-2.09\5.22	Waste/garbage, debris or refuse will not be discarded into borrow pits and quarries or	
	buried during reclamation activities.	



Photo 1: Gravel from a borrow pit being loaded onto a truck for transportation.



Photo 2: A borrow pit next to a highway with a vegetative berm to shield the area from view.



Photo 3: Ariel view of a borrow pit during winter.



Photo 4: Spreading stockpiled soils over borrow pit slopes for rehabilitation.

7. BUILT-UP AND POPULATED AREAS - ENVIRONMENTAL MITIGATION MEASURES

Component Description

Residential and industrial zones areas that are built up and populated that may be impacted by operation and maintenance activities. This may include areas such as homes, farms, cabins, cottages, stores, work yards.

Environmental Protection Objective

Built-up and populated areas may require planning and permitting to minimize effects to the surrounding people and infrastructure. Noise and dust pollution are the main concerns to mitigate for.

ID	Mitigation
Methods	
EC-2.01\6.00	Work activities and equipment will be managed to avoid damage and disturbance to
	adjacent properties, structures, and operations.
EC-2.02\6.01	Mud, dust, and vehicle emissions will be managed in a manner that ensures safe and
	continuous public activities near work sites.
EC-2.03\6.02	Noisy work activities where noise and vibration may cause disturbance and stress in
	built up areas will be limited by applicable noise bylaws.
EC-2.05\6.03	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.
Soil Management	
EC-2.04\6.04	All stockpiles shall be maintained as to minimize dust associated with fine soils prone
	to wind erosion (i.e., covering with tarp/poly, maintain wetted surface).

8. BURNING - ENVIRONMENTAL MITIGATION MEASURES



Activity Description

Burning is used to dispose of cleared woody vegetation on new rights-of way ROWS. It involves gathering timber and debris into discrete piles on the ROW and burning to dispose of the material. It is used primarily in remote areas where timber is merchantable and uneconomical to take off site.

Environmental Protection Objective

To conduct burning activity in a safe manor than minimizes environmental impacts and is isolated to the ROW being cleared.

ID	Mitigation
Methods	
PA-2.01\7.00	All occurrences of uncontrolled burning or fire spreading beyond the debris pile will be reported immediately to Manitoba Hydro (MH).
PA-2.09\7.01	Debris piles scheduled for burning will be piled on mineral soils where possible.
PA-2.11\7.02	Slash will be piled in a manner that allows for clean, efficient burning of all material and on mineral soils where applicable.
PA-2.13\7.03	Site personnel 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.
Monitoring	
PA-2.05\7.04	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.
Regulatory	
PA-2.07\7.05	A burning permit is required between April 1st and November 15. And notification is required for remainder of year. Consult MS website to confirm there are no restrictions.
PA-2.10\7.06	Firefighting equipment required by legislation, guidelines, contract specifications and work permits will be kept on site and maintained in serviceable condition during burning.
Riparian Habita	t/ Stream Crossings
PA-2.06\7.07	Burning will not be carried out within riparian buffer zones or setbacks for stream crossings or waterbodies.
Limitations	
PA-2.02\7.08	Any residue or unburned materials remaining post-burn is not to encumber operations or re-vegetating activities.
PA-2.03\7.09	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 be removed from site.
PA-2.04\7.10	Burning of solid wastes including kitchen wastes and treated wood will not be permitted.

ID	Mitigation
PA-2.08\7.11	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-2.12\7.12	Burning of any material is not permitted on Manitoba Infrastructure (MI) roadway ROW's.



Photo 1: Moving timber and slash into piles for burning.



Photo 2: A fire extinguisher is marked and located near a burning pile.



Photo 3: This burning location was selected to avoid impacts on residences, towns and highways.



Photo 4: Merchantable timber neatly piled to be brought to market.

9. CLEARING - ENVIRONMENTAL MITIGATION MEASURES



Activity Description

Clearing generally refers to the cutting and disposal of trees, shrubs and other vegetation on rights-of-way (ROW) or worksite. There are several different methods of clearing and associated activities such as mechanical, lowdisturbance and hand clearing.

Environmental Protection Objective

The environmental mitigation measures for clearing are designed to prevent environmental impact on soils, water, and wildlife while creating a sustainable ROW that meets transmission line requirements for safe, reliable operation. Clearing method and timing is key in environmental protection.

ID	Mitigation
Access	
PA-3.02\8.00	Access to clearing areas will utilize existing roads and trails to the extent possible.
OMLM7- 10\8.01	Use existing roads and trails wherever possible. The Natural Resource Officer must approve a temporary route before it is cleared. Snow should be compacted and leveled rather than pushing it and organic material aside. Avoid pushing debris and felled trees into standing timber.
OMLM7-	On Agricultural Lands, use existing access where possible. All fences and gates are to be
16\8.02	re-closed upon entering or exiting fence lines.
Methods	
PA-3.03\8.03	All clearing and maintenance equipment is to remain within the bounds of access routes and project footprint identified.
PA-3.05\8.04	Chipped or mulched material may be collected for use in work areas and sediment / erosion control on site.
PA-3.07\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
PA-3.12\8.06	Vehicles where possible will be wide-tracked or equipped with high flotation tires to minimize rutting and compaction to surface soils.
PA-3.13\8.07	Vehicles, machinery and heavy equipment will not be permitted in designated machine- free zones except at designated crossings.
PA-3.14\8.08	Danger trees will be flagged/marked for removal using methods that do not damage soils and adjacent vegetation.
PA-3.17\8.09	Machine clearing will remove trees and brush with minimal disturbance to existing organic soil layer using a shear "V" or "K-G" type blades, feller-bunchers, mulcher, chipper and other means approved by the Transmission Line Maintenance (TLM) Environmental Specialist. Straight "bulldozer" blades must not be used.

ID	Mitigation
PA-3.20\8.10	Slash piles will be placed at least 15 m from forest stands.
PA-3.21\8.11	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 32\8 12	During mulching or chipping activities, debris must be directed away and not enter
FA-3.32 (8.12	watercourses.
OM4-5\8 13	The slash from the right-of-way must be cut, piled, burned or disposed of as specified in
	the Work Permit. Debris and brush must not be pushed into standing timber.
OMLM7-	"Shearing" shall be with K-G blades, or V-Blades, straight bulldozer blades are not
5\8.14	acceptable
OMLM7-	Avoid leaving brush piles and windrows. Reduce fire hazard and restrictions to wildlife
6\8.15	and recreational vehicle travel.
OMI M7-	Travel on Tundra, permafrost, and areas of high water content and organic soils is
15\8.16	restricted to frozen conditions or mitigated for with low ground pressure vehicles and
	equipment.
Regulatory	
PA-3.28\8.17	If clearing is needed on a Manitoba Infrastructure (MI) roadway ROW, clearance must be
	obtained from MI in advance.
PA-3.31\8.18	Storing elm wood firewood is prohibited under the Dutch Elm Disease Act.
OMLM7-	Contact the Line Inspector to obtain all necessary Manitoba Conservation work permits,
2\8.19	property agreements, right-of-way easements and local stakeholder concerns.
OMLM7-	In Urban Areas, all municipal and local by-laws shall be respected. Review work activities
17\8.20	with local authorities. Mitigate impacts to infrastructure, trees, parks and landscaped
Dingrign Ughit	areas.
кірапап нарп	A Binarian Buffer must be used on all Binarian Areas, within this area shrub and
	A Riparian burlet must be used on all Riparian Areas, within this area shrub and
	Hydro vogotation cloarance requirements. This Buffer shall be a minimum of 20 m
	manufer and from the Ordinary High Water Mark where no ground disturbance is
DA 2 01\ 9 21	nermitted. This distance will increase in size based on slope of land entering waterway
FA-3.01 (0.21	Within the Piparian Puffer a "Machine Free Zene" applies which also increases with
	slope, this area can be cleared of trees by reaching in with mechanical harvesting
	slope, this area can be cleared of thees by reaching in with mechanical harvesting
	Zono" which can be cleared using benuesting equipment. Soo Figure 1
	Zone which can be cleared using harvesting equipment. See Figure 1.
	stream crossings must be at designated sites only. Where an ice bridge is required at a
	choising, using only show, ice and de-imbed logs, or by freezing down the waterway.
	Chain the logs together to facilitate removal. No tree limbs, organic or mineral soil can be
13\8.22	used. No disturbance of the stream banks should occur. The ice bridge must be removed
	or broken up before spring thaw. Check with current Manitoba Stream Crossing
	Guidelines in Appendix.
OMLM7- 14\8.23	where temporary or permanent bridges, cuiverts or ford crossings are needed, they
	must be approved by the Natural Resource Officer and specific work Permits for their
	construction must be obtained. Check with current Manitoba Stream Crossing Guidelines
Sianaae	
OM4-1\8 24	Areas identified for selective clearing (e.g. huffer zones, sensitive sites) must be clearly
0.24	marked and appropriate mitigation measures must be identified and applied
	marked and appropriate mitigation measures must be identified and applied.

ID	Mitigation
PA-3.18\8.25	Buffers and sensitive areas (where applicable) should be clearly marked with stakes
	and/or flagging tape prior to clearing.
Sensitive Sites	
OMLM7-	If sensitive sites or areas of concern are found, contact the Line Inspector and/or the
11\8.26	Transmission Line Maintenance (TLM) Environment Specialist. This may include: heritage
()(sites, rare plants, trees containing large stick nests, active dens or burrows.
PA-3.11\8.27	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.
	It new sensitive sites or areas of concern are found during clearing, the Field Supervisor
OM4-4\8.28	must be notified. New sensitive sites might include: neritage resource sites, rare or medicinal plant areas, trees containing large stick posts, active animal dans or burrows
	and transer trails
Soil Managem	and trapper traits.
Son Managem	In locations where grubbing and vegetation stringing is not required disturbance to roots
PA-3.16\8.29	and adjacent soils will be minimized.
OM5-6\8.30	Retain all shrub understory Disturb the ground surface as little as possible.
Training/Com	munication
OMLM7-	Review any applicable Environment Act licenses or existing Environmental Protection
1\8.31	Plans that are applicable to the transmission line being worked on (see Appendix).
Vegetation Ma	anagement-(Elm Trees)
PA-3.29\8.32	When elm trees are removed the stump must be debarked to the soil line or stump must
(be ground or removed to flush or just below the soil line.
PA-3.30\8.33	All elm wood must be immediately disposed of onsite by burning/chipping (<5cm) or
	transported to a designated elm disposal site.
	Irimming eim trees is prohibited between April 15 to July 31; cut stumps below ground
8\8.34	level; burry, burn or chip (5cm or less) all elm wood (no firewood).
	ement The work site must be kent tidy at all times. Weste must be collected for proper dispessed
	All burning and clash dispesal must be carried out as stipulated in the Work Dermits
9 \o.55	All burning and siash disposal must be carried out as stipulated in the work Permits.
wnanje	Clearing is allowed only within the reduced risk time period for wildlife illustrated (in
PA-3 10\8 36	Appendix) If clearing within the sensitive time period for wildlife, further mitigation and
LH-2'TN/9'20	approvals would be required
	Avoid disturbing hird pests during the pesting periods (spring to early summer). If large
OMLM7-	stick nests are encountered, contact the Line Inspector and TI M Environmental Specialist
7\8.37	for instructions.
	Trees containing active nests and areas where active animal dens or burrows are
PA-3.23\8.38	encountered will be left undisturbed until unoccupied.
OMLM7-	
18\8.39	Refer nuisance wildlife to local Natural Resource Officer.
Non-mitigatio	n
OMLM7-	Tailheard meetings shall review environmental senseres
3\8.40	ימושטמים חופרנוווצא אומו ופעופא פוועו טווחפוונמו נטוונפוווא.
OM4-3\8.41	Clearing by mulching and mechanized forestry equipment may also be considered.


Photo 1:Clearing during frozen ground periods to minimize soil and vegetation disturbance.



Photo 3: A danger tree is carefully removed to prevent impacts to soils and adjacent vegetation.



Photo 2: Right-of-way clearing on the Bipole III Transmission Project.



Photo 4: Hand clearing methods used for an identified Environmentally Sensitive Site.



Photo 5: Merchantable timber neatly piled to be brought to market.



Photo 6: A 30 m riparian buffer established from the ordinary high water mark.



Figure 2: Examples of the Riparian Buffer Zones width changes based on bank slope

10. CONCRETE WASHWATER AND WASTE - ENVIRONMENTAL MITIGATION MEASURES



Application

Water that has been used to clean equipment of concrete is generally caustic with a high pH and high level of suspended solids which is not suitable for direct discharge to surface waterbodies. Wastewater from concrete preparation and equipment cleaning and washing requires containment and treatment.

Environmental Protection Objective

To safely collect, store and treat waste concrete and wash water to appropriate environmental limits prior to discharge to surface water.

ID	Mitigation
Water Collection	n and Treatment
EI-13.01\9.00	Wash water and solid waste will not be discharged onto the ground at the project site.
EI-13.02\9.01	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_12 02\0 02	High density polyethylene geomembrane liners and either earth or physical berms may
LI-13.03 (9.02	be used for a temporary concrete washout for uncured or partially cured concrete.
FI_13 0/\9 03	All water from chute washing activities will be contained in leak proof containers or in
EI=13.04 (3.03	an approved settling pond.
	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
EI-13.05\9.04	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
EI-13.06\9.05	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
EL-12 07\0 06	treated to meet the Manitoba Water Quality Standards, Objectives, and Guidelines
LI-13.07 (9.00	(Tier 3; MWS 2011) for the protection of aquatic life for pH 6.5-9.0, prior to discharge
	into a watercourse.
Concrete	
	Cured concrete can be transported in non-hazardous waste containers and disposed of
EI-13.08(9.07	at a licensed facility.
	Any uncured and partly cured concrete will be kept isolated from
EI-13.09/9.08	watercourses/ditches.

11. CONSTRUCTION CAMPS - ENVIRONMENTAL MITIGATION MEASURES



Component Description

Workcamps are places with services and infrastructure to accommodate workers, crews, and supervisory personnel for overnight stays in remote areas. Workcamps include all amenities for temporary shelter, food service, and water and waste facilities. Workcamps may also contain equipment and material storage associated with a complex.

Environmental Protection Objective

To minimize the impact of temporary human habitation on the environment in remote areas by proper siting, servicing, and operation of workcamps.

ID	Mitigation	
Fuel & Hazardous Materials		
PC- 3.12\10.00	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	
DC	Shill control and clean up equipment and materials will be provided for construction	
FC- 2 15\10 01	camps in accordance with an Emergency Prenaredness and Perponse Plan	
OM11- 5\10.02	Specific camp activities such as water supply, sewage disposal, handling and storage of fuel, lubricants and other potentially hazardous materials are regulated by law. If you have any questions, concerns or suggestions, contact the Field Supervisor.	
OMLM12- 8\10.03	Storage of petroleum products must be located a minimum of 100 meters from any lake, river or stream. The dedicated storage area shall be bermed, or the fuel must be in approved bulk storage containers (Enviro Tanks). Ensure filling pumps and hoses and nozzles are maintained leak free. All persons involved in the handling and storage of fuels and hazardous materials shall have Workplace Hazardous Materials Information System (WHMIS) training.	
OMLM12- 9\10.04	Ensure there are appropriate spill kits available – including equipment service and fuel storage areas. Project sites must have an emergency spill response plan and designated on-site Emergency Response Coordinators. All spills regardless of size must be reported to your Area Spill Response Coordinator.	
OMLM13- 7\10.05	Manitoba Hydro's "Code of Practice" for Storage and Handling of Petroleum Products and Allied Products must be followed. Storage of petroleum products must be located a minimum of 100 metres from any lake, river or stream. The dedicated storage area shall be bermed, or the fuel must be in approved bulk storage containers (Enviro Tanks). Ensure filling pumps and hoses and nozzles are maintained leak free. All persons involved in the handling and storage of fuels and hazardous materials shall have WHMIS training.	
Heritage		
PC- 3.21\10.06	As marshaling yards, borrow sources, temporary work spaces, work camps are identified, additional heritage monitoring activities may be required to be conducted prior to approval.	
OM11-	The camp should be located 200m away from any known heritage resource sites or	

ID	Mitigation	
1\10.07	other sensitive features so as not to disturb sensitive sites. Try to choose a natural or	
	existing opening and obtain prior approval from Manitoba Conservation.	
Food Health & Safety		
PC-	A food handling permit will be obtained from the local public health inspector prior to	
3.01\10.08	the operation of kitchens.	
PC-	Food, greases and wastes will be stored in sealed, air-tight containers and managed to	
3.19\10.09	prevent attraction of wildlife.	



Photo 1: Keewatinohk workcamp in northern Manitoba.



Photo 2: Construction of the Keeyask workcamp.



Photo 3: A permit may be required for the operation of a kitchen and food services.



Photo 4: Hazardous material, septic and solid waste a safe distance from camp.

CONSTRUCTION MATTING - ENVIRONMENTAL MITIGATION MEASURES 12.



Figure 2: MH TLM stock photo

Component Description

Matting is used on projects to stabilize the work area and to prevent compaction and rutting.

Environmental Protection Objective

To minimize the impact of equipment and activities on sensitive soil and wetter areas. To minimize admixing, rutting, and compaction of agricultural areas and to use in areas of high risk biosecurity.

ID	Mitigation	
Methods		
PA-	Verify that mats are clean and free of soil, debris and plant material when they arrive	
11.01\11.00	for use on site.	
PA-	Mate cannot be constructed of chamically treated wood products	
11.02\11.01	Mais cannot be constructed of chemically treated wood products.	
PA-	In wetlands three mats is the maximum number that can be stacked and used in one	
11.03\11.02	location.	
PA-	Natting chould not impode or redirect natural drainage nattorns or water courses	
11.06\11.03	inviating should not impede or redirect natural drainage patterns of water courses.	
Preparation/Prevention		
PA-	Follow the Transmission Bio-security Standard Operating Procedure (SOP) for cleaning	
11.04\11.04	washing and disinfecting matting prior to moving it to a new project location.	
Removal		
PA-	Mat removal will take place from the existing mat road, working in a backwards fashion	
11.07\11.05	(from work site to initial access point).	
PA-	When mat removal is complete all remaining matting debris will be cleaned, up and	
11.08\11.06	transported to an approved waste disposal facility.	
PA-	When matting is removed from Agricultural areas any compaction of soils may have to	
11.09\11.07	be rehabilitated or landowner may be compensated.	

13. CONTAMINATED SOIL - ENVIRONMENTAL MITIGATION MEASURES



Application

Soil can become contaminated from many construction and maintenance activities including spills, leaks and improper waste storage or containment. Contaminated soil includes all sites where fuels, oils, solvents, or hazardous materials have touched or seeped into surface gravel, organic material, and/or mineral soil.

Environmental Protection Objective

To properly handle, transport, dispose and remediate contaminated surface materials and leave no residual contamination on work sites.

ID	Mitigation
Methods	
EI-	When a spill or release is identified, it shall be flagged off to prevent disruption of that
7.13\12.00	area until remediation occurs.
Monitoring	
FI-	A Manitoba Hydro (MH) Environmental Representative may inspect contaminated site
7 12\12 01	assessment and remediation work regularly to confirm that environmental protection
7.12 (12.01	measures are implemented and effective.
Plans	
EI-	A remediation plan may be required for sites contaminated by project activities
7.02\12.02	including remediating soils according to provincial standards.
Prevention	
EI-	Site personnel will take all reasonable steps to prevent soil, groundwater and surface
7.05\12.03	water contamination.
Regulatory	
EI-	A closure report may be required for completed soil remediation projects in accordance
7.01\12.04	with provincial and MH guidelines.
EI-	All spills and releases reported will be responded to in accordance with provincial
7.03\12.05	legislation and guidelines and MH guidelines.
	Marshaling yards, camps or petroleum storage, dispensing areas and hazardous
EI-	materials storage areas may need to be assessed for potential contamination using
7.10\12.06	Canadian Standards Association Environmental Site Assessment (CSA Z768- 01)
	procedures.
	A CSA Phase I Environmental Site Assessment (CSA Z768-01) at abandoned construction
EI-	camps, marshaling yards, petroleum product storage, dispensing areas and hazardous
7.11\12.07	materials storage areas may be required if contamination is suspected. If required Phase
	II Environmental Site Assessment (CSA Z769-00) will be conducted.



Photo 5: Clean-up of petroleum storage site in Keewatinohk area.



Photo 2: Contaminated soil being placed in a hazardous materials bag along transmission rights-of –way (ROW).



Photo 3: A spill response kit being used to clean a fluid leak.



Photo 5: Contaminated soil is removed by shovel.



Photo 4: A fluid leak from a piece of machinery is contained.



Photo 6: Spill pads to soak up an oil leak.

14. DEMOBILIZATION AND CLEAN-UP - ENVIRONMENTAL MITIGATION MEASURES



Application

At the completion of work or activity there is often residual material and equipment that requires removal, and site cleanup and/or restoration is required. Marshalling yards, rights-of-way (ROWs), workcamps, borrow pits and other worksites are some of the sites that clean up measures apply to. Demobilization from ROWs or station sites also require clean up measures to ensure there is no residual environmental impact from activities.

Environmental Protection Objective

To demobilize, clean up and restore work-sites to natural or pre-work conditions in a timely manner post construction or use.

ID	Mitigation	
Decommissionii	ng	
PA-4.01\13.00	Temporary buildings, structures, trailers, equipment, utilities, waste materials, etc. will be removed from work areas and sites when work is completed. Tools, surplus and waste materials, rubbish and debris must also be removed from the work site once work has been completed.	
OMLM15- 5\13.01	Temporary camps and facilities must be removed from project	
OMLM15- 6\13.02	A final inspection might be required after decommissioning, to be conducted with Manitoba Conservation and Climate (MCC)	
Fuel & Hazardo	us Materials	
PA-4.05\13.03	Petroleum product and other temporary hazardous material storage areas will be cleaned up, assessed and, if necessary, remediated in accordance with provincial guidelines and Manitoba Hydro (MH) guidelines.	
Rehabilitation		
PA-4.03\13.04	After demobilizing and clean-up, work areas and sites will be assessed for rehabilitation. Prescriptions will be developed for approval to the Transmission Line Maintenance (TLM) Environmental Specialist.	
Riparian Habita	t/ Stream Crossings	
PA-4.06\13.05	Water crossings, ditches and drains will be left free of obstructions so as not to impede water flow.	
Waste Management		
OMLM15- 1\13.06	The work site must be kept tidy at all times. Work and personal waste must be collected for proper disposal. Garbage must be removed regularly to an approved site so that wildlife is not attracted to work sites.	
OMLM15- 3\13.07	Burning and slash disposal must be carried out as stipulated in the Work Permits.	



Photo 1:The excavation of a petroleum fuel storage area at Keewatinohk.



Photo 3:Stockpiled soils are placed over the edges of a borrow pit.



Photo 2: After the excavation of a petroleum fuel storage area at Keewatinohk.



Photo 4: All hazardous material storage areas are to be inspected for any spills of leaks and cleaned up.

15. DIRECTIONAL DRILLING - ENVIRONMENTAL MITIGATION MEASURES



Application

Directional drilling to bore holes and install pipelines, cables and/or conduits.

Environmental Protection Objective

To conduct drilling activities in a way that minimizes environmental impact and prevents drilling fluids from entering waterbodies.

ID	Mitigation	
Methods		
PA-	When drilling takes place under a watercourse, the drill entry and exit points will be	
12.02\14.00	outside of the riparian buffer of that watercourse.	
PA-	Keep all material and equipment needed to contain and clean up drilling mud releases	
12.05\14.01	on site and readily accessible in the event of a frac-out.	
Rehabilitation		
	Re-vegetate any disturbed native vegetation by seeding with native grass species and	
DA	cover such areas with mulch to prevent erosion and to assist in seeds germination. If	
PA-	there is insufficient time remaining in the growing season, the site should be stabilized	
12.08\14.02	(e.g., cover exposed areas with erosion control blankets to keep the soil in place and	
	prevent erosion) and vegetated the following spring.	
Preparation/Pre	evention	
	A frac-out contingency plan will be prepared that includes monitoring control and	
PA-	potentially impacted waters, measures to stop work, contain the drilling mud and	
12.01\14.03	prevent its further migration into the watercourse. Contact the Transmission Line	
	Maintenance (TLM) Environmental Specialist for further information.	
	A dugout/settling basin at the drilling exit site will be constructed to contain drilling	
DA	mud to prevent sediment and other deleterious substances from entering the	
FA- 12 02\14 04	watercourse. If this cannot be achieved, silt fences or other effective sediment and	
12.03 (14.04	erosion control measures will be installed to prevent drilling mud from entering the	
	watercourse.	
	In the event of a frac-out, implement the frac-out contingency plan and notify all	
PA-	applicable authorities. Prioritize clean-up activities relative to the risk of potential harm	
12.06\14.05	and dispose of the drilling mud in a manner that prevents re-entry into the	
	watercourse.	
Disposal		
PA-	Excess drilling mud, cuttings will be disposed of at an adequately sized disposal site	
12.04\14.06	located away from the water to prevent it from entering the watercourse.	
PA-	Stabilize any spoil materials to prevent them from entering the watercourse	
12.07\14.07		
Water Management		
ΡΔ-	When obtaining water from fish bearing waterways all pump intakes will be screened	
12.10\14.08	according to the Freshwater Intake End-of-Pipe Fish Screen Guideline (DFO 1995).	
	(Found in Appendix)	

ID	Mitigation
PA-	Water, to mix the drilling mud, shall be brought in from off site and stored in tanks at
12.11\14.09	the entry locations or be withdrawn from local a watercourse.
Soil/Erosion Management	
PA-	Maintain effective sediment and erosion control measures in accordance with the
12.09\14.10	Erosion and Sediment Control Plan until revegetation of disturbed areas is achieved.

16. DRAINING - ENVIRONMENTAL MITIGATION MEASURES



Activity Description

Draining is an activity to remove excessive or accumulated water from an area to facilitate construction or for on-going site protection.

Environmental Protection Objective

To create site drainage or dewatering that does not alter water-quality, aquatic habitat, or sediment regime of nearby natural or manmade waterbodies.

ID	Mitigation	
Methods		
PA-5.01\15.00	Work activities shall not block natural drainage patterns	
PA-5.03\15.01	Dewatering discharges from work activities will be directed into vegetated areas, existing drainage ditch(es) 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\15.02	Drainage water from work areas will be diverted through vegetated areas, existing drainage ditch(es) or a means of sediment control prior to entering a water body.	
PA-5.06\15.03	Existing, natural drainage patterns and flows will be identified and maintained to the extent possible.	
PA-5.14\15.04	Flows to Manitoba Infrastructure (MI) roadway drains and ditches will not be altered by work activities (increased flow, de-watering and other flow effects) without department approval in advance.	
Regulatory		
PA-5.02\15.05	Culverts will be installed and maintained in accordance with Manitoba Stream Crossing Guidelines (1996) and relevant provincial and municipal acts, regulations and bylaws.	
Soil/Erosion Management		
PA-5.05\15.06	Erosion and sediment control will be provided by the contractor where necessary	
PA-5.15\15.07	All drainage, natural or manmade that may deposit construction generated sediments on the MI roadway right-of-way will be managed through the Erosion and Sediment Controls.	

17. DRILLING - ENVIRONMENTAL MITIGATION MEASURES



Activity Description

Drilling involves the use of specialized machinery to drill bore holes for soil testing, foundations, pipeline installation or water-well development. Drilling includes directional drilling which also involves specialized equipment for subsurface horizontal drilling.

Environmental Protection Objective

To conduct drilling activities that prevents water and soil contamination and does not mix surface and groundwater.

ID	Mitigation
Fuel & Hazardo	us Materials
PA-6.04\16.00	Drilling fluids and waste materials will be contained and not allowed to drain into waterbodies, riparian areas or wetlands.
Heritage	
OM7-8\16.01	If an archaeological or heritage artifact is discovered, refer to the Cultural and Heritage Resources Handbook.
Methods	
PA-6.01\16.02	Abandoned drill holes will be sealed with bentonite or other effective sealers to prevent interconnection and cross-contamination of ground and surface waters.
OM7-6\16.03	Make sure all necessary equipment arrives on site in a clean and leak free condition. Service equipment 100m back of the high water mark to avoid deleterious substances entering the water course and have a sufficient emergency spill kit readily available.
PA-6.07\16.04	Drilling will not be permitted within established buffer zones and setback distances from waterbodies unless approved in advance by a Transmission Line Maintenance (TLM) Environmental Specialist.
PA-6.08\16.05	Spill control and clean-up equipment will be provided at all drilling locations.
PA-6.09\16.06	The drilling contractor will ensure that equipment and materials are available on site for sealing drill holes.
PA-6.10\16.07	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.
PA-6.11\16.08	Where there is potential for mixing of surface and groundwater, precautions will be taken to prevent the interconnection of these waters.
PA-6.12\16.09	The contractor must submit a plan to the TLM Environmental Specialist 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.
OM7-4\16.10	In situations where there is high risk of a frac-out occurrence, a contingency plan must be in place which should include a qualified professional available to be brought to site to monitor and advise the High Pressure Directional Drilling (HPDD) contractor. Contact

ID	Mitigation
	the TLM Environmental Specialist for assistance in this regard.
Regulatory	
OM7-2\16.11	Fisheries and Oceans Canada (DFO) self-assessment must be completed to determine whether or not the project needs to be submitted for DFO review. If project is on a line that is regulated by Canadian Energy Regulator (CER), consult DFO guidance document on regulatory partnerships. Or contact the TLM Environmental Specialist for further instruction.
Sensitive Sites	
PA-6.05\16.12	Drilling in environmentally sensitive sites, features and areas will not be permitted unless approved in advance by TLM Environmental Specialist and mitigation measures are implemented.
Non-mitigation	
OM7-3\16.13	Review the professionally prepared geo-technical assessment, emergency frac-out response and contingency crossing plans with all project participants.



Photo 1: Low disturbance methods for drilling.



Photo 2: Drilling equipment being inspected regularly for fuel and oil leaks and spills.



Photo 3: Directional drilling operations.



Photo 4: Drilling activities in northern Manitoba are carried out under frozen ground.



Photo 5: A drill hole being sealed with bentonite to prevent water contamination

18. DRINKING (POTABLE) WATER - ENVIRONMENTAL MITIGATION MEASURES



Application

Often drinking (potable) water is covered in environmental protection plans., the application of this is to remind staff that there are requirements for drinking water including regulatory, storage, and best practices.

Environmental Protection Objective

The objective of the mitigation measure is to remind project staff of the guideline which provides for recommended practices for drinking water supplies at Manitoba Hydro work locations.

ID	Mitigation
Regulatory	
EI-11.03\17.00	Potable water used to fill the drinking water holding tanks will be in compliance with
	provincial legislation. Please reference MB Hydro publication # 0142/08
Storage	
EI-11.01\17.01	Drinking water holding tanks will be designed for potable water containment.
EI-11.02\17.02	Drinking water holding tanks will be cleaned and disinfected before use.
17.03	If tap wat is not potable signs must be placed in the location, clearly visible indicating
	that water is nto potable

19. Emergency and Spill Response – Environmental Mitigation Measures



Application

Spills of hazardous substances, fires and explosions, environmental accidents, heritage resource discoveries and other emergency or contingency situations require immediate action and response in accordance with established response plans. Emergency Preparedness and Response Plans are required for project and major work activities.

Environmental Protection Objective

To respond immediately and effectively to emergency situations and spills of hazardous materials minimizing environmental and human health impacts.

ID	Mitigation	
Fuel & Hazardo	us Materials	
EI-2.03\18.00	All vehicles hauling petroleum products will carry spill containment and clean-up equipment.	
EI-2.11\18.01	Reasonable precautions will be taken to prevent fuel, lubricant, fluids or other products from being spilled during equipment operation, fuelling and servicing.	
EI-2.15\18.02	The hazardous materials incident report form will be completed when reporting a spill.	
Fire Safety		
EI-2.01\18.03	All fires will be reported to Manitoba Hydro (MH)	
EI-2.13\18.04	Temporary construction camps will have a designated fire marshal to communicate to contractor employees emergency response and evacuation procedures in the event of forest fires.	
EI-2.16\18.05	Should a forest fire be caused by work activities, it must be reported to Manitoba Conservation and Climate (MCC) as soon as feasible.	
Implementation	1	
EI-2.09\18.06	Site personnel to conduct investigation for all provincially reportable spills and fires reported to ensure that procedures are being followed and plans remain active.	
Training/Comm	unication	
EI-2.05\18.07	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-2.08\18.08	Orientation for personnel working on site will include emergency response awareness.	
Spill/Release		
EI-2.02\18.09	All spills at work sites will be reported in accordance with provincial legislation and guidelines, and MH guidelines.	
Contaminated Materials		
EI-2.04\18.10	Clean-up and the disposal of contaminated materials will be managed in accordance with provincial guidelines and MH guidelines.	
Equipment		
EI-2.06\18.11	Emergency spill response and clean-up materials and equipment will be available at work sites, marshalling yards, fuel storage facilities, and standby locations.	

Mitigation

EI-2.12\18.12

Spill response and clean up equipment will be available for responding to releases for a

site location.

Photos

ID



Photo 1: A fire extinguisher and spill response kit mounted on the side of a refueling location.



Photo 2: Spills must be immediately reported, secured contained, and clean up procedures implemented.



Photo 3:Secondary containment is used to minimize the impacts of a potential spill.



Photo 4: Spill response and clean up equipment will be available for responding to releases for a site location.

20. EROSION AND SEDIMENT CONTROL - ENVIRONMENTAL MITIGATION

MEASURES



Application

Erosion is a natural process that can be exacerbated by maintenance activities. The mobilization of soil and silt particles by exposure to precipitation, runoff, and wind can cause project and environmental damage that can be prevented. Erosion and sediment control applies to all projects and activities where bare ground is exposed or vehicle travel can cause rutting and surface damage.

Environmental Protection Objective

To objective is to keep soil and sediment in place and prevent release to waterways or the atmosphere.

ID	Mitigation
Monitoring and	l Maintenance
EI-3.01\19.00	Accumulated sediment will be removed from silt fences and other barriers in
	accordance with the Erosion and Sediment Control Plan to ensure proper functioning.
	Site personnel will be responsible for monitoring and if required modifying erosion and
EI-2.09/19.01	sediment control installations to ensure continued effectiveness.
	A Transmission Line Maintenance (TLM) Environmental Specialist may make
EI-3.11\19.02	inspections of erosion and sediment control measures to confirm implementation and
	continued effectiveness.
Prevention	
EL 2 02\10 02	Project activities may be suspended during extreme wet weather events to prevent
EI-3.02 (19.03	rutting and erosion issues.
Implementation	1
	Erosion and sediment control installations will only be removed after disturbed areas
EI-3.04\19.04	are protected and sediments are disposed of in accordance with Erosion and Sediment
	Control Plan.
EI_2 05\10 05	Erosion and sediment control measures will be left in place and maintained until either
LI-3.03 (19.05	natural vegetation or permanent measures are established.
	Contractors and Staff will communicate the requirement to follow the Erosion and
EI-3.10\19.06	Sediment Control Plan, or any other project/site specific plans to all project staff and a
	copy will be made available at the project site.
	Protect the natural drainage courses and keep natural vegetation intact while working
OM9-2\19.07	around rivers, streams and wetlands. This can be accomplished by flagging buffers
	around existing drainages and minimizing the use of heavy equipment in these areas.
	Where drainage alterations are necessary, use approved methods (silt fences, erosion
OM9-3\19.08	control blankets, modified drainage/runoff etc.) for erosion and sediment control
	approved by the Field Supervisor.
	Never allow direct discharge of excessive site drainage water into natural water
OM9-5\19.09	systems. Drainage water shall be diverted through vegetated areas prior to entering a
	water body or stream.

ID	Mitigation	
Monitoring and Maintenance		
OM9-4\19.10	Make frequent inspections of any Erosion and Sediment control installations. All drainage alterations and installations must remain intact for the duration of the project and only removed after sedimentation has been disposed of and disturbed areas have been protected (re-vegetated).	

21. FISH PROTECTION - ENVIRONMENTAL MITIGATION MEASURES



Application

Meaures need to be take to avoid causing harn to fish and fish habitat (Fisheries and Oceans Canada (DFO)). Manitoba Stream Crossing Guidelines says that potential impacts of stream crossings on fish and fish habitat can be eliminated or reduced by using appropriate mitigation measures during every phase of the design and construction process from scheduling and route planning to clean-up and maintenance.

Environmental Protection Objective

To objective is to protect fish and fish habitat including areas when there could be fish nests, eggs, rearing and feeding habitat.

ID	Mitigation
Regulatory	
EC-3.01/20.00	When a work, undertaking, or activity results in the deposit of a deleterious substance or creates the potential for such a deposit, site personnel will advise the Transmission Line Maintenance (TLM) Environmental Specialist of the situation.
EC-3.04/20.01	Fish and fish habitat will be protected in accordance with federal legislation and federal and provincial guidelines.
20.02	Any work, undertaking or activity that occurs between the high-water marks of any water body being planned must involve input from the TLM Environmental Specialist.
EC-3.05/20.03	Prior to seeking authorization from Manitoba Conservation and Climate (MCC) 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-3.07/20.04	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). (Found in Appendix) <u>http://www.dfo-mpo.gc.ca/Library/223669.pdf</u>
EC-3.10/20.05	Muskrat house, Beaver Dam or Lodge removal requires consultation with Fisheries and Oceans Canada (DFO) who may require additional authorizations. House, Dam or Lodge removal may require heavy equipment or explosives which would require an additional Work Permit from Manitoba Conservation and Climate (MCC) when located on Crown Land.
Fish Habitat	
EC-3.08/20.06	The withdrawal of any water will not result in reduction in the wetted width of a stream, in order to maintain existing fish habitat
Soil/Erosion Ma	inagement
EC-3.02/20.07	Disturbances to waterbodies, shorelines, riparian areas, etc. will be stabilized to

ID	Mitigation	
	prevent erosion immediately.	
EC-3.03/20.08	Erosion and sediment control measures will be put in place at all project locations	
	where surface drainage is likely to flow into fish bearing waters.	
Species of Conservation Concern		
EC-3.09/20.09	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.	

22. GRADING - ENVIRONMENTAL MITIGATION MEASURES



Application

This mitigation applies to areas that need to be graded such as roads, borrow pits, access routes or developments.

Environmental Protection Objective

Meaures need to be take to avoid causing harm to adjacent ecosystems including location, buffers around riparian, dust and sediment. Addiiotnally, watch for nesting birds and agresive and defensive bird behaviour.

ID	Mitigation	
Methods		
PA-7.05\21.00	Grading will only be permitted within rights-of-way (ROWs) and construction areas.	
Riparian Habitat/ Stream Crossings		
	Grading will not be permitted within established buffer zones and setback distances	
PA-7.04\21.01	from waterbodies.	
	Gravel pads will be graded so the surface runoff is directed away from waterbodies,	
PA-7.00\21.02	riparian areas and wetlands.	
Rehabilitation		
	Grading for site rehabilitation and restoration will be in accordance with a site specific	
PA-7.05\21.05	Rehabilitation and Invasive Species Management Plan.	
Permafrost		
PA-7.01\21.04	Compacted snow layer will be used in temporary workspaces or marshalling yards	
	located in permafrost areas where required to prevent damage to surface materials.	
Soil/Erosion Management		
PA-7.07\21.05	Any required erosion and sediment control measures will be put in place prior to	
	grading in accordance with a site specific Erosion and Sediment Control Plan.	

23. GROUNDWATER - ENVIRONMENTAL MITIGATION MEASURES



Application

Drilling and pile installation involves the use of specialized drills to bore holes/wells for various activities including soil/ rock testing, geothermal development, pipeline installation, potable water and blast holes along with the use of various piles for foundation install. There may also be deep-set anchors for transmission towers and structures.

Environmental Protection Objective

To ensure that drilling activities do not affect surface water and groundwater.

ID	Mitigation
Prevention	
EC-4.03\22.00	Where there is potential for mixing of surface and groundwater, precautions will be
	taken to prevent the interconnection of these waters.
22.01	When planning to apply or applying herbicide, ensure that groundwater ratings are
22.01	reviewed for Picloram.
Plans	
	When high water table is present, or activitites may impact an aquifer, Staff or the
EC-4.04\22.02	contractor must submit a plan to the Transmission Line Maintenance (TLM)
	Environmental Specialist 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

24. **GRUBBING - ENVIRONMENTAL MITIGATION MEASURES**



Activity Description

Stripping is a construction activity to remove soil and organic material from a site to facilitate the construction of structures or facilities. Grubbing involves the removal of roots, stumps rocks, and debris on right-of ways or other construction areas to create a smooth compactible surface for further construction and/or transportation.

Environmental Protection Objective

To remove soil, organic matter, roots and stump debris from construction while minimizing impacts on permafrost, soil loss, surface water, groundwater and site contamination.

ID	Mitigation	
Methods		
PA- 8 01\22 00	Work areas containing soil with high silt content, artesian springs or areas of previous	
	erosion will be assessed by Transmission Line Maintenance (TLM) Environmental	
8.01 (25.00	Specialist for additional erosion and sediment control measures.	
PA-	Work areas requiring extensive grubbing will be stabilized as soon as possible to	
8.02\23.01	minimize erosion.	
PA-	Grubbing will be halted during heavy precipitation events when working in areas of finely	
8.03\23.02	textured soils.	
PA-	Grubbing will not be permitted within 2 m of standing timber to prevent damage to root	
8.04\23.03	systems and to limit the occurrence of blow down.	
PA-	Grubbing will not be permitted within established buffer zones and setback distances	
8.05\23.04	from waterbodies unless approved by a TLM Environmental Specialist.	
PA-	Stocknilled materials from grubbing will not block natural drainage natterns	
8.06\23.05		
PA-	Unless required for the work, grubbing will be minimized to the extent possible	
8.07\23.06		
PA-	Construction areas requiring extensive grubbing will be stabilized as soon as possible to	
8.02\23.07	minimize erosion.	
Regulatory		
PA-	If grubbing is needed on a Manitoba Infrastructure (MI) right-of-way, clearance must be	
8.10\23.08	obtained from MI in advance.	
Soil/Erosion Management		
PA-	When not under frozen conditions, erosion and sediment control measures will be put in	
8.08\23.09	place prior to grubbing.	

25. HAZARDOUS MATERIALS - ENVIRONMENTAL MITIGATION MEASURES



Application

Many work sites involve use of fuels, oils, chemicals, solvents, pesticides, coolants, and hydraulic fluid. They are used in equipment and vehicles and used for site servicing and management. Mitigation measures are required for the safe handling, storage and transportation of hazardous materials and hazardous waste.

Environmental Protection Objective

To safely store, handle and transport hazardous materials and wastes used during work activity, and prevent any environmental releases.

ID	Mitigation	
Methods		
EI-	Non-hazardous products will be used in place of hazardous substances to the extent	
4.19\24.00	possible.	
Regulatory		
EI_	Site personnel will be responsible for the safe use, handling, storage, and disposal of	
LI- 1 22\21 01	hazardous materials including waste as well as procedures for emergency conditions in	
4.22 (24.01	accordance with provincial and federal legislation and standards.	
Siting		
FI_	Temporary hazardous material storage containers will be located on level ground and	
4 28\24 02	within a structure that is covered by roofing preventing precipitation from entering the	
4.20 (24.02	storage area or the secondary containment system	
Waste Manag	gement	
EI-	Waste oil will be transported by licensed carriers to licensed or approved waste oil	
4.25\24.03	recycling facilities.	
EI-	Wet batteries will be stored and transported to licensed or approved waste recycling	
4.26\24.04	facilities and are subject to Transportation of Dangerous Goods (TDG).	
Monitoring and Maintenance		
EI-	Site personnel will monitor hazardous substance containers regularly for leaks and to	
4.23\24.05	ensure that labels are legible and prominently displayed.	
FI_	The Transmission Line Maintenance (TLM) Environmental Specialist may make	
LI- 1 21\21 06	inspections of hazardous substance storage sites to confirm that environmental	
4.24 (24.00	protection measures are implemented and effective.	
Training/Communication		
EI-	Site personnel will be trained and certified in the handling of hazardous materials	
4.06\24.07	including emergency response procedures in accordance with provincial legislation.	
EI-	Site personnel will receive Workplace Hazardous Materials Information System(WHMIS)	
4.07\24.08	training in accordance with provincial legislation	
EI-	Hazardous substances management procedures will be communicated to all project staff	
4.13\24.09	and a copy will be made available at the project site.	
EI-	Orientation for personnel working on site will include hazardous substance awareness.	
4.20\24.10		

ID	Mitigation	
Storage		
EI-	Access to hazardous materials storage areas will be restricted to authorized and trained	
4.02\24.11	site personnel.	
EI-	Bulk waste oil will be stored in approved aboveground tanks provided with secondary	
4.04\24.12	containment in accordance with provincial legislation.	
EI	Hazardous materials storage sites will be secured, and signs will be posted that include	
EI- 4 10\24 12	hazard warnings, contacts in case of a release, access restrictions and under whose	
4.10\24.15	authority the access is restricted.	
EI-	Hazardous waste materials will be segregated and stored by type in approved containers	
4.16\24.14	within a 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	
4.17\24.15	standards.	
EI-	Pesticide storage will be in accordance with provincial legislation and Manitoba Hydro	
4.21\24.16	(MH) guidelines.	
General		
EI-	An inventory of WHMIS controlled substances will be prepared by site personnel,	
4.03\24.17	maintained and updated as required by provincial legislation.	
	Controlled substances will be labeled in accordance with WHMIS requirements. Required	
EI-	documentation will be displayed and current Materials Safety Data Sheets (MSDS) will be	
4.08\24.18	available at each project site in accordance with the Hazardous Materials Management	
	Handbook.	
Hazardous Waste		
EI-	Empty hazardous waste containers will be removed to a licensed or approved disposal	
4.09\24.19	site.	
24.20	Hazardous waste can be stored for up to 24 months. Day one of 24 months begins waste	
	starts to be collected. This Hazardous storage waste has to be inspected every 30 days.	



Photo 1: Hazardous materials stored outside are covered with a weatherproof tarp.



Photo 2: Hazardous material from a spill cleanup being place in a designated bag for proper disposal.



Photo 3: Proper labelling required on all storage containers of hazardous materials.



Photo 4: Hazardous materials stored on spill containment pallets.

26. HERITAGE RESOURCES - ENVIRONMENTAL MITIGATION MEASURES



Application

In the conduct of construction and maintenance work heritage resources, artefacts, sacred sites and burial sites may be encountered. Awareness of known resources and the potential for discovery of unknown sites requires planning and vigilance for many activities.

Environmental Protection Objective

Avoidance and minimization of disturbance is the objective to preserve and protect heritage resources.

ID	Mitigation	
Implementation		
EC-	All archeological finds discovered during work activities will be left in their original	
5.01\25.00	position until the project archaeologist is contacted and provides instruction.	
EC-	Work activities will not be carried out within established buffer zones for heritage	
5.02\25.01	resources except as approved by the project archaeologist.	
FC-	Site personnel will report heritage resource materials immediately to the site supervisor.	
5 06\25 02	Work activities will cease in the immediate vicinity until a Transmission Line Maintenance	
5.00 (25.02	(TLM) Environmental Specialist is contacted and provides further instruction.	
EC-	The Culture and Heritage Resource Protection Plan (CHRPP) will be adhered to during	
5.07\25.03	work activities.	
	If suspected human remains are encountered, the Field Supervisor will contact the TLM	
OM23-	Environmental Specialist who will communicate with the Historic Resources Branch,	
4\25.04	Archaeology Unit (204-945-4390). The Historic Resources Branch will contact the RCMP	
	and Medical Coroner in the event that the human remains are forensic in nature.	
OM23-	Heritage resources are non-renewable. Once they are removed from their context, all	
5\25.05	description of their deposition can be lost if not recorded prior to removal. Site	
5 (25:05	personnel must not remove Archaeological finds from their original position.	
Inspection/M	onitoring	
FC-	As marshalling yards, borrow sources, temporary work spaces, work camps are identified	
5 09\25 06	or route changes required, additional heritage monitoring activities may be required to	
5.05 (25.00	be conducted prior to approval.	
Training/Communication		
EC-	Environmental protection measures for heritage resources will be reviewed with site	
5.03\25.07	personnel prior to commencement of any work activities.	
OM23-	The CHRPP must be reviewed with project participants prior to commencement of any	
1\25.08	project-related field activities.	
FC-	Orientation for project staff working on site will include heritage resource awareness and	
5.04\25.09	training including the nature of heritage resources and the management of any resources	
	encountered.	

27. MANAGEMENT MEASURES - ENVIRONMENTAL MITIGATION MEASURES



Application

Environmental mitigation measures rely on effective implementation and management. Many steps are taken to ensure there is sufficient organization and communication to implement prescribed mitigation.

Environmental Protection Objective

To provide sufficient resources and management to effectively implement Environmental Protection Plans and measures during all stage of project development and operation.

ID	Mitigation
Access	
MM- 16\26.00	In areas of active construction contractors must provide Manitoba Hydro (MH) representatives with full and unrestricted access to the right-of-way (ROW) and all project related work areas so that inspections can occur.
Regulatory	
MM- 01\26.01	All licenses, permits, contracts, project specifications, guidelines and other applicable documents will be obtained and in the possession of both the contractor and MH prior to commencement of applicable work.
MM- 02\26.02	All project participants will ensure that project activities are carried out in compliance with applicable legislation, guidelines and, contractual obligations and environmental protection plan provisions.
MM- 12\26.03	Relevant documents including licenses, permits, approvals, legislation, guidelines, environmental protection plans, ortho-photos maps, etc. will be made available to project participants.
MM- 14\26.04	The contractor will obtain all licenses, permits, contracts and approvals other than those that are MH's responsibility prior to project start-up.
MM- 15\26.05	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 MH.
Sensitive Sites	
MM- 22\26.06	Temporary work spaces are prohibited from being placed within environmentally sensitive sites without written approval from MH, exceptions may be subject to Manitoba Conservation and Climate (MCC) approval
General	
MM- 20\26.07	Aside from service animals, pets are not permitted on active construction project sites.
Communicatio	n
MM- 04\26.08	MH will notify applicable stakeholders, First Nation, and Metis leadership of any disruptive activities prior to project start-up.
MM-	MH will contact local municipal authorities prior to project start-up.

ID	Mitigation
05\26.09	
MM- 06\26.10	MH 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.
MM- 08\26.11	MH will meet the contractor at the beginning of each new contract to review environmental protection requirements including mitigation measures, inspections and reporting.
MM-	MH will notify trappers in advance of clearing and construction schedules in their trapline areas
MM- 21\26.13	Affected private landowners and Crown land encumbrance holders will be notified in advance of the schedule for construction, operation and maintenance

28. MARSHALING YARDS - ENVIRONMENTAL MITIGATION MEASURES



Component Description

Marshalling yards are areas set aside near construction or work areas to assemble and store equipment and materials. Yards may contain fuel depots and store hazardous materials and wastes.

Environmental Protection Objective

To minimize environmental effects and prevent spills and contamination of the environment. Appropriate siting and operation are key to meeting this objective.

ID	Mitigation		
Decommissioning			
PC-5.11\27.00	Once marshaling yards are no longer required, structures, equipment, materials,		
	fences, etc. will be dismantled and moved to storage or a new location.		
Equipment			
PC-5.14\27.01	Spill control and clean-up equipment to be located at designated areas within		
	marshaling yards.		
PC-5.17\27.02	Vehicle, machinery and equipment maintenance and repairs will be carried out in		
	designated areas within marshaling yards.		
PC-5.19\27.03	Welding mats will be used to minimize the risk of fire.		
Fuel & Hazardous Materials			
PC-5 06\27 04	Hazardous materials entering and leaving the marshaling yards will be inventoried and		
	accounted for.		
PC-5.13\27.05	Petroleum products will only be stored, handled and dispensed in designated areas		
1 0 3:13 (27:03	within marshaling yards in accordance with provincial legislation and guidelines.		
	Hazardous waste materials, fuel containers and other materials will be stored in		
PC-5.18\27.06	approved containers and transported to licensed or approved waste management		
	facilities by a licensed carrier.		
Heritage			
	As marshaling yards, borrow sources, temporary work spaces, work camps are		
PC-5.22\27.07	identified, additional heritage monitoring activities may be required to be conducted		
	prior to approval if not already included in the Heritage Resources Branch assessment.		
Methods			
	Fire breaks will be established a minimum of 6 m around marshaling yards in areas		
PC-3.04\27.06	where there is a risk of fire.		
PC-5.12\27.09	Organic material, topsoil and sub-soil stripped during site preparation will be		
	stockpiled separately for later use in site rehabilitation.		
OM8-4\27.10	The amount of clearing should be minimized by using natural forest openings on our		
	corridors.		
OM8-7\27.11	Where appropriate, removed timber should be made available to local residents.		
Plans			

ID	Mitigation		
PC-5.02\27.12	Emergency Preparedness and Response Plan and procedures for marshaling yards will be developed.		
Regulatory			
PC-5.07\27.13	Hazardous materials will be stored in accordance with provincial legislation, and provincial and national codes and standards.		
	The contractor will assess lands required for marshaling yards, camps or petroleum		
PC-5.21\27.14	storage, dispensing areas and hazardous materials storage areas for potential		
	contamination following Canadian Standards Association Environmental Site		
	Assessment (CSA Z768- 01) procedures.		
OM8-1\27.15	Obtain prior approval and Work Permit from Manitoba Sustainable Development.		
Rehabilitation			
	The Transmission Line Maintenance (TLM) Environmental Specialist will inspect		
PC-5 20\27 16	rehabilitated marshaling and work storage areas in accordance with the Rehabilitation		
10 3.20 (27.10	and Invasive Species Management Plan to assess the success of revegetation and to		
	determine if additional rehabilitation is required.		
Sensitive Sites			
	If new sensitive sites, heritage resource sites, rare or medicinal plants are discovered		
OM8-6\27.17	during site preparation for a marshaling yard, the TLM Environmental Specialist must		
	be notified immediately.		
Siting			
	Both permanent and any temporary marshaling yards should be located away from		
OM8-2\27 18	known heritage resource sites, specific traditional use areas or other sensitive features		
01010 2 (27.10	(e.g. eagle/osprey nests, mineral licks, rare plants). Refer to Cultural Heritage		
	Resources Protection Plan for further direction.		
OM8-3\27.19	Marshaling yards must be located at least 100 m away from any water body.		
Training/Communication			
	Site personnel responsible for receipt and distribution of hazardous substances will be		
PC-5.01\27.20	trained in handling and transportation of dangerous goods, and Workplace Hazardous		
	Materials Information System.		
Waste Management			
PC-5.05\27.21	Garbage and debris will be stored in approved containers, sorted for recycling and		
	disposed of at a licensed or approved waste management facilities site.		



Photo 1: A well-organized marshalling yard located on right-of-way.



Photo 3: Materials neatly stored in the marshalling yard.



Photo 2: Materials are safely stacked in a marshalling yard.



Photo 4: Marshalling yard sites must have appropriate permits for locations on Crown lands.

29. PERMAFROST - ENVIRONMENTAL MITIGATION MEASURES



Component Description

Natural Resources Canada (NRCan) describes permafrost as soil or rock that remain frozen from one year to the next and is an important component of the northern Canadian landscape. Warming and thawing of permafrost can cause ground instabilityand alter drainage patterns having implications for natural systems and infrastructure integrity.

Environmental Protection Objective

To minimize impacts such as melting of permafrost. The main objective is to minimize excavations and surficial distrurbance.

ID	Mitigation	
Methods		
EC-	Alterations to natural drainage patterns by rutting and scouring of surface	
6.01\28.00	materials in permafrost areas will be avoided to the extent possible.	
EC-	Excavations of permafrost areas in northern Manitoba will be minimized to	
6.07\28.01	the extent possible.	
FC-	Clearing activities will ensure that the top layer of vegetation and organic	
6 00/ 28 02	materials will be retained as an insulating layer in permafrost areas (i.e., no	
0.09\28.02	clearing down to the organic layer will be allowed).	
FC-	Burning of slash on permafrost soils should be avoided. If it is unavoidable,	
6 11\ 28 02	the utilization of other methods such as a metal container that can be	
0.11\28.03	removed from site.	
EC-	Debris piles scheduled for burning will be piled on mineral soils where	
6.12\28.04	possible.	
Timing		
EC	Work activities in northern Manitoba will normally occur under frozen	
EC- 6 02\28 0E	ground conditions during established timing windows to minimize	
0.02\28.03	disturbance and rutting.	
Environmental Protection		
	Environmental protection measures for permafrost areas located in site	
EC-	specific mitigation tables and maps will be reviewed with the site personnel	
6.06\28.06	prior to commencement of any work activities as well as the methods used	
	to achieve them.	
30. PETROLEUM PRODUCTS - ENVIRONMENTAL MITIGATION MEASURES



Application

Petroleum products including fuels, oils, and lubricants are used routinely for construction and maintenance activities in vehicles, heavy equipment, and smaller gas-operated tools. Mitigation measures are needed for the proper storage, handling and transportation of petroleum products including siting of temporary depots.

Environmental Protection Objective

The environmental mitigation measures for this category are designed to prevent any losses or spills of product to the environment and protection of human health. Spill and leak response is provided separately.

ID	Mitigation
Dispensing	
EI-	Fueling of equipment or portable storage tanks will be a minimum of 100 m from the
5.06\29.00	ordinary high water mark of any waterbody.
EI-	Evolve energing require the energies to visually cheering the process 100% of the time
5.07\29.01	Fulling operations require the operator to visually observe the process 100% of the time.
EI-	Slip tanks and barrels will be securely fastened and grounded to the vehicle during
5.23\29.02	transport and fueling operations.
Equipment	
EI-	Spill control and clean-up equipment and materials will be available at all petroleum
5.24\29.03	product storage and dispensing locations.
General	
EI-	Aboveground tanks will be equipped with overfill protection, spill containment and
5.01\29.04	collision protection as per legislation.
EI-	Containment measures, such as secondary containment (i.e., double wall tank, bermed
5.04\29.05	liner) will be used at all locations where stationary equipment is used.
FI-	Containment areas (berms/dykes/trays, etc.) will be dewatered after precipitation events
5 08\29 06	and the containment water, captured, run through a hydrocarbon filter, and disposed of
3.08\23.00	as specified in contract specifications.
EI-	Ignition sources (i.e., smoking) must be at least 7.5m from petroleum product storage
5.28\29.07	areas.
	All slip tanks are to meet American Society for Testing and Materials standards (ASTM) or
EI-	International Organization for Standardization (ISO) or Canadian Standards Association
5.33\29.08	(CSA) or Federal Motor Carrier Safety Administration (FMCSA) certification and be re-
	certified every five years by an Licensed Petroleum Technician (LPT).
EI-	Drip containers will be placed beneath all Slip tank nozzles when not in use and regularly
5.34\29.09	monitored, any accumulation removed and appropriately disposed.
Inspection/Monitoring	
EI-	Site personnel will inspect all mobile and stationary equipment using petroleum products

ID	Mitigation
5.05\29.10	to ensure measures are taken immediately to stop any leakage discovered.
El- 5.27\29.11	Site personnel will inspect all petroleum product storage tanks and containers daily for leaks, and product inventories will be recorded and retained for inspection by Manitoba Hydro (MH) and Manitoba Conservation and Climate (MCC).
EI- 5.31\29.12	Vehicles hauling petroleum products will carry equipment and materials for emergency spill containment and clean-up.
Plans	
OM3- 6\29.13	Project sites must have an emergency spill response plan and designated on-site Emergency Response Coordinators. All spills regardless of size must be reported to your Area Spill Response Coordinator.
Regulatory	
EI- 5.02\29.14	All aboveground petroleum product tanks with a capacity greater than 5,000 L will be registered with Manitoba Conservation and Climate (MCC) and have a valid operating permit posted onsite. These tanks will have yearly inspections performed and Contract administrator's executed.
OM3- 1\29.15	All petroleum products must be transported/ handled in accordance with the Manitoba Provincial Dangerous Goods Handling and Transportation Act.
OM3- 2\29.16	All petroleum products must have correct placards and labeling and stored and handled in accordance with Manitoba Regulation 188/2001 respecting Storage and Handling of Petroleum Products and Allied Products.
Signage	
EI- 5.32\29.17	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.
Spill/Release	
EI- 5.36\29.18	When a spill or release is identified, it shall be flagged off, and communicated to site staff to prevent disruption of that area until clean up takes place.
EI- 5.37\29.19	Site personnel are responsible for reporting a spill to MH of any quantity within 2 hours, with a written report due in 24 hours.
EI- 5.38\29.20	In the case of an externally reportable spill, the contractor is required to contact an Area Spill Response Coordinator or Transmission Line Maintenance (TLM) Environmental Specialist immediately
OM3- 4\29.21	Ensure spill kit(s) available at the project site – including at equipment service and fuel storage sites.
OM3- 7\29.22	Directions and information for reporting spills must be made readily available.
Storage	
EI- 5.03\29.23	Construction, installation or removal of petroleum product storage tank systems will only occur under the supervision of a registered licensed petroleum technician.
EI- 5.13\29.24	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 MH or MCC upon request.
EI- 5.14\29.25	Petroleum product storage containers in excess of 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.

ID	Mitigation	
EI-	Petroleum product storage sites and mobile transportation units will be equipped with	
5.15\29.26	fire suppressant equipment and products.	
EI-	Potroloum product storage tanks will have adequate collician protection	
5.16\29.27	Petroleum product storage tanks will have adequate conision protection.	
EI-	Petroleum product storage will be located a minimum of 100 m from waterbodies,	
5.17\29.28	riparian areas or wetlands.	
EI-	Petroleum products stored outside will be in waterproof and labeled containers, placed	
5.18\29.29	on spill containment pallets.	
EI-	Petroleum products stored will only be stored and handled within designated areas at	
5.21\29.30	camps and marshalling yards.	
	Portable petroleum product storage containers will be placed on spill trays with a	
EI-	capacity of 110% of the largest container when not in use. Accumulated precipitation	
5.22\29.31	collected in the containment shall be removed regularly so as not to diminish the	
	capacity of the containment.	
EI-	Used petroleum products (including empty containers) will be collected and transported	
5.30\29.32	to a licensed oil recycling facility in approved storage containers.	
Training/Communication		
EI-	Orientation for site personnel working on site will include petroleum product storage and	
5.11\29.33	handling awareness.	
	All persons involved in the handling and storage of fuels and hazardous materials shall	
OM3-	have Workplace Hazardous Materials Information System (WHMIS) training and those	
5\29.34	involved in transporting dangerous goods will have a valid Transportation of Dangerous	
	Goods (TDG) certificate of training.	



Photo 1: A fuel storage and containment area with automatic shut-off nozzles.



Photo 2: Placards are located on all four sides of the fuel tanks during transportation to a work site.



Photo 3: A spill kit located on a construction vehicle.



Photo 4: Slip tanks must be properly secured to vehicles and have secondary containment.

31. REHABILITATION AND REVEGETATION - ENVIRONMENTAL MITIGATION MEASURES



Activity Description

Following construction use of an area, rehabilitation in the form of re-contouring, aggregate removal, drainage restoration and revegetation are considered to return the site to pre-construction conditions.

Environmental Protection Objective

To restore construction use sites to natural or preconstruction conditions recovering the environmental values of the area.

ID	Mitigation		
Vegetation N	lanagement		
PA-	Natural revegetation will be allowed to occur although active rehabilitation programs		
9.02\30.00	may be required at specific sites where erosion warrants seeding or planting.		
	Regional native grass mixtures will be used to assist revegetation of disturbed areas to		
PA-	control erosion or prevent invasion of non-native species. The mixtures will not contain		
9.06\30.01	non-native or invasive species. Contact Transmission Line Maintenance (TLM)		
	Environmental Specialist for additional information.		
Plans			
D ۸_	If rehabilitation is required, planning will include objectives for erosion and sediment		
0 05\20 02	control, restoration of natural vegetation as well as non-native and invasive plant species		
9.03 (30.02	management.		
Soil/Erosion N	Soil/Erosion Management		
PA-	Organic material, topsoil, and subsoil stripped from work areas will be stockpiled and		
9.03\30.03	protected to be used for future site rehabilitation.		
Rehabilitation			
PA-	Work areas no longer required will be recenteured, stabilized, and reversetated		
9.01\30.04	work areas no longer required will be re-contoured, stabilized, and revegetated.		



Photo 1:Hydro seeding can be a method to get quick grass coverage of disturbed sites.



Photo 2: Erosion and sediment control is put in place to accomplish rehabilitation of the riparian vegetation.



Photo 3: Low shrub and herbaceous vegetation growing within the right-of-way (ROW).



Photo 4: Topsoil stripped from construction areas is stockpiled for use in rehabilitation and revegetation.

32. RIGHTS OF WAY - ENVIRONMENTAL MITIGATION MEASURES



Component Description

Rights-of-way (ROW) are cleared land areas for the construction and safe operation of transmission lines. They vary in width from 30 m to over 300 m depending on the voltage and number of transmission lines on a single ROW. They represent a discrete component of transmission projects.

Environmental Protection Objective

To establish ROWs that minimizes effects on wildlife, aquatic habitat, and access to natural resources.

ID	Mitigation
Access	
PC-	Access to transmission line ROW for work activities will utilize existing roads and trails to
8.01\31.00	the extent possible.
PC-	Access to transmission line ROW will be closed, signed and/or controlled in accordance
8.02\31.01	with an Access Management Plan if one has been developed for the transmission line
	being worked on.
	No new access will be created without contacting the Transmission Line Maintenance
31.02	(TLM) Environmental Specialist who may require further approval from Manitoba
	Conservation and Climate (MCC).
Sensitive Sites	
PC-	Temporary work spaces are prohibited from being placed within Environmentally
8 11\31 03	sensitive sites without written approval from Manitoba Hydro(MH), exceptions may be
0.11(51.05	subject to Manitoba Conservation and Climate (MCC) approval
Equipment	
PC-	Equipment will be wide-tracked or equipped with high flotation tires if there is a
8.06\31.04	potential for rutting and/or compaction to surface soils.
PC-	In situations where the ROW doesn't have completely frozen or dry ground conditions
8.09\31.05	alternate products (such as mats) or mitigations may be used.
Clearing	
PC-	Additional clearing outside established ROW is subject to Manitoba Conservation and
8.03\31.06	Climate (MCC) approval.
PC-	Cleaning and disturbeness will be limited to define d DOW and even sight days of the
8.04\31.07	Clearing and disturbance will be limited to defined ROW and associated access routes.



Photo 1: Breeding bird sweeps must be conducted before clearing and active nests must be buffered.



Photo 2: Signs used to guide construction activities on the rights-of-way ROW.



Photo 3: Aerial view of the Bipole III Transmission Project rights-of-way ROW.



Photo 4: Wide-tracked vehicles on frozen ground will minimize rutting and limit compaction to surface soils.



Photo 5: An Environmentally Sensitive Site clearly marked for selective clearing.



Photo 6: A recently clear rights-of-way ROW.

33. STRIPPING - ENVIRONMENTAL MITIGATION MEASURES



Activity Description

Stripping is a construction activity to remove soil and organic material from a site to facilitate the construction of structures or facilities. Grubbing involves the removal of roots, stumps rocks, and debris on right-of ways or other construction areas to create a smooth compactible surface for further construction and/or transportation.

Environmental Protection Objective

To remove soil, organic matter, roots and stump debris from construction while minimizing impacts on permafrost, soil loss, surface water, groundwater and site contamination.

ID	Mitigation
Methods	
PA- 10.01\32.00	Construction areas containing soil with high silt content, artesian springs or areas of previous erosion must receive special erosion and sediment control techniques. Development of an Erosion and Sediment Control Plan is advised.
PA- 10.02\32.01	Erosion and sediment control measures will be put in place prior to stripping.
PA- 10.04\32.02	Mineral topsoils and surficial organic materials should be stripped separately from subsoils, segregated, and stockpiled for later use in backfilling, contouring and rehabilitation. Soils should be replaced in the reverse order to which they were removed.
PA- 10.05\32.03	Stockpiled materials from stripping will not block natural drainage patterns.
PA- 10.06\32.04	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\32.05	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\32.06	Site personnel will stabilize construction areas requiring extensive stripping as soon as possible to minimize erosion.



Photo 1: Stripping and grubbing during frozen ground conditions to minimize rutting and soil compaction.



Photo 2: Organic material, topsoil and subsoil is stripped and stockpiled for future use.



Photo 3: Windrows of grubbed materials will be piled at least 15 m from standing timber.



Photo 4: Top soil stripped for the construction of the Riel Station.

34. TOWERS AND CONDUCTORS - ENVIRONMENTAL PROTECTION MEASURES



Application

Structures are any type of wooden or steel configuration to suspend metal conductors for transmission lines of 66 kV or greater. Sizes vary with voltage, location and design. The component includes foundations, anchors, structures, insulators, and conductors including the activities of installation, assembly and stringing. They represent a discrete component of construction projects.

Environmental Protection Objective

To construct transmission lines that minimizes effects on wildlife, surface and groundwater, and access to natural resources.

ID	Mitigation
Methods	
PC- 10.02\33.00	During tower foundation excavation Overburden, topsoil, and subsoil will be piled separately for later use in backfilling, contouring and revegetation.
Mitigation	
33.01	Concrete bags will be disposed of according to the waste management plan. Run off from the worksite or spoil piles will not be allowed to run into waterbodies or ditches. Concrete wastewater cannot be discharged into drainages or water bodies.
33.02	Agricultural BioSecurity Standard Operating Procedure (SOP) must be followed in agricultural zoned areas.
33.03	Tower foundations construction and repair work cannot impact drainage of surrounding areas.
33.04	If avian collisions or avian populations are impacted by tower and infrastructure, avian deterrents or other methods should be considered.



Photo 6: Steel lattice transmission towers are assembled in a marshalling yard.



Photo 3:Conductor stringing in the winter with a tracked vehicle on frozen ground.



Photo 5: A mat foundation is lowered into an excavated area.



Photo 2: A crane being used to erect an assembled transmission tower section.



Photo 4: Use of implosion sleeves to splice conductors.



Photo 6: A drill rig prepares a transmission tower site for a pile foundation.

35. VEHICLE AND EQUIPMENT MAINTENANCE - ENVIRONMENTAL MITIGATION MEASURES



Application

Construction and maintenance activities involve the use of light vehicles, and heavy and other equipment that require routine servicing to remain functional on work sites. Oil and fluid changes and other mechanical servicing can be performed in proximity to work areas. Hydrocarbons and other hazardous materials are transferred and stored and need to be handled appropriately when not in service centres.

Environmental Protection Objective

To prevent environmental contamination at work sites during the servicing and operation of equipment and vehicles.

ID	Mitigation
Methods	
EI- 9.02\34.00	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\34.01	Unnecessary idling of vehicles, equipment and machinery will be avoided to the extent practical.
EI- 9.02\34.02	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- 9.05\34.03	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.
OMLM1- 1\34.04	All Equipment is required to arrive on site in a clean condition, free from fluid leaks and weed seeds. All Equipment must also follow a schedule of regular inspections and maintenance.
OM12- 5\34.05	Welding mats should be utilized to prevent potential forest fires during the fire season of April 1 to Nov 15 of each year.
EI- 9.08\34.06	Vehicles, equipment and machinery that carry fuel, hydraulic oil and other petroleum products will also carry spill control and clean-up equipment and materials.
OMLM1- 4\34.07	All slip tanks and barrels must be securely fastened and grounded to the vehicle during transport and refueling operations.
OMLM1- 6\34.08	All petroleum products must have correct placards and labeling and be stored and handled in accordance with Manitoba Hydro (MH) Code of Practice - Storage and Handling of Petroleum and Allied Products.
OMLM1- 8\34.09	Carry spill response kits when operating vehicles that carry large quantities of fuel, oil, or hydraulic oil (e.g. Bucket trucks, flex tracks).
Fuel & Hazardous Materials	
OM12-	Storage of petroleum products as well as refueling sites should be a minimum of 100m
3\34.10	from any lake, river or stream.

ID	Mitigation	
OMLM1- 12\34.11	While transporting Dangerous Goods or Hazardous Materials, ensure you have proper labeling, placarding and documentation and a valid Transportation of Dangerous Goods Certificate Training. The transportation of dangerous goods must be in accordance with the Hazardous Materials Management Handbook	
Plans		
EI- 9.01\34.12	A spill response plan must be available at all designated vehicle, equipment and machinery maintenance areas.	
Siting		
El- 9.04\34.13	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.	
Spill Clean Up		
OMLM1- 9\34.14	If a spill occurs, contain the spill and clean it up. Take soil samples below the cleaned area as required.	
Waste Management		
OMLM1- 10\34.15	Dispose of waste oil and lubricants at proper recycling or disposal locations, or return to Waverley Service Center (see Man. Hydro Hazardous Materials Management Handbook).	

36. WASTE MANAGEMENT - ENVIRONMENTAL MITIGATION MEASURES



Application

Wastes in various forms are generated during work activities for projects and on-going maintenance and repair of the transmission system. Construction waste materials, solid waste, and sanitary waste are all generated and in need of proper storage, disposal, and recycling.

Environmental Protection Objective

To reduce waste, recycle, and properly dispose of generated wastes with minimal environmental effect.

ID	Mitigation	
Methods		
OM21-	All work sites are to be kept tidy at all stages of the project including operation and	
7\35.00	maintenance.	
OM21-	Indiscriminate burning, dumping, littering or abandonment of garbage is not to occur.	
3\35.01	Any burning is to follow conditions specified in the work permit.	
01/21	All garbage/waste/Recyclables is to be collected on a regular basis and disposed of at	
4/25.02	an approved waste management facilities. This will help to eliminate nuisance wildlife	
4\33.02	incidents.	
EI-	Waste materials remaining at snow disposal sites after melting will be disposed of at a	
10.07\35.03	licensed or approved landfill.	
OM21-	Wasta ails and other natroloum products are not to be used for burning brush pilos	
5\35.04	waste ons and other perioreum products are not to be used for burning brush plies.	
Regulatory		
OM21-	All applicable laws, regulations and standards for the safe use, handling, storage and	
2\35.05	disposal will be followed.	
Storage		
EI.	Animal-proof garbage containers will be used (if practicable). Regular removal of food	
EI- 10.02\35.06	waste to approved waste management facility grounds will be used to manage food	
	waste.	
25.07	Litter will be prevented by retaining personal waste (lunch waste and wrappers etc.)	
35.07	for proper disposal.	



Photo 1:On-site separation of construction waste materials for recycling or disposal.



Photo 2: Signs help ensure petroleum products and other hazardous wastes are separated for recycling.



Photo 3: Septic wastes must be disposed of at licensed wastewater treatment facilities.



Photo 4: Construction wastes are sorted with the help of labeled waste management containers.

37. WASTE WATER HOLDING TANKS- ENVIRONMENTAL MITIGATION MEASURES



Application

Projects that require contractors to supply their own wastewater facilities will establish them in compliance with the Onsite Wastewater Management Systems Regulation.

Wastewater flows that exceed 10,000 L/day require an Environment Act Licence and are beyond the scope of this guidance.

Environmental Protection Objective

Manage sewage such that

- No unauthorized discharges take place
- Wastewater is disposed of at a licenced facility

Methods		
ID	Mitigation	
EI- 12.03\36.00	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.	
Regulatory		
EI- 12.01\36.01	All sewage haulers will be registered with the Manitoba Conservation and Climate (MCC). A copy of the hauler registration will be provided to Transmission Line Maintenance (TLM) Environmental Officer upon request.	
Siting		
El- 12.02\36.02	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.	

38. WATER CROSSING - ENVIRONMENTAL MITIGATION MEASURES



Activity Description

Crossing streams is necessary for construction and maintenance activities and involves temporary crossings in winter, ford crossings, and installation of bridges and culverts.

Environmental Protection Objective

To carefully plan and construct stream crossings that do not adversely affect water quality, fish and fish habitat, or stream flow.

ID	Mitigation	
Access		
PC-	Water crossings will be at right angles to waterbodies to the extent possible	
9.01\37.00		
Methods		
PC-	No logs or woody debris are to be left within the water body or on the banks or shoreline	
9.09\37.01	where they can wash back into the water body.	
	Grading of the stream banks for the approaches should not occur. Establish a single entry	
PC-	and exit. If minor rutting is likely to occur, stream bank and bed protection methods (e.g.,	
9.10\37.02	swamp mats, pads) should be used provided they do not constrict flows or block fish	
	passage.	
PC-	Cleared trees and woody debris will not be pushed into (or adjacent) to standing timber,	
9.15\37.03	or within the high-water mark of wetlands or waterbodies	
OM5-	The width of the area to be cleared for vehicle access across the stream should be as	
8\37.04	narrow as possible.	
PC-	Signage at each end of any ice bridges indicating the ice thickness and the date it was last	
9.14\37.05	measured is required.	
OM6-	Clearing should be kept to a minimum within the buffer zone and within the	
2\37.06	requirements for safety and reliability of the transmission line.	
Regulatory		
	Construction of stream crossings will follow the Manitoba Stream Crossing Guidelines For	
0 0/1\37 07	The Protection of Fish and Fish Habitat (DFO and MNR 1996). Found in the Appendix	
5.04\57.07	https://www.gov.mb.ca/sd/waterstewardship/fisheries/habitat/sguide.pdf	
OM5-	Obtain Manitoba Conservation and Climate (MCC) and Fisheries and Oceans Canada	
1\37.08	(DFO) approvals Prior to working in Riparian and or below the ordinary high water zone.	
OM6-	After obtaining required MCC and DFO approvals, vehicles and equipment should cross a	
1\37.09	stream at the designated site only, staying within the right-of-way.	
OM6-	When placing barriers to navigation on navigable waters, approval under the Navigable	
E\27.10	Waters Protection Act may be required. Contact Transmission Line Maintenance (TLM)	
3/37.10	Environmental Specialist	

ID	Mitigation
Species of Cor	ncern – Maple leaf Mussel
PC- 9.13\37.11	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.
Riparian Buff	ers
37.12	A Riparian Buffer must be used on all Riparian Areas, within this area shrub and understory vegetation will be maintained along with trees that will not violate Manitoba Hydro (MH) vegetation clearance requirements. This Buffer shall be a minimum of 30 m, measured from the Ordinary High Water Mark (OHWM) where no ground disturbance is permitted. This distance will increase in size based on slope of land entering waterway (see Figure 1). Within the Riparian Buffer a "Machine Free Zone" applies which also increases with slope, this area can be cleared of trees by reaching in with mechanical harvesting equipment or hand cleared. The remainder of the Riparian Buffer is the "Management Zone" which can be cleared using harvesting equipment.
Soil Managen	nent
OM5- 5\37.13	In a Riparian area where there is a risk for erosion identified ahead of time erosion control measures (e.g. silt fences) will be put in place as soon as possible before work activities take place.
Vegetation M	lanagement
OM5- 6\37.14	Retain all shrub understory Disturb the ground surface as little as possible.
OM5- 7\37.15	Trees must be felled away from the water, not towards. Trees that fall in the water must be removed by hand as soon as possible. The debris that results from clearing may be piled above the high water mark to prevent erosion. Any burning must be done a minimum of 100m away from the crossing.
Water Crossir	ng
OM6- 3\37.16	Where an ice bridge is required at a crossing, it should be constructed by using only snow, ice or how otherwise stated in a work permit. No tree limbs, organic or mineral soil can be used. No disturbance of the stream banks should occur. Crossings cannot impede water flow at any time of the year. The ice bridge must be removed or broken up before spring thaw.
PC- 9.08\37.17	When it is safe to do so, create a v-notch in the centre of the ice bridge prior to spring thaw to facilitate water flow and also to prevent blocking fish passage, channel erosion and flooding. Compacted snow and all crossing materials will be removed prior to the spring freshet.
OMLM7- 13\37.18	Stream crossings must be at designated sites only. Where an ice bridge is required at a crossing, using only snow, ice and de-limbed logs, or by freezing down the waterway. Chain the logs together to facilitate removal. No tree limbs, organic or mineral soil can be used. No disturbance of the stream banks should occur. The ice bridge must be removed or broken up before spring thaw. Check with current Manitoba Stream Crossing Guidelines in Appendix.
OMLM7- 14\37.19	Where temporary or permanent bridges, culverts or ford crossings are needed, they must be approved by the Natural Resource Officer and specific Work Permits for their construction must be obtained. Check with current Manitoba Stream Crossing Guidelines in Appendix.
PC-	Fording may need to occur through a watercourse to bring required equipment to the

ID	Mitigation									
9.11\37.20	opposite side. This would be 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 (see Appendix) and will not be permitted to									
	occur in areas that are known fish spawning sites.									
PC-	Fording should occur under low flow conditions and not when flows are elevated due to									
9.12\37.21	local rain events or seasonal flooding.									
Water Withd	rawal									
	Prior to the withdrawal of any water contact the TLM Environmental Specialist. Water									
PC-	flow is maintained under the ice, where this naturally occurs, and If water is being									
9.06\37.22	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.									
	The contractor requires approval from the TLM Environmental Specialist prior to									
PC-	withdrawing water from any waterbody. The withdrawal of water from a waterbody will									
9.16\37.22	not reduce water levels to the point of exceeding that waterbody's ability to sustain an									
	active beaver lodge									



Photo 1: The log corduroy in this winter crossing is clean and securely bound together.



Photo 2: A swamp mat is used to prevent rutting and erosion.





Photo 3: Crews flood a winter stream crossing with clean, ambient water.





Photo 5: A crossing cleaned of debris, compacted snow and other crossing materials before spring freshet.



Figure 1: The ordinary high water mark is used to plan acceptable fording locations.

39. WILDLIFE PROTECTION - ENVIRONMENTAL MITIGATION MEASURES



Application

Some activities have the potential to affect wildlife (mammals, birds, reptiles and amphibians), and their habitat. Noise, dust, blasting, as well as accessing or clearing habitat, and maintaining existing infrastructure can all affect wildlife.

Environmental Protection Objective

To minimize disturbance to wildlife due to construction and maintenance activities

ID	Mitigation
Access	
EC-9.22\38.00	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.
Birds	
EC-9.02\38.01	Bird Diverters or aerial markers may be installed in high bird traffic areas.
General	
EC-9.10\38.02	Prior to seeking authorization from Manitoba Conservation and Climate (MCC) 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-9.13\38.03	Problem wildlife will be reported immediately to Manitoba Conservation and Climate (MCC).
EC-9.15\38.04	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 required if unoccupied nests must be removed.
EC-9.01\38.05	Any injured or killed wildlife encountered on the transmission line rights-of-way (ROW) and associated access roads/trails as a direct result of maintenance activities will be reported to Manitoba Conservation and Climate (MCC).
EC-9.19\38.06	Wildlife (e.g. Birds and foxes) will not be fed, befriended or harassed.
38.07	Dispose of cigarette butts in proper receptacles and not on the ground.
Regulatory	
EC-9.23\38.08	New occurrences of any listed rare, threatened or endangered species will be documented and provided to MCC.
EC-9.25\38.09	Muskrat house, Beaver Dam or Lodge removal requires consultation with Fisheries and Oceans Canada (DFO) who may require additional authorizations. House, Dam or Lodge removal may require heavy equipment or explosives which would require an additional Work Permit from MCC when located on Crown Land.
Restrictions	
EC-9.11\38.10	No firearms will be permitted during work activities.
Riparian Habite	at
EC-9.26\38.11	The contractor requires approval from the Transmission Line Maintenance (TLM)

ID	Mitigation							
	Environmental Specialist 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							
Timing								
	Maintenance activities are allowed only within the reduced risk time period for wildlife							
EC-9.04\38.12	illustrated (in Appendix). If clearing within the sensitive time period for wildlife, further							
	mitigation and approvals would be required.							
Training								
FC 0 12\20 12	Orientation for contractor and Manitoba Hydro (MH) employees will include awareness							
EC-9.12\38.13	of environmental protection measures for wildlife and wildlife habitat.							
Waste Manage	ement							
EC-9.06\38.14	Animal-proof garbage containers with regular removal of food waste to approved waste							
	management facility will be used to manage food waste.							

Appendix E: Timing Windows

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APPENDIX E: TIMING WINDOWS

Project Wildlife Reduced Risk Timing Windows

Species	Sensitivity	January		February		March		April		May		June		July		August		September		October		November		December	
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 work activities occur during this period,

mitigation measures will be prescribed on a

site by site basis)

Appendix F:

Operation and Maintenance Environmental Protection Plan Mapbooks

Appendix G: Agricultural Biosecurity Standard Operating Procedure Transmission BU

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Agricultural Biosecurity Standard Operating Procedures Transmission Business Unit

1. PURPOSE OF THE PROCEDURE

This Standard Operating Procedure (SOP) provides guidance and direction to individuals who may be required to enter agricultural lands and the level of cleaning necessary to reduce the likelihood of soil and manure transport of invasive organisms (diseases, pests, and invasive species).

2. SCOPE

This SOP describes the risk, techniques, and document controls for activities related to transmission construction and maintenance and its associated infrastructure, on agricultural land in Manitoba.

3. APPLICABILITY

This SOP applies to the following:

- Land zoned as agricultural (e.g. pasture, cropland, livestock areas).
- All employees of Manitoba Hydro as well as external individuals such as contractors or consultants who conduct work on behalf of the Transmission Business Unit.
- Additional measures may be prescribed in a project's Environment Act Licence or in the project's Environmental Protection Plan. These measures will be project specific and will not apply to all departments within the Business Unit.
- Additional measures may be implemented for agricultural areas where there is documented evidence of invasive organisms (diseases, pests, and invasive species).

This SOP **does not** apply to the following:

- Government road allowances.
- Gravel or paved driveways or roadways.

4. GENERAL INFORMATION

Agricultural biosecurity is the protection of crops and livestock systems against the threats to production from invasive organisms (diseases, pests, and invasive species). Human activity is one of the factors in the spread of invasive organisms, and the responsibility for agricultural biosecurity rests with all stakeholders.

Agricultural land is land zoned for agricultural use by the provincial government, a municipality, planning commission or planning district.



Agricultural Biosecurity Standard Operating Procedures

Transmission Business Unit

5. GENERAL CONSIDERATIONS

- 1. If existing farm level biosecurity measures exist, Transmission staff and contractors will strive to meet the requirements of the agricultural operation when access is required.
- 2. Activities will try to avoid access through areas that may contain manure.
- 3. Regular maintenance activities (including patrols) on agricultural lands will typically be scheduled after crops have been harvested and conducted primarily after freeze up.
- 4. Staff from other Business Units carrying out work for Transmission will be required to follow these procedures during the course of their work.



Agricultural Biosecurity Standard Operating Procedures Transmission Business Unit

6. **RESPONSIBILITY**

All Transmission staff and contractors who carry out work on agricultural land will:

- Refer to and comply with the requirements of the SOP and the Agricultural Biosecurity Policy.
- If requested, be able to provide a copy of this SOP to the landowner or producer leasing the land.
- Be able to inform a landowner or producer leasing the land about the SOP, if asked.

It is expected that all individuals who require access onto agricultural land and are conducting activities for the Transmission Business Unit, including contractors, will be trained on the Agricultural Biosecurity Policy and this SOP.

7. Internal Training

A computer based training (CBT) course will be made available for training purposes. All individuals required to undergo training will complete the CBT and will have fulfilled the training requirement.

8. External Training

The Agricultural Biosecurity Policy and the SOP will be incorporated into the safety and environmental orientation prior to the start of work. Training records will be stored with the individual projects files. Contractors will be required to view the three biosecurity videos available from Corporate Environment as a part of their training.

9. ASSESSMENT OF RISK

The Transmission Business Unit elected to use a risk matrix to identify the potential biosecurity risk. The matrix identified the perceived risk to agricultural land from maintenance and construction activities by taking the frequency a hazard may occur and multiplying it by the consequence or severity of the hazard to determine the level of acceptable risk. The following two levels of risk were identified from the matrix; low risk and high risk.

10. Low Risk

Areas are considered Low Risk when the ground is frozen with sufficient snow cover; or dry and have no exposed soil or manure. It is not anticipated that activities conducted during this time will effectively transfer invasive organisms (diseases, pests, and invasive species) onto clothing, vehicles and equipment.

11. High Risk

Areas are considered High Risk when ground conditions are wet and the accumulation of soils occurs on footwear, vehicles or equipment. The High Risk designation also applies to livestock settings or areas where manure has been spread. The risk can be mitigated by avoiding wet ground conditions, additional cleaning procedures, employing access mitigations, or rescheduling the work until ground conditions are more favourable. Although

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Agricultural Biosecurity Standard Operating Procedures Transmission Business Unit

the last method is preferred, it is not always possible because the activity may be dependent upon a specific timeline, seasonal changes, or an emergency situation where it is essential to return infrastructure to normal operating conditions.

Additional measures may be implemented when there is documented evidence of invasive organisms (diseases, pests, and invasive species) that are of concern to Manitoba Agriculture.

For the majority of activities conducted within the Transmission Business Unit, the level of risk is anticipated to be low. With continual educational awareness and effective implementation of biosecurity procedures, the goal is to further minimize potential effects to agricultural lands.

12. PRESCRIBED ACTIONS Emergency

In emergency situations the Manitoba Hydro Act will prevail in order to return services to normal operating conditions. All efforts will be made to assess the risk to agricultural lands and personnel safety to determine the most appropriate measures to be taken.

13. Low Risk

- 1. Ensure clothing, matting, vehicles and equipment is clean of soil, manure, plant material and foreign matter prior to entering agricultural lands.
- 2. When leaving agricultural lands, visually inspect clothing, matting, vehicles, and equipment for seeds, soil, or manure and if required, mechanically clean all surfaces prior to leaving the land. Brushing and/or scraping will remove most surface soil, plant material, and foreign matter from clothing, vehicles and equipment.
- 3. Complete the Vehicle and Equipment Cleaning Record and submit with the Biosecurity Checklist as required by Manitoba Hydro departmental or contract requirements.

14. High Risk

- 1. If possible, schedule activities to occur when ground conditions are more favorable.
- 2. Ensure clothing, matting, vehicles and equipment is clean of soil, manure, plant material and foreign matter prior to entering agricultural lands.
- 3. When leaving the agricultural land, visually inspect clothing, matting, vehicles and equipment for soil, manure, plant material or foreign matter and if required, mechanically clean all surfaces prior to leaving the land. Brushing and/or scraping will remove most surface soil, plant material, and foreign matter from clothing, matting, vehicles and equipment.
- 4. Matting, vehicles and equipment may require fine cleaning to remove remaining soil, manure, plant material and foreign matter. Fine cleaning will be conducted using high pressure water, steam or compressed air to remove remaining soil, manure, plant material and foreign matter.
- 5. Fine cleaning and disinfecting of matting and equipment only, may be completed off site, **if** the matting or equipment is transported directly to a Manitoba Hydro approved or commercial wash facility. In cases where there is a risk of spreading soil to agricultural lands (such as vehicle or equipment tires/tracks),

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pressure washing/steaming/compressed air cleaning must occur before leaving the land.

- 6. After fine cleaning, disinfection of matting, vehicles and equipment through the use of a disinfectant mist that is applied to all surfaces that have been in contact with soil, manure, plant material and foreign matter is required.
- 7. Only disinfectants approved by Manitoba Hydro, Property and Corporate Environment Department are to be utilized.
- To clean footwear, use a brush or scraper to remove soil, manure, plant material and foreign matter. Apply disinfectants approved by Manitoba Hydro, Property and Corporate Environment Department. Alternatively, use disposable footwear booties or change dirty footwear for clean footwear when leaving the field.
- 9. Complete the Vehicle and Equipment Cleaning Record and submit with the Biosecurity Checklist as required by Manitoba Hydro departmental or contract requirements.

15. PERSONAL PROTECTIVE EQUIPMENT

Safety of the individual will always be of the highest importance at Manitoba Hydro. Corporate safe work procedures and protocols are in place to protect not only the individual(s) directly involved in the activity or work, but also as it relates to public safety.

Personal protective equipment (PPE) will be worn as per the manufacturer's specifications and as directed by Manitoba Workplace Health and Safety Regulation 217/2006, Part 6 Workplace Safety and Health Regulations.

16. CONTACT INFORMATION

If there are any questions or concerns from the public related to biosecurity at Manitoba Hydro, contact the Customer Contact Centre at 1-MB-HYDRO (1-888-624-9376) or via email at environment@hydro.mb.ca.

APPROVAL

Original signed by Shane Mailey Shane Mailey Vice-President Transmission November 27, 2017 Date

NOTE: This procedure will be reviewed annually by management. As conditions change or new information becomes available, this document may be revised prior to the annual review date. Printed copies are not controlled, so check with management for the latest version.

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Appendix H: Golden Winged Warbler Habitat Management Plan

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MANITOBA-MINNESOTA TRANSMISSION PROJECT

Right-of-Way Habitat Management Plan for Managing Critical Golden-winged Warbler Habitat during Construction and Operation



Document Owner Licensing and Environmental Assessment Department Transmission Planning and Design Division Transmission Business Unit Manitoba Hydro

Version – Final 1.0

List of Revisions

Number	Nature of revision	Section(s)	Revised by	Date
Draft ADDITION AND DESCRIPTION OF HERBICIDAL STUMP TREATMENT		Construction Phase pg.12	MH	10/12/2018

Right-of-Way Habitat Management Plan for Managing Critical Golden-winged Warbler Habitat during Construction and Operation of the Manitoba–Minnesota Transmission Project

Background

Golden-winged warbler is one of eleven Species of Conservation Concern (SOCC) associated with open forest habitat, which is discussed as part of potential environmental effects on wildlife and wildlife habitat (Chapter 9, Section 9.4.2 Manitoba Hydro 2015). It is the only species in the Regional Assessment Area (RAA) to have defined critical habitat.

The golden-winged warbler is a ground-nesting songbird that breeds in shrubby habitats adjacent to mature stands of deciduous and mixedwood forest (Manitoba Hydro 2015). It uses forest edge habitat and openings containing shrubs and grasses. Habitat is often regenerated by natural and human disturbances, including hydroelectric utility corridors, which can be preferred habitat for this species if corridors are maintained in a manner that retains shrubs and herbs along forest edges.

There are records from Bird Studies Canada and the Manitoba Breeding Bird Atlas of goldenwinged warbler occurrences throughout the east portion of the RAA. Observations are concentrated in the areas surrounding the communities of Ste-Genevieve, Ross and Richer. In addition, six golden-winged warblers were detected during MMTP environmental assessment breeding bird surveys north and southwest of the community of Marchand, south of the community of Richer, and south of the Watson P. Davidson Wildlife Management Area (WMA) (Manitoba Hydro 2015).

Statement of Intent

The "*Recovery Strategy for the Golden-winged Warbler (Vermivora chrysoptera) in Canada*" was published in 2014 (Environment Canada 2014). Manitoba Hydro recognizes that a portion of the Manitoba-Minnesota Transmission Project intersects an area defined in this strategy as critical golden- winged warbler habitat. By utilizing an integrated vegetation management approach, application of standard operating procedures, best practices and the usage of adaptive management techniques, Manitoba Hydro will endeavor to maintain or enhance the critical habitat of the golden-winged warbler within the Project right-of-way (ROW).

ROW Habitat Management Area for Golden-winged Warbler

For the purposes of this plan, a golden-winged warbler ROW Habitat Management Area (HMA) was developed. This area is comprised of the portion of the project ROW that intersects the five critical habitat grid squares as outlined in the recovery strategy (approximately 70 spans) (Map 1).

Within the "*Recovery Strategy for the Golden-winged Warbler (Vermivora chrysoptera) in Canada*" focal areas designate critical golden-winged warbler habitat on a broad scale throughout their range. Manitoba contains three focal areas, GL 1 near Dauphin along the western edge of the province, GL 2 in the Interlake, it is within GL 3 located in southeastern part of the province, through which the proposed ROW crosses. These focal areas are subdivided into 10 x 10km grid squares, based on the standardized UTM grid. A total of 177 grid squares occur in Manitoba, 60 of which are located in GL 3. Map 2 illustrates Potential Golden-winged Warbler Habitat and Critical Golden-winged Warbler Habitat Grids in the RAA intersected by the Project's transmission line ROW.

Goal and Objectives

Goal: In sensitive areas of critical golden-winged warbler habitat, ROW vegetation will be selectively cleared and maintained using an integrated vegetation management approach to enhance long-term habitat suitability for golden-winged warbler.

Objective 1: To improve understanding of golden-winged warbler habitat distribution along the Project ROW.

Objective 2: To apply construction clearing prescriptions suitable for the maintenance and development of potential golden-winged warbler habitat while allowing for safety considerations in the construction of the Project.

Objective 3: To apply operational vegetation maintenance prescriptions suitable for the enhancement of potential golden-winged warbler habitat, while abiding by legal requirements for the safe operation and maintenance of the Project.

Objective 4: To monitor the response of the local golden-winged warbler population along the Project ROW.



Map 1. Critical Golden-winged Warbler Habitat Grids in the RAA.



Map 2. Potential Golden-winged Warbler Habitat and Critical Golden-winged Warbler Habitat Grids in the RAA.

Baseline Conditions

Landscape-scale habitat suitability for golden-winged warblers was determined for the five 10 x 10km grid squares that intersect the ROW using Manitoba Conservation and Water Stewardship Forest Resource Inventory Data. The habitat standards presented in Environment Canada Recovery Strategy (50-75% forest cover that is composed of 50% deciduous or mixed forest, with less than 30% coniferous forest) (Environment Canada 2014), were used as a reference to calculate suitable and non-suitable habitat.

At baseline, one of the five grid squares met the Environment Canada standards for being suitable golden-winged warbler habitat, while the remaining four contained an amount slightly below the recommended amount of suitable habitat (Table 1, Map 2). Suitable habitat consisted mainly of broadleaf forest. Mixedwood forest was scarce. The predominant nonsuitable habitat at the landscape scale was agriculture. Developed areas and meadow were less abundant than agricultural land, but are still relatively common in each grid square compared to other habitat types (Table 1). **Table 1.** Baseline habitat areas (ha) within the 10 x 10km grid squares intersected by the ProjectROW based on Environment Canada's landscape-scale habitat definition (Environment Canada2014).

		10 x 10km Grid Square				
	Habitat Type (ha)	14PA70	14PA71	14PA72	14PA80	14PV89
	Broadleaf	3,787	3,914	4,748	5,355	2,978
	Mixedwood	22	2	7	32	102
	Total	3,809	3,915	4,755	5,388	3,081
Habitat	Percent of Grid	38	39	48	54	31
	Coniferous	13	22	67	45	456
	Developed	1,001	907	847	621	279
	Fields (Agriculture)	4,415	4,189	2,792	1,248	2,536
	Willow/Alder	394	365	679	1,277	877
	Marsh Muskeg	23	15	46	394	1,925
	Meadow	257	588	763	977	750
	Shelter Belts	89	0	3	0	0
	Treed Muskeg	0	0	47	1	87
	Water	0	0	0	51	10
Non-	Total	6,192	6,085	5,245	4,612	6,919
Habitat	Percent of Grid	62	61	52	46	69

Habitat suitability for golden-winged warblers was also determined for the section of the ROW that intersects the five 10 x 10km grid squares. A more detailed habitat model presented in the EIS (Appendix C) was applied to Forest Resource Inventory data to identify potential nesting and foraging habitat (EIS Map 9-24). The ROW was defined by buffering the Project centreline by 80m for sections that will use self-supporting towers and 100m for sections that will use guyed-towers.

In the ROW that intersects the five 10 x 10km critical habitat grid squares, the Project ROW contains approximate totals of 64ha of high, 40ha of medium, and 57ha of low potential habitat for golden-winged warblers (Table 2). Much of the existing habitat within the proposed ROW is considered non-habitat for golden-winged warblers (Table 2, Map 2).

Table 2. Baseline habitat areas (ha) within the five 10 x 10km critical habitat grid squares withinthe Project ROW based on EIS habitat models.

		Potent			
	Habitat Type	High	Medium	Low	Total (ha)
		(ha)	(ha)	(ha)	
	Grassland	4.7	5.7	0.0	10.4
Habitat	Productive Forest	44.8	30.5	57.0	132.3
	Shrub	14.9	3.7	0.0	18.6
	Total	64.4	39.9	57.0	161.3
Non-Habitat	NA	NA	NA	NA	199.3
					360.6

Implementation Phases

Planning Phase

In developing this section the publications "The Best Management Practices for the Goldenwinged Warbler Habitat on Utility Rights of way in the Great Lakes" (ND) and "Best Management Practices for Golden-winged Warbler Habitat in the Aspen Parkland Transition Zone of Canada" (ND) provided valuable guidance on how best to plan and maintain vegetation along a ROW for the benefit of golden-winged warblers.

Habitat Management Sites (HMS) will be approximately 10ha in size, which is roughly equivalent to the ROW area between three transmission towers (two spans). There are approximately 90 spans in total within the ROW habitat management area. The size of the HMS is derived from recommendations made by Roth et al. (2012), who suggest that management sites be 2ha in size if located within 300m of existing suitable habitat and 10ha in size when located further than 300m from existing suitable habitat. Potential Golden-winged Warbler Habitat (Map 2) and vegetation surveys as described below will inform the selection of the HMS.

The near and long-term habitat management objective for the golden-winged warbler is to provide a mosaic of different vegetation types that are preferred by this species within each HMS. Habitat preferences for this species have been well documented and are generally described as clumps of shrubs interspersed with herbaceous openings, adjacent to mature forest. Specifically, ideal golden-winged warbler habitat within a HMS is defined as: (GWWAWG 2013)

- Tall shrubs and saplings (1-4m) unevenly distributed as clumps, consisting of up 30-70% of the management site;
- Shrub and sapling clumps interspersed with herbaceous openings that are primarily composed of forbs with a smaller proportion of grasses;

- Low woody vegetation (1m), leaf litter, and bare ground that occupies less than 25% of the opening's space;
- Low density of overstory trees (10-15/ha).

As the Project proceeds, the first objective will be to validate the amount of potential goldenwinged warbler habitat present within the proposed ROW using vegetation surveys. Vegetation surveys will use a combination of remotely-sensed data, including LiDAR (light detection and ranging) and high-resolution imagery, as well as data collected from the ground. Remotelysensed data will be used to improve understanding of where potential golden-winged warbler habitat is located along the ROW. Both spatial and quantitative information of tree and shrub species, their heights and grass-forb habitat patches derived from LiDAR imagery will be mapped. One of the most important factors in developing clearing prescriptions will be to determine the extent of tree growth along the Project ROW. Trees are not compatible with the safe operation and maintenance of a transmission line and must be managed when their height exceeds the vegetation clearance requirements for the safe operation of a transmission line. The derived plant community distributions will be used to develop vegetation management prescriptions for each management site. As additional digital imagery and ground-based vegetation survey data becomes available for the Project development area, Manitoba Hydro will develop specific mapping products to help guide on the ground clearing activities in goldenwinged warbler critical habitat.

Construction Phase

Clearing of the ROW for transmission line construction will be considerate and selective in areas designated as golden-winged warbler habitat from the vegetation mapping described above. Within each HMS (two spans), vegetation clearing will occur in two separate zones (Figure 1). Vegetation management in Zone 1 (0-12m on either side of the centreline of the ROW and up to a 100 x 100m cleared area around the tower base) will involve the clearing of all trees and shrubs to provide safe access and work areas at tower footprints and during conductor stringing. Vegetation management within Zone 1 will likely involve the use of mechanical equipment such as feller-bunchers or mulchers to remove all standing woody vegetation.

After vegetation removal, poplar trees (*Populus tremuloides*) are expected to sucker and rapidly regrow. This rapid regrowth will hinder golden-winged warbler habitat and right-of-way vegetation management goals. To minimize the requirement to immediately apply foliar herbicide or conduct invasive mechanical clearing, a herbicidal stump treatment may be applied. This herbicidal stump treatment will be part of an integrated vegetation management approach to managing tall growing trees in Zone 1.

Vegetation management within Zone 2 (12-50m on either side of the centreline of the ROW between tower footprints) will involve the selective removal of woody vegetation. In this zone, all trees will be removed, but other vegetation, particularly forbs, some saplings, and most shrubs will be retained to the extent possible. The use of feller-bunchers and hand clearing will likely be used to remove all trees in this zone. On the outer edges of Zone 2, clearing equipment operators will work closely in real-time with Manitoba Hydro environmental inspectors in an effort to develop a feathered edge by selectively clearing vegetation in an uneven pattern to create a mosaic of habitats as described in Petzinger et. al (ND), Artuso et al. (ND) and GWWAWG (2013).

The conceptual vegetation clearing prescription described above applies to forested habitat. Large shrubland, wet areas, and grassland dominated plant communities will not require vegetation clearing beyond Zone 1, and as such will be maintained as close as possible to their existing and naturally occurring state.

Clearing activities will take place during the non-breeding season to minimize the disturbance during this critical period. If any construction activities cannot be achieved during the nonbreeding season, pre-clearing nest surveys will be conducted, and a set-back distance of 300m from breeding and nest sites will be used to prevent disturbances to golden-winged warblers (EIS, Ch. 22, Appendix E). In addition, supply and marshalling yards will be located in previously developed areas or in low potential golden-winged warbler habitat.



Figure 1. Vegetation clearing and management zones (100m ROW) within the five 10 x 10km critical habitat grid squares within the Project ROW (not too scale).

Operations Phase

The goal of long-term habitat management is to provide golden-winged warbler habitat as described above within the HMS. Following construction, within forested areas, shrubs and other vegetation will regenerate naturally through the spread of suckers and new growth from the existing seed bank. During operation and prior to vegetation management activities, Manitoba Hydro will assess vegetation diversity, distribution and height along the ROW. These results will be compared to the habitat preferences of golden-winged warbler (see Planning Section above). Where ROW vegetation characteristics substantially deviate from golden-winged warbler habitat preferences, as outlined in Petzinger et. al (ND), Artuso et al. (ND) and

GWWAWG (2013), Manitoba Hydro will adjust vegetation management prescriptions within HMS accordingly using an adaptive management approach.

Typically, vegetation management along transmission line ROWs occurs every 8-10 years (EIS, Section 2.13.3). Vegetation within Zone 1 will be maintained as a mosaic of grass, forbs and low shrubs to prevent interference with the transmission line and allow access for transmission line inspection and maintenance. Vegetation management in this zone will likely use a combination of mechanical mowing and the selective application of herbicides to prevent tree growth.

Vegetation within Zone 2 will be selectively managed to remove all trees but maintain the presence of a forbs, grasses, saplings, and a low and tall shrub layer. Along the outer edge of this zone, management will likely include the use of selective brush mowing and/or hand-clearing of trees to leave patches of shrubs and taller woody vegetation to create a feathered edge, as shown in Figure 2. Selective herbicide use may also be applied to prevent tree growth. Manitoba Hydro has considered the general vegetation management techniques described by Roth (2012b) to maintain specific habitat conditions for golden-winged warbler.



Figure 2. Example of high quality golden-winged warbler habitat along a transmission line ROW with a feathered edge (Petzinger et al. (ND). Photo credit Tom Langen).

Burning is not considered as a management tool in this plan due to risk of wildfire, the presence of private property, and other logistical constraints. Habitat management within farmland, pasture, or other developed land types is not practicable due to private land considerations and the lack of suitability for golden-winged warblers.

To maximize the diversity and habitat structure in the ROW, vegetation management will be staggered in space and time amongst HMS. An adaptive management approach will be used to determine the timing of vegetation prescriptions in each HMS as habitat development depends on numerous environmental factors. By alternating vegetation management within parts of Zone 2 over a suitable period (dependent on local environmental conditions), different stages of regenerating forest will develop within a single habitat management site and enhance the potential habitat suitability for golden-winged warblers (Figure 3).

Project Monitoring

The Manitoba-Minnesota Transmission Project - Environmental Monitoring Plan (Appendix 22C) outlines monitoring activities for bird species of conservation concern, including golden-winged warblers.

These monitoring objectives include:

- Identify the location of bird species of conservation concern within or in close proximity to the Project footprint with the purpose of establishing a Control-Impact monitoring program for known individuals and/or groups;
- Monitor species of conservation concern in close proximity to the transmission line and compare annual site fidelity and abundance to nearby control sites; and
- Determine the effectiveness of mitigation measures and, if appropriate, propose revisions to the existing plans or develop new mitigation options should unexpected impacts to birds occur as a result of construction or operation activities.



Figure 3. Examples of high quality (top) and poor quality (bottom) golden-winged warbler habitat in a transmission line ROW ((GWWAWG (2013). Photos credits from top and bottom: Sara Barker Swarthout; and Amber Roth)

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Roth, A.M., Rohrbaugh, R.W., Will, T., and Buehler D.A. 2012b. Golden-winged warbler status and review and conservation plan. Golden-winged Warbler Working Group Publication 175 pp. Available from www.gwwa.org/.

Appendix I: Golden Winged Warbler Habitat Clearing Detail Drawings

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227	227 671703.26 5524676.64		A-550-0+3
228	671711.50	5524242.10	A-550-0+3
229	671719.41	5523824.84	A-550-0+3
231	671733.37	5523089.01	D-550-0+0
232	671989.42	5523018.74	A-550-0+0
233	672255.76	5522945.64	D-550-0+6
234	672267.15	5522511.58	A-550-0+6
235	672278.67	5522072.74	A-550-0+6
236	672290.92	5521592.62	A-550-0+6
237	672303.09	5521113.31	A-550-0+6
238	672314.25	5520673.55	A-550-0+0
243	672639.98	5518689.06	A-550-0+6
244	672801.55	5518265.54	A-550+9
245	672960.41	5517849.12	A-550-0+6
246	673095.77	5517494.29	A-550-0+0
247	673229.17	5517144.60	A-550-0+6
248	673383.93	5516738.89	A-550-0+3
249	673537.15	5516337.17	A-550+9
250	673686.34	5515946.03	A-550-0+3
251	673839.77	5515543.77	A-550+9
252	673987.24	5515157.23	C-550-0+0
253	674271.50	5514888.88	A-550-0+3
254	674596.93	5514581.68	A-550-0+6
255	674933.18	5514264.26	A-550-0+6
256	675260.61	5513955.17	D-550-0+9
257	675556.07	5513568.13	A-550-0+12
258	675852.17	5513180.25	A-550+9
259	676139.49	5512803.88	A-550-0+6

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OWER No.	X EASTING (M)	Y NORTHING (M)	TOWER DESCRIPTION
260	676431.96	5512420.76	A-550+9
261	676715.85	5512048.88	A-550+9
262	677020.58	5511649.70	A-550+9
263	677302.82	5511279.98	A-550-0+6
268	678612.02	5509565.01	A-550-0+6
269	678904.37	5509182.05	A-550-0+6
270	679142.02	5508870.74	C-550-0+6
271	679136.65	5508429.15	A-550-0+6
272	679130.85	5507952.55	A-550+9
273	679124.75	5507451.56	A-550+9
274	679119.53	5507022.97	A-550-0+6
275	679114.03	5506571.44	A-550-0+6
276	679110.85	5506310.32	C-550-0+9
277	679256.22	5505882.46	A-550-0+6
278	679399.71	5505459.76	A-550-0+6
281	679799.69	5504257.88	C-550-0+0
282	680026.20	5503955.50	A-550+9
283	680294.64	5503597.20	A-550-0+6
284	680571.24	5503228.15	A-550+9
287	681370.48	5502163.22	A-550-0+6
288	681626.95	5501821.47	A-550-0+6
289	681903.77	5501452.60	A-550-0+6
290	682182.87	5501080.56	A-550-0+6
291	682462.79	5500707.60	A-550-0+6
292	682742.69	5500334.80	A-550-0+6
293	683008.88	5499980.26	A-550-0+6
294	683261.91	5499643.25	D-550-0+0

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TOWER No.	X EASTING (M)	Y NORTHING (M)	TOWER DESCRIPTION
295	683170.70	5499253.41	A-551-0+3
296	683070.17	5498823.73	A-551-0+3
297	682966.64	5498381.19	A-551-0+6
298	682858.14	5497917.43	A-551-0+6
299	682753.37	5497469.63	A-551-0+6
300	682646.40	5497012.42	A-551-0+3
302	682445.93	5496155.59	A-551-0+3
303	682349.80	5495744.70	A-551-0+3
304	682242.44	5495285.83	A-551-0+9
305	682133.73	5494826.17	A-551-0+12

Appendix J:

Red River Crossing (Aqua 110-) Memorandum of Agreement -Government of Manitoba and Manitoba Hydro (Floodway MMTP St Vital) This page was left intentionally blank.

Memorandum of Agreement

Government of Manitoba

- and -

The Manitoba Hydro-Electric Board

December 8th, 2017

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Memorandum of Agreement made this 8th day of December, 2017.

BETWEEN:

GOVERNMENT OF MANITOBA represented by the Minister of Infrastructure ("Manitoba")

- and -

THE HYDRO-ELECTRIC BOARD ("Hydro")

WHEREAS:

- A. As per The Water Resources Administration Act, C.C.S.M. c. W70 (the "Act"), Manitoba has jurisdiction over, and control and possession of provincial waterways;
- B. Manitoba has constructed a diversion channel for the Red River from a point at or near St. Norbert, in the Province of Manitoba, around Greater Winnipeg to St. Andrew's Locks, near Lockport in the said Province, which diversion channel is known as the Red River Floodway;
- C. The Red River Floodway is a critical piece of water control infrastructure to protect the City of Winnipeg against flooding;
- D. The Red River Floodway has been designated a provincial waterway in accordance with Act;
- E. The Act provides as follows:

Restricting and controlling access to floodway

- 2.1 In addition to any of the powers or authority of the minister under this Act, the minister may
 - (a) deny or restrict a person's access to the floodway, as defined in The Red River Floodway Act; and
 - (b) require a person to obtain his or her approval before undertaking any activity on the floodway, or on Crown land near the floodway, and may impose conditions on an approval given to a person.

Prohibition against placing materials, etc.

14(4) No person shall place any material on, remove any material from, or construct, carry out, reconstruct, establish, or place, any works or structures on, over, or

across, a provincial waterway, except as may be authorized in writing by the minister and subject to such terms and conditions as the minister may prescribe:

- F. Hydro, for its business needs, desires to construct and use two (2) electric power transmission lines and/or distribution lines and related plant, equipment and facilities, for the following:
 - (i) the St. Vital Transmission Complex; and
 - (ii) the Manitoba-Minnesota Transmission Project;

on and across those provincial waterway lands as identified in yellow on the plan attached to this Agreement as Schedule B, including within lands within the boundaries of the Floodway which are identified in red on the plan attached to this Agreement as Schedule B;

- G. The placement of the two (2) overhead electric power transmission and/or distribution lines and related plant, equipment and facilities (the "Facilities") in the Designated Area within proximity of the Floodway is an unquantified risk with potentially significant consequences to the Floodway, the operation of the Floodway and Manitoba's use and reliance on the Floodway to protect the City of Winnipeg;
- H. The Minister of Infrastructure has granted approval and authorization to Hydro, a copy of which is attached to this Agreement as Schedule A (the "Authorization"), to construct, place, operate, inspect, maintain, repair and remove on, over, or across the Designated Area the Facilities as identified on the plan attached to this Agreement as Schedule B, for up to fifteen (15) years following the Construction Completion Date until an alternative location for the Facilities is found or a longer period of time is negotiated;
- The parties agree that the risks posed by the facility will be mitigated (i) by the provisions of this Agreement, which require review after ten (10) years pursuant to Section 14; (ii) by the clauses in this Agreement which require coordination and communication in the design, construction and operation of the Floodway and the Facilities, and (iii) by agreed upon procedures for the removal of the conductors in case of an Emergency Situation;
- J. The parties recognize that the construction of the Facilities on the Designated Area is an accommodation to assist Hydro in satisfying its business needs to provide hydro-electric power to the St. Vital area and to Minnesota and that the Facilities will be removed or relocated in the time period stipulated unless alternative arrangements are agreed to by Manitoba as provided for in subsection 14.1;
- K. The parties recognize that any decision by Manitoba during the term of this Agreement to request that Hydro move, or remove, the Facilities shall not be taken lightly, taking into account:
 - (i) firstly the paramount importance of the critical nature of the Floodway to the protection of the City of Winnipeg and its residents, and the paramount responsibility of Manitoba to ensure the integrity of Floodway and the operation of the Floodway is maintained at all times; and

(ii) secondly the significant costs involved in removing the Facilities, and the regulatory requirements which result;

NOW THEREFORE, THE PARTIES AGREE AS FOLLOWS:

SECTION 1 DEFINITIONS

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- 1.1 The following capitalized terms used in this Agreement have the following meanings:
 - (a) Actual Flood Event means the duration of time for any Flood Event that is actually occurring, identified by Manitoba;
 - (b) Agreement means this document and the schedules attached to this document;
 - (c) Authorization has the meaning ascribed to that term in preamble paragraph H;
 - Business Day means Monday to Friday, excluding statutory and civic holidays in the Province of Manitoba;
 - (e) **Construction Completion Date** means the date upon which the last transmission tower structure is constructed in the Designated Area;
 - (f) **Designated Area** is that provincial waterway area identified in yellow on the plan attached to this Agreement as Schedule B;
 - (g) **Effective Date** means the date of the signing of this Agreement by the last of the Parties;
 - (h) Emergency Situation means:
 - (i) any situation of an Actual or Forecasted Flood Event, which may or may not be combined with any other events (such as for example a tornado, ice storm, terrorism); or
 - (ii) any other events caused by weather disturbances, natural disasters or other emergencies (such as for example tornados, ice storms, terrorism);

where, in Manitoba's opinion (which shall be determined at least at the Deputy Minister level), the presence of the Facilities could potentially threaten or jeopardize the flood protection system for the City of Winnipeg or that could otherwise potentially threaten or jeopardize the safety of persons and/or property;

- Expiry Date means fifteen (15) years less one (1) day from the Construction Completion Date, or such later date as may be mutually agreed to in writing by the Parties;
- (j) Facilities has the meaning ascribed to that term in preamble paragraph G;
- Flood Event means a period of time during which the water level exceeds the top of the bank of the river channel;

- (I) **Floodway**, also referred to as the **Red River Floodway**, means the "floodway" as defined in *The Red River Floodway Act*, C.C.S.M. c. R32;
- (m) Forecasted Flood Event means the period of time during which a Flood Event is expected to occur at a point of time in the future based on best available hydrometric and weather information, as reasonably determined by Manitoba in its discretion;
- (n) Party means either Manitoba or Hydro; and Parties means Manitoba and Hydro;
- (o) **Term** has the meaning ascribed to that term in subsection 4.1.

SECTION 2 INTERPRETATION

- 2.1 The preamble forms an integral part of this Agreement.
- 2.2 Titles and headings in this Agreement are used for reference purposes only.
- 2.3 Unless specifically stated otherwise in this Agreement:
 - (a) words and phrases denoting inclusiveness (such as "including" or "includes"), whether or not stated as being without limitation, are not limited by their context or the words or phrases which precede or succeed them;
 - (b) all documents and materials to be provided by Hydro to Manitoba under this Agreement must be satisfactory in form and content to Manitoba, acting reasonably;
 - (c) where the agreement, approval or consent of a Party is required, it will be in writing and will not be unreasonably withheld or delayed;
 - (d) whenever the words opinion, discretion, option, determine, election or other similar words or any variation thereof are used with respect to a Party, they will be deemed to mean such Party's sole and absolute discretion, option, determination, election or other such similar act, acting reasonably;
 - (e) all references to "sections", "subsections", "clauses" and "subclauses" used in the main body of this Agreement shall mean the respective sections, subsections, clauses and subclauses as contained in the main body of this Agreement.
- 2.4 Any reference to a statute will be deemed to refer to the statute and any regulation made under that statute in force as at the Effective Date, as the same may be subsequently amended, expanded, added-to, supplemented or otherwise changed or replaced from time to time, unless otherwise expressly provided in this Agreement.
- 2.5 Words importing the singular number only will include the plural and vice versa, and words importing gender will include all genders.
- 2.6 No provision of this Agreement shall be construed against any Party merely because that Party or its legal representative drafted or prepared the Agreement.

SECTION 3 SCHEDULES

- 3.1 This Agreement consists of the main body of this Agreement and the following schedules, which are attached or incorporated by reference:
 - (a) Schedule A Ministerial Approval and Authorization under *The Water Resources* Administration Act, C.C.S.M. c. W70;
 - (b) Schedule B Plan of Designated Area;
 - (c) Schedule C List of Individuals for Dispute Resolution Process.
- 3.2 If there is any conflict or inconsistency:
 - between the main body of this Agreement and the Schedules, the main body of this Agreement will govern;
 - (b) between the schedules, the following order of priority will govern:
 - Schedule A Ministerial Approval and Authorization under The Water Resources Administration Act, C.C.S.M. c. W70;
 - (ii) Schedule B Plan of Designated Area;
 - (iii) Schedule C List of Individuals for Dispute Resolution Process.

SECTION 4 TERM

- 4.1 This Agreement is effective as of the Effective Date and will continue until the earlier of:
 - (a) the Expiry Date; and
 - (b) the relocation or other removal of the Facilities from the Designated Area by Hydro;

unless this Agreement is terminated earlier according to its terms or extended by mutual written agreement of the Parties (the "Term").

4.2 Hydro will advise Manitoba in writing immediately following the completion of the construction of the last transmission tower structure in the Designated Area.

SECTION 5 AGREEMENT AND OPERATIONS REVIEW

- 5.1 Executive representatives of the Parties will meet on or about each fifth (5th) anniversary of the Effective Date during the Term of this Agreement to:
 - review, assess and make improvements to the operation and effectiveness of this Agreement; and
 - (b) to review, assess and discuss any issues, concerns and challenges encountered by the Parties over the course of the previous five (5) year period in relation to the Floodway, the Designated Area, and/or the Facilities.

SECTION 6 LICENCES, REGULATIONS AND LAWS

- 6.1 Nothing in this Agreement shall be construed as an admission or denial of the applicability of provincial legislation to Hydro.
- 6.2 Notwithstanding that Hydro is an agent of the Crown and as such may not be legally bound by Provincial statutes, Hydro will comply with *The Water Resources Administration Act* (Manitoba), and regulations under that Act, as may be modified from time to time or its successor legislation to that Act, as it pertains to the Designated Area.
- 6.3 Hydro shall comply with all other applicable federal, provincial and municipal laws, regulations, by-laws and orders that apply to the construction, operation and maintenance of the Facilities on the Designated Area, including applicable labour laws, environmental laws, and human rights legislation.
- 6.4 Hydro, in its application to the National Energy Board under the *National Energy Board Act*, R.S.C., 1985, c. N-7, agreed to reflect the negotiations surrounding the construction of the Manitoba-Minnesota Transmission Project in and around the Designated Area, consistently with the terms, conditions and obligations set out in this Agreement.
- 6.5 If compliance with any provision of this Agreement would result in violation of any codes, statutes, laws, regulations, permits, licenses, orders and directions of any governmental authority, such code, statute, law, regulation, permit, license, order and direction of any governmental authority shall prevail and this Agreement shall be deemed to be amended accordingly.

SECTION 7 CONSTRUCTION PLANS

- 7.1 Manitoba and Hydro will work cooperatively, through the liaisons (referred to in subsection 8.1), in the development of the design of the Facilities. It is understood that Hydro is responsible for and as such will determine and approve the final design for the Facilities, PROVIDED THAT:
 - (a) Hydro will exercise due care and attention in designing the Facilities addressing the risks resulting from the placement of the Facilities in proximity to the Floodway, including those communicated to Hydro by Manitoba; and
 - (b) the design is not, in Manitoba's opinion, detrimental to the Floodway or the operation of the Floodway, and if the design is detrimental in Manitoba's opinion, Hydro must revise the designs so that there is no detrimental impact (in Manitoba's opinion) to either the Floodway or the operation of the Floodway.
- 7.2
- (a) Prior to any construction occurring but in any event no less than six (6) months prior to the intended date for construction, Hydro will provide Manitoba with detailed engineering designs, reports, plans and drawings ("Construction Plans") for the location and construction of the Facilities on the Designated Area for Manitoba's review.
- (b) Manitoba will provide its comments to Hydro within thirty (30) Business Days of receipt of the Construction Plans, or within such longer period of time as may be

reasonably necessary to enable Manitoba to conduct a thorough analysis of all geotechnical and hydrologic considerations.

- (c) While Hydro is responsible for and as such will determine and approve the final Construction Plans, neither the design or the location of the Facilities can in any way be detrimental to the Floodway or the operation of the Floodway, in Manitoba's opinion, and if either the design or the location is detrimental in Manitoba's opinion, Hydro must revise its Construction Plans so that there is no detrimental impact (in Manitoba's opinion) to either the Floodway or the operation of the Floodway.
- 7.3 Notwithstanding that Manitoba may review the Construction Plans, Hydro will be solely responsible for and liable for all aspects of the Facilities, including the engineering, location and construction of the Facilities.
- 7.4
- (a) Hydro will not make any substantial change to the final Construction Plans provided and reviewed by Manitoba without reasonable prior written notice to Manitoba; any changes made to the final Construction Plans must not in any way be detrimental to the Floodway or the operation of the Floodway, in Manitoba's opinion. Concurrent with providing the written notice, Hydro will also provide such information and details as requested by Manitoba, acting reasonably.
- (b) Manitoba will provide comments to Hydro on any changes proposed by Hydro within thirty (30) Business Days of receipt of the proposed changes and the information and details requested in accordance with 7.4(a), or within such longer period of time as may be reasonably necessary to enable Manitoba to conduct a thorough analysis of all geotechnical and hydrologic considerations.
- (c) No change will be made that in Manitoba's opinion is detrimental to the Designated Area, the Floodway or the operation of the Floodway.

SECTION 8 LIAISONS

- 8.1 For the purposes of construction of the Facilities:
 - (a) Within ten (10) Business Days of the last Party executing this Agreement, Manitoba and Hydro shall each appoint a liaison to meet together on a regular basis during the period of time from their appointments through to the completion of the construction of the Facilities, including during the design activities as well as the construction activities.
 - (b) The liaisons will meet (which may be in person or by teleconference as the liaisons may determine) at appropriate intervals to be determined by the liaisons, which shall in no event be less frequently than monthly (unless mutually agreed otherwise by the liaisons) during the design activities and no less frequently than weekly (unless mutually agreed otherwise by the liaisons) during the construction of the Facilities, for the purpose of communicating activities related to the Facilities which may impact Manitoba and/or Hydro. The liaisons will be responsible for communicating those activities to their respective principals.

(c) At Manitoba's liaison's request, the Hydro liaison will provide status reports respecting the design activities and the construction activities, which reports may be verbal or written as may be required by Manitoba's liaison, acting reasonably.

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- (d) An individual appointed by a Party to be its liaison representative must be acceptable to the other Party, acting reasonably, and must be sufficiently knowledgeable and available to meet and provide information as contemplated in subsection 8.1.
- (e) Each Party will exercise reasonable efforts to maintain the continuity of the individual it has appointed as its liaison and will provide the other Party as much prior notice as possible in the event that the individual it has appointed will be replaced.
- 8.2 Immediately following the conclusion of the construction of Facilities:
 - (a) Each Party will appoint a liaison (who may be the same or a different individual than the one appointed for the purposes of subsection 8.1), who must be acceptable to the other Party, acting reasonably.
 - (b) The liaisons will meet together on a regular basis during the Term of this Agreement, at appropriate intervals to be determined by the liaisons, which shall in no event be less frequently than annually, for the purpose of communicating activities related to the Facilities and the Floodway that may impact the Parties.
 - (c) In addition to the meetings contemplated in clause 8.2(b), the liaisons will also meet on an ad hoc basis as either of the Parties' liaisons may require from time to time.
 - (d) The liaisons will be responsible for communicating those activities to their respective principals.
 - (e) Each Party will exercise reasonable efforts to maintain the continuity of the individual it has appointed as its liaison and will provide the other Party as much prior notice as possible in the event that the individual it has appointed will be replaced.

SECTION 9 CONSTRUCTION

- 9.1 Hydro will exercise due care and attention in constructing the Facilities so as to minimize damage, injury or impairment to the Floodway or the Designated Area during the construction, including damage which may result from the use of heavy work equipment in and around the Designated Area or the Floodway, and Hydro will:
 - (a) carry out, manage and complete the construction in a professional, safe, careful and prudent workmanlike manner, and exercise good business practices:
 - (b) comply with and satisfy all applicable legislation, including all applicable *National Energy Board Act, R.S.C., 1985, c. N-7,* requirements.

- 9.2 Hydro will submit to Manitoba its construction schedule for the Facilities, no less than three (3) months prior to the start of any construction on the Designated Area. Hydro shall not make any substantial changes to the construction schedule without the prior written consent of Manitoba. In no event will Hydro carry on construction activities on or near the Designated Area during a Forecasted Flood Event or an Actual Flood Event or an Emergency Situation, except with Manitoba's prior written approval.
- 9.3 Manitoba will be entitled to unrestricted access to the construction site to:
 - (a) inspect the construction;
 - (b) ensure Hydro is complying with its obligations in this Agreement;
 - (c) ensure integrity of the Floodway and the Designated Area;
 - (d) maintain and operate the Floodway;

provided that Manitoba will comply with all reasonable safety and security practices while attending the construction site which are communicated to Manitoba.

- 9.4 In the event of any damage, injury or impairment to the Designated Area, or the Floodway or the operation of the Floodway as a result of the construction of the Facilities including damage which may result from the use of heavy work equipment in and around the Floodway or Designated Area, Hydro shall, immediately upon the earlier of:
 - (a) becoming aware of the damage, injury or impairment; or
 - (b) receiving notice from Manitoba;

at its own cost and expense repair any such damage, injury or impairment, to the satisfaction of Manitoba.

SECTION 10 INGRESS AND EGRESS

- 10.1 Hydro shall, to the extent reasonably practical, ingress and egress the Designated Area and the Facilities from existing roadways.
- 10.2 Ingress and egress routes to and from the Facilities over the Designated Area to be established by Hydro must be pre-approved by Manitoba, in writing, and once approved, Hydro will not change the ingress and egress routes without Manitoba's prior written consent. Manitoba will not remove ingress and egress routes established by Hydro unless in Manitoba's opinion such routes interfere with the operation or maintenance of the Floodway. Any required removal and relocation of ingress and/or egress routes established by Hydro will be at the sole cost and expense of Hydro.
- 10.3 In no event will Hydro use any ingress or egress routes, whether established by Manitoba or by Hydro, that in any way interfere with the operation of the Floodway.
- 10.4 Manitoba has no obligation to provide or keep in good repair routes of ingress or egress to and from the Facilities over the Designated Area.
- 10.5 Use of ingress and egress routes, whether established by Manitoba or Hydro, will be at the sole and entire risk of Hydro.

10.6 Hydro shall, to the satisfaction of Manitoba, repair any damage, injury or impairment caused to the Designated Area or the Floodway as a result of its ingress and egress to the Facilities.

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SECTION 11 HYDRO: ONGOING OPERATION AND MAINTENANCE OF FACILITIES AND FLOOD AREA

- 11.1 Hydro shall use the Facilities and the Designated Area with due care and attention and in a careful and workmanlike manner so as to minimize damage, injury or impairment occurs to the Designated Area, or the Floodway or the operation of the Floodway, including damage which may result from the use of heavy work equipment in and around the Floodway or Designated Area. In the event of any damage to, injury to or impairment of the Floodway and/or the Designated Area, Hydro shall, at its own cost and expense, immediately upon the earlier of
 - (a) becoming aware of the damage, injury or impairment; or
 - (b) receiving notice from Manitoba;

repair any such damage, injury or impairment, to the satisfaction of Manitoba.

- 11.2 Hydro shall maintain the Facilities in good condition and repair. Hydro will not add to or in any way expand the Facilities beyond those as identified on Schedule B without prior written authorization from Manitoba.
- 11.3 Subject to subsection 11.4, Hydro shall, at least ninety (90) days in advance, obtain prior written approval from Manitoba, acting reasonably, before undertaking any significant construction, reconstruction, or maintenance of Facilities or any part of the Facilities. Hydro will endeavour to provide Manitoba with prior notice, through the liaison representatives referred to in subsection 8.2, in the event of minor emergency repairs and ordinary maintenance.
- 11.4 In the event Hydro needs to make significant emergency repairs:
 - (a) if during Forecasted Flood Events or Actual Flood Events or Emergency Situations, Hydro must obtain Manitoba's approval; and
 - (b) at any other time, Hydro will provide Manitoba with as much prior notice as possible.
- 11.5 In respect of the approvals to be obtained under subsection 11.3 and clause 11.4(a), Hydro acknowledges and agrees that Manitoba may, in its discretion, withhold its approval, even for emergency repairs, during Forecasted Flood Events or Actual Flood Events or Emergency Situations, and without incurring any liability whatsoever to Hydro even if the withholding of such approval results in loss of, damage or injury to the Facilities or any part or parts thereof.
- 11.6 Hydro is responsible for vegetation maintenance in the immediate vicinity and within the base of each tower constructed in the Designated Area, including mowing, weeding and maintaining the area in the immediate vicinity and within the based on each such tower in a clean and tidy manner.

SECTION 12 MANITOBA: ONGOING OPERATION AND MAINTENANCE OF THE FLOODWAY

- 12.1 In the event Manitoba closes Courchaine Road for the purposes of managing a Flood Event or an Emergency Situation, Hydro acknowledges it may be denied access to the Facilities through Courchaine Road, at Manitoba's sole discretion and without any liability to Hydro for any costs, expenses or damages it may suffer or sustain as a result.
- 12.2 Hydro acknowledges that Manitoba, and its employees, contractors and agents, may enter the Designated Area at all times and from time to time, with vehicles, machinery and equipment as may be required for the purpose of reconstructing, excavating, drilling, placing, installing, erecting, improving, relocating, inspecting, maintaining and operating the Floodway, which, subject to subsection 12.4, may include excavating using power operated equipment within thirty (30) metres of the Facilities.
- 12.3 Except where Manitoba determines, in its discretion, that an Emergency Situation exists (in which case Manitoba will endeavour to provide Hydro with advance notice but will not be obligated to do so), Manitoba will give Hydro:
 - (a) reasonable advance notice before undertaking any major construction in the Designated Area; and
 - (b) no less than ninety (90) days notice in writing prior to excavating, drilling, placing, installing or erecting on, over or under the Facilities any pit, well, foundation, pavement, material, fence, structure or thing which will extend more than twelve (12) feet above the ground level.
- 12.4 For the purposes of the *National Energy Board Act*, and without limiting the generality of subsection 12.2, Hydro expressly consents to Manitoba excavating using power operated equipment within thirty (30) metres of the Facilities, provided that:
 - Manitoba's activities are designed and executed in accordance with CAN/CSA-C22.3 No. 1-M87 Overhead Systems as amended from time to time in respect of overhead crossings;
 - (b) Manitoba's activities are designed and executed in accordance with CAN4-C22/3 No. 7-M86, Underground Systems as amended from time to time in respect of underground crossings; and
 - (c) a written procedure and schedule for the activities have been agreed to by Hydro and Manitoba and are followed by Manitoba in such a manner so as to minimize damage, injury or impairment to the Facilities.
- 12.5 Prior to the expiry of the Term, as may be extended by mutual agreement of the Parties, in the event that the Facilities, in the sole opinion of Manitoba, interfere with the operation, improvement, reconstruction or relocation of the Designated Area, Hydro will, at its sole cost and expense, remove or relocate the Facilities within a reasonable period of time upon the request of Manitoba, upon such logistical terms and conditions (for example, when, where and how the removal or relocation will occur) as may be agreed upon by Manitoba and Hydro.

(a) It is firstly recognized by Hydro that the Floodway is a critical infrastructure of paramount importance in the protection of the City of Winnipeg and its residents, and that the integrity of the Floodway and the operation of the Floodway is of paramount importance; and 4 .

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- (b) It is recognized by Manitoba that, prior to removing or relocating the works, Hydro may have to do significant advance work, including environmental assessments, property acquisition and regulatory approval, which advance work could take approximately three (3) years to complete. Hydro will not delay such advance work and shall exercise best efforts to complete any such required advance work as quickly as possible.
- (c) In the event that Hydro and Manitoba fail to agree on the terms and conditions, or in the event that Hydro cannot obtain regulatory approval within the time agreed upon, the matter may be referred by either Party to the Lieutenant Governor in Council for final determination.
- 12.6 Hydro acknowledges and agrees that Manitoba may, at any time, with or without notice to Hydro, in its discretion operate the Floodway as Manitoba determines necessary, including directing, channeling or diverting the flow of water across the Floodway, including the Designated Area, without incurring any liability to Hydro whatsoever.
- 12.7 Hydro further acknowledges and agrees that any costs and expenses Manitoba incurs as a result of the location of the Facilities on the Designated Area, in addition to those identified elsewhere in this Agreement, will be immediately reimbursed to Manitoba upon Hydro's receipt of a written invoice, and this amount shall be a debt due and owing to Manitoba.

SECTION 13 EMERGENCY SITUATIONS

- 13.1 Within ninety (90) days following the finalization of the Construction Plans as contemplated in subsection 7.2, the Parties will establish operational procedures and requirements (the "Operational Procedures") for the removal of the conductors in an Emergency Situation. Notwithstanding anything to the contrary in this Agreement, the liaison representatives may, by mutual agreement, amend the Operational Procedures from time to time, as they determine necessary.
- 13.2 In the event of an Emergency Situation:
 - (a) Manitoba will endeavour to provide Hydro with advance notice once an Emergency Situation is determined.
 - (b) The Parties shall carry out and comply with the Operational Procedures.
 - (c) Hydro will only access the Designated Area as permitted in the Operational Procedures.
 - (d) In addition, the Parties agree:
 - (i) Manitoba shall have unrestricted access to the Designated Area, for its employees, contractors and agents, with vehicles, machinery (including

heavy equipment and power equipment) as Manitoba determines necessary to address the Emergency Situation and in priority to Hydro, even if such priority may result in loss of, damage or injury to the Facilities or any part or parts thereof; and

- (ii) Hydro shall, at its own cost and expense, remove all of the Facilities' conductors immediately, but in any event within seventy-two (72) hours of receiving of notice from Manitoba that the removal is required, in accordance with the Operational Procedures. Hydro will be responsible to repair any damage caused to the Floodway or the Designated Area as a result.
- (e) Hydro shall cooperate in all ways with Manitoba and shall comply with all Manitoba directions and requirements determined necessary even if in conflict with the Operational Procedures. Manitoba will endeavour to provide directions and requirements that are reasonable in the circumstances of an Emergency Situation and will try to provide those directions and requirements in writing, however Hydro acknowledges, understands and accepts that in the event of an Emergency Situation, Manitoba's primary and overriding consideration will be to address the Emergency Situation and to protect the people and property in the City of Winnipeg.
- 13.3 Except as provided for in subsection 13.2, Hydro shall not enter upon the Designated Area during an Emergency Situation until such time as Manitoba, in writing, confirms to Hydro the Emergency Situation has ended and then:
 - (a) Hydro shall only enter upon the Designated Area at such time as Manitoba provides written permission for Hydro to enter; and
 - (b) Upon entry, Hydro shall, at its own cost, immediately:
 - repair, to the satisfaction of Manitoba, all damage to the Floodway or the Designated Area caused by the Facilities or parts of the Facilities; and
 - (ii) repair all damage sustained to the Facilities. If Hydro determines it is not practical to repair the Facilities located on the Designated Area, Hydro shall have the option to replace the Facilities in a manner similar to the original design, or to remove the Facilities or parts thereof remaining on the Designated Area and restore the Designated Area as required under Section 15. If Hydro determines to replace the Facilities, Section 5 Section 7, subsection 8.1 and Section 9 will apply as was the case during the original construction of the Facilities.

SECTION 14 REMOVING FACILITIES

- 14.1 No later than on the tenth (10th) anniversary of the Effective Date, Hydro and Manitoba shall meet to review the operation of the Facilities and:
 - (a) discuss opportunities to eliminate or mitigate risks to the Floodway, the operations of the Floodway and/or the Designated Area as a result of the location of the Facilities in the Designated Area, including:

- consideration of alternate technologies that may then be available as an alternative to the location of the Facilities on the Designated Area, for example underground facilities;
- (ii) consideration of alternative geographic areas for the Facilities that may be new and then available, for example new by-pass infrastructure that may have been constructed not existing when the Facilities were first constructed in the Designated Area; and
- (b) discuss if Manitoba has any ongoing concerns and if Manitoba's concerns can be mitigated such that this Agreement can be extended; and
- (c) if risks of the Facilities remaining on the Designated Area are not eliminated or sufficiently mitigated in Manitoba's sole opinion, Hydro will plan for and take all actions necessary to relocate and/or remove the Facilities from the Designated Area as soon as practicable but in any event before the Expiry Date, unless mutually agreed to by the Parties in writing.
- 14.2 In the event that Hydro is required to remove or relocate the Facilities, Hydro will exercise best efforts and diligently pursue the relocation and/or removal of the Facilities from the Designated Area with the objective to relocate or remove the Facilities as soon as practicable but in any event before the Expiry Date.
- 14.3 Commencing on the tenth (10th) anniversary of the Effective Date, Hydro shall on an annual basis, at least thirty (30) days prior to the end of that annual period of time, provide Manitoba with a written report detailing:
 - (a) the activities undertaken by Hydro in the previous year towards relocating and/or removing the Facilities from the Designated Area; and
 - (b) the activities intended to be undertaken by Hydro in the immediately next following year to relocating and/or removing the Facilities from the Designated Area.
- 14.4 If Hydro wishes to relocate and remove the Facilities from the Designated Area at any time during the Term or if relocation or removal is to occur as otherwise contemplated by this Agreement:
 - (a) in no event will Hydro undertake any removal activities during Forecasted Flood Event times or Actual Flood Event times, or during an Emergency Situation;
 - (b) Hydro will give Manitoba reasonable written notice of its intention, describing the intended removal activities, including the manner in which removal will occur and the timing of the removal; and
 - all removal activities shall be at Hydro's cost and expense;
 - (d) except as provided in clauses 14.4(a), 14.4(b) and 14.4(c), Manitoba and Hydro will agree on all other terms and conditions for the removal.

14.5 If, for any reason whatever, the Facilities or any part or parts of the Facilities are abandoned, Hydro shall remove the same at its own cost and expense and shall restore the Designated Area as described in Section 15.

SECTION 15 RESTORATION OF DESIGNATED AREA

- 15.1 Following any removal of the Facilities or any part or parts of the Facilities from the Designated Area, Hydro shall, at its own cost and expense, to the satisfaction of Manitoba, and within a reasonable period of time not to exceed one (1) year:
 - (a) repair any damage or injury to the Floodway, or any part thereof, or the Designated Area caused by the removal of the Facilities from the Designated Area;
 - (b) restore the Designated Area, and all ingress and egress routes to the Designated Area across the Designated Area, the Floodway or adjacent lands owned by Manitoba, to a similar state as existed prior to the construction of the Facilities acceptable to Manitoba;

and this Agreement shall thereupon terminate.

15.2 In the event Hydro fails to repair the Floodway or the Designated Area or fails to restore the Designated Area as required in subsection 15.1, Manitoba may, but is not obligated to, repair or restore the Floodway and/or the Designated Area to good condition and repair, and Hydro shall immediately reimburse Manitoba for all reasonable costs and expenses incurred by Manitoba in so doing, which amounts shall be a debt due and owing to Manitoba.

SECTION 16 CONFIDENTIALITY

- 16.1 While this Agreement is in effect and at all times thereafter, the Parties and their respective officeholders, officers, employees and agents (collectively the "Receiving Party") shall:
 - (a) treat all information, documents and materials, including drawings, designs and plans acquired or to which access has been given in the course of, or incidental to, the performance of this Agreement, and including the terms and conditions of this Agreement (the "Confidential Material") as confidential, with the same degree of care as the Receiving Party uses to protect its own Confidential Material, but no less than with a reasonable degree of care;
 - (b) not use, or permit the use of, including copying or reproducing the Confidential Material, except for the proper performance of the Receiving Party's obligations under this Agreement or as expressly authorized (in writing) by the Party originally in possession of the Confidential Material (the "Disclosing Party") or as permitted in this Agreement;
 - (c) not disclose, or permit the disclosure of, the Confidential Material to any third party without first obtaining the written permission of the Disclosing Party, unless required to do so by law or regulation or by order of the court in which case the Receiving Party must first comply with subsection 16.2); and

(d) comply with all reasonable restrictions, procedures, rules and directions made or given by the Disclosing Party, with respect to the safeguarding or ensuring the confidentiality of the Confidential Material prior to, during and subsequent to the Term of this Agreement. 1.

- 16.2 Upon prior written notice to the Disclosing Party, the Receiving Party may disclose Disclosing Party's Confidential Material as:
 - (a) required by law or regulation to be disclosed; or
 - (b) required by order of a court or other governmental body;

but only to the extent and solely for the purpose of the required disclosure. The Receiving Party agrees to assist the Disclosing Party (at the Disclosing Party's expense) in all proper ways to limit or prevent the disclosure of such Confidential Material.

SECTION 17 LIABILITY AND INDEMNIFICATION

- 17.1 Hydro must use due care in constructing, operating and maintaining the Facilities during the Term of this Agreement and in complying with its obligations under this Agreement, and must exercise best efforts to protect the safety of persons, and property.
- 17.2 Hydro shall be solely responsible and liable for and shall fully indemnify, hold harmless and defend Manitoba (including its Ministers, officeholders, officers, employees and agents) from and against, any and all claims, damages, losses, liabilities, demands, suits, judgments, causes of action, legal proceedings, penalties or other sanctions, including all direct, indirect, special, consequential and incidental damages, and any and all costs and expenses arising in connection therewith, including legal fees and disbursements on a solicitor and his/her own client basis which may, directly or indirectly in any way result from or arise out of or be in relation to:
 - (a) the location of the Facilities on the Designated Area;
 - (b) the construction, operation or maintenance of the Facilities on the Designated Area;
 - (c) Hydro or any director, officeholder, officer, employee, agent or contractor of Hydro, performing or failing to perform any term or condition of this Agreement; or
 - (d) any wrongful or negligent act or omission of Hydro, or of its any directors, officeholders, officers, employees or agents.
- 17.3 Manitoba will not be liable or responsible for any loss of or damage to property, real or personal (including the Facilities or any part or parts of the Facilities), or any injury to persons, including injuries resulting in death unless caused by, and only to the extent caused by, the negligence or wrongful act or omissions of Manitoba's Ministers, officeholders, officers, employees or agents, acting in the course of their engagement/employment with Manitoba, but specifically subject to subsection 17.4.
- 17.4 Notwithstanding anything to the contrary, in the event of any Emergency Situation, Manitoba will not be liable in any way to Hydro for any costs, expenses, losses or damage

to any property, real or personal (including Hydro's Facilities or any part or parts of the Facilities), or any injury to persons, including death or injuries resulting in death, even if caused by any acts or omissions of Manitoba (with the exception of fraud or criminality) and even if Manitoba had been advised of the possibility of such costs, expenses, losses or damage occurring. Manitoba will endeavour to act in as reasonable a manner as possible in the circumstances of an Emergency Situation. However Hydro acknowledges, understands and accepts that in the event of an Emergency Situation, Manitoba's primary and overriding consideration will be to address the Emergency Situation and to protect the people and property in the City of Winnipeg and Manitoba will act accordingly.

SECTION 18 INSURANCE

- 18.1 In addition to any insurance required to be provided by Hydro under any applicable statute, regulation, by law, or order, Hydro shall, at its own cost, obtain and maintain during the Term of this Agreement:
 - (a) commercial general liability insurance in respect of the Facilities on the Designated Area, including the construction, operation and maintenance of the Facilities, with minimum coverage of ten million dollars (\$10,000,000.00) per occurrence. The policy shall include "Sudden and Accidental" Environmental Impairment Liability coverage, twenty four (24) months completed operations coverage and shall cover Hydro and its directors, officeholders, officers, employees, agents and contractors. Manitoba and its Ministers, officeholders, officers, employees and agents shall be added as additional insureds to this policy;
 - (b) workers' compensation insurance, ensuring that all employees (including Hydro's and all contactor's employees) working are covered; and
 - (c) coverage for all licensed vehicles operated on the Designated Area insured for third party liability with minimum coverage of two million dollars (\$2,000,000.00) per occurrence. Hydro may elect to self insure the basic third-party liability coverage above two hundred thousand dollars (\$200,000).
- 18.2 The kinds and amounts of insurance called for in subsection 18.1 are minimum coverages. Hydro is solely responsible for determining the adequacy of its insurance coverages, and for determining if additional kinds or amounts of insurance are advisable.
- 18.3 Hydro will provide Manitoba with a Certificate of Insurance evidencing all of the insurance required to be obtained in accordance with this Section 18 prior to commencing any construction in the Designated Area. Thereafter, upon request, Hydro will also provide Manitoba with Certificates of Insurance for all renewals of such insurance that occur during the Term of this Agreement.

SECTION 19 OWNERSHIP OF FACILITIES

19.1 It is understood and agreed that the Facilities shall be and shall remain the property of Hydro notwithstanding that they may be or become affixed to the land of the Designated Area.

SECTION 20 NO INTEREST ETC IN LAND

20.1 Hydro acknowledges and agrees that nothing in this Agreement in any way creates, transfer, or conveys to Hydro any right or interest in land, or a licence (excepting the Authorization made pursuant to this Agreement) or easement or right of way in land, even if the Facilities may be or become affixed to the land of the Designated Area. The right of Hydro to use the Designated Area as set out in this Agreement are pursuant to the Authorization permitting Hydro to construct, operate and maintain the Facilities on the Designated Area on the terms set out in this Agreement.

SECTION 21 1985 AGREEMENT

- 21.1 The Parties agree that the agreement entered into by Manitoba and Hydro, dated August 30, 1985 (the "1985 Agreement"), pursuant to which Manitoba granted to Hydro an easement and right of way over portions of the Floodway for the construction and use of transmission lines and related facilities, is terminated and at an end in respect of the following parcels of land:
 - (a) Parcel Forty-One: All those portions of River Lots 174 to 176, both inclusive, of the Parish of Saint Norbert, in Manitoba, according to a plan of same registered in the Winnipeg Land Titles Office as No. 3941, including Saint Mary's Road as the same is shewn on a plan registered in the said Office as number 3941, now closed, taken for Water Control Work and Public Road as the same is shewn bordered blue and pink respectively on plans deposited in the said Office as numbers 7560 and 10,104, which lie to the West of the Western limit of the land taken for a Public Road as the same is shewn on a plan deposited in the said Office as number 9009, contained within the limits bordered blue and pink respectively on a Special Plot registered in the said Office as number 12,965. [CT E35514]
 - (b) Parcel Forty-Two: All that portion of the South half of River Lot 75, of the Parish of Saint Norbert, in Manitoba, accordingly to said Plan number 3941, taken for Water Control Work and Public Road as the same is shewn on said Plan number 10,104 contained within the limit bordered blue and pink respectively on said Special Plot number 12,965. [CT E35513]

Parcel 42 CT. E35513 the first plan # should be 3762 instead of 3941.

- 21.2 Except in respect of those parcels identified in subsection 21.1, the 1985 Agreement continues in full force and effect.
- 21.3 Hydro shall, within a reasonable period of time from the Effective Date not to exceed ninety (90) days, discharge all encumbrances against the parcels of land identified in subsection 21.1 related to the 1985 Agreement.

SECTION 22 DISPUTE RESOLUTION

22.1 In the event of any dispute or disagreement under this Agreement, which the liaisons are unable to resolve between them, with the exception of disputes or disagreements falling under Section 12.5 ("Dispute"):

- (a) the first level individuals for each of Manitoba and Hydro identified in Schedule C will meet to attempt to resolve such Dispute within a reasonable period of time, failing which, they shall each prepare a written report within two (2) Business Days of either one Party notifying the other that there is a Dispute which they are unable to resolve.
- (b) Copies of both of the reports referred to in clause 22.1(a) shall be delivered to the second level individuals for each of Manitoba and Hydro identified in Schedule C and the second level individuals for each of Manitoba and Hydro identified in Schedule C will meet to attempt to resolve such Dispute within a reasonable period of time.
- 22.2 The Parties agree that all communications, including any offers of settlement made, during or in connection with the informal dispute resolution process outlined in this Section 22:
 - (a) will be deemed confidential and "without prejudice"; and
 - (b) will not be admissible in any arbitration or court and will not be disclosed or used for any purpose other than for such informal dispute resolution process; and

will not constitute an admission or waiver of the rights of either Party.

SECTION 23 DEFAULT AND TERMINATION

- 23.1 If either Party defaults in carrying out any of the provisions of this Agreement:
 - the other Party will give written notice to the defaulting Party, providing the details of the default; and
 - (b) if the defaulting Party fails to commence to remedy such default within ten (10) days after receipt of such notice and fails to diligently complete such remedy thereafter;

then, subject to firstly pursuing the dispute through the dispute resolution process in Section 22, in additional to any other rights and remedies the non-defaulting Party may have at law, in equity or under this Agreement, the non-defaulting Party may, but is not obligated to, take such steps as are appropriate to remedy such default and the defaulting Party shall be liable for and shall pay all reasonable costs and expenses incurred by the non-defaulting Party in remedying the default.

SECTION 24 ASSIGNMENT OF AGREEMENT

- 24.1 Hydro shall not assign or transfer this Agreement or any of the rights or obligations under this Agreement without the prior written consent of Manitoba, which consent may be withheld at Manitoba's discretion.
- 24.2 No assignment or transfer of this Agreement or subcontracting of any of the Hydro's obligations under this Agreement relieves Hydro of its obligations under this Agreement, except to the extent the obligations are properly performed by Hydro's permitted assigns, transferees or subcontractors.

24.3 This Agreement is binding on Hydro's successors and permitted assigns.

SECTION 25 NOTICES

- 25.1 Any notice, demand, request or other communication ("Notice") required or permitted to be given or made shall be in writing and shall be sufficiently given or made if delivered in person, sent by facsimile transmission or electronic mail or sent by prepaid first class registered mail, addressed as follows:
 - to Manitoba: Government of Manitoba Manitoba Infrastructure 215 Garry Street Winnipeg MB R3C 3P3 Attention: Assistant Deputy Minister, Water Management and Structures Division Fax: 204-945-4456 <u>wmsadm@gov.mb.ca</u>
 - (b) to Hydro Manitoba Hydro 3rd Floor, 820 Taylor Ave., Winnipeg MB R3M 3T1 Attention: Shane Mailey, Vice-President Transmission Fax: 204 360 6167 samailey@hydro.mb.ca

or to such other person or address as a Party may from time to time advise the other by notice in writing pursuant to the provisions of this Section 29. If there is a postal strike threatened or in effect, all Notices shall be delivered personally, sent by facsimile transmission or electronic mail.

- 25.2 The date of receipt of any such Notice shall be deemed to be:
 - (a) the date of delivery, electronic mail or facsimile of such Notice if served personally, faxed or sent by electronic mail on a Business Day during the hours of 8:30 am and 4:30 p.m. (Winnipeg time), or if delivered, faxed or sent by electronic mail outside of the hours of 8:30 am and 4:30 p.m. (Winnipeg time), then the next Business Day; or
 - (b) if mailed by prepaid first class registered mail, the third Business Day following the date of mailing.

SECTION 26 FORCE MAJEURE

- 26.1 Neither Party will be liable for any failure or delay in its performance under this Agreement due to causes that are beyond its reasonable control, provided that it:
 - (a) promptly gives the other Party written notice of such causes; and
 - (b) uses its reasonable efforts to correct such failure or delay in its performance.

SECTION 27 GENERAL

- 27.1 This Agreement shall be interpreted, performed and enforced in accordance with the laws of the Province of Manitoba and the laws of Canada applicable in the Province of Manitoba. The courts of the Province of Manitoba have exclusive jurisdiction to hear all matters related to this Agreement.
- 27.2 This Agreement shall be binding upon and enure to the benefit of the Parties and their respective successors and any authorized or permitted assigns.
- 27.3 Any amounts payable by Hydro to Manitoba may, at Manitoba's discretion, be set off against any amounts payable by Manitoba to Hydro or owing by Manitoba to Hydro under this Agreement.
- 27.4 Neither Party shall publicly announce or disclose any of the terms or conditions of this Agreement to any third party, except as otherwise permitted in this Agreement or as may be agreed upon in writing by the Parties or as may be required by law or a court of competent jurisdiction.
- 27.5 The Parties acknowledge that this Agreement (with all of the Schedules that are attached or incorporated by reference) sets forth the entire agreement and understanding of the Parties as to the matter herein, and supersedes all prior discussions, negotiations, covenants, arrangements, agreements, and writings in respect of the subject matter of this Agreement.
- 27.6 No amendment, change to or modification of any of the provisions of this Agreement shall be valid unless it is in writing and signed by both Parties, provided that the individuals identified in Schedule C may be changed by an exchange of letters between those officials identified in subsection 25.1.
- 27.7 No term or condition of this Agreement shall be deemed waived and no breach or omission excused, unless the waiver is in writing and signed by the Party granting the waiver. A waiver of a term or condition of this Agreement in any regard shall not constitute a waiver or breach of any different or subsequent breach or omission, and a Party who has waived a breach or omission may invoke any remedy available at law or in equity in respect of a different or subsequent breach or omission despite the provision of the initial waiver.
- 27.8 No exercise of a specific right or remedy by a Party precludes that Party from or prejudices it in exercising any other right or pursuing any other remedy or maintaining an action to which it may otherwise be entitled either at law or in equity. All rights and remedies to which a Party may be entitled to cumulative and may be exercised and pursued concurrently.
- 27.9 If one or more provisions of this Agreement are held to be unenforceable under applicable law, the Parties agree to renegotiate such provision in good faith. In the event that the Parties cannot reach a mutually agreeable and enforceable replacement for such provision, then:
 - (a) such provision shall be excluded from this Agreement;
 - (b) the remainder of this Agreement shall be interpreted as if such provision were so excluded; and

- (c) the remainder of this Agreement shall be enforceable in accordance with its terms.
- 27.10 Notwithstanding the termination or expiry of this Agreement, it is acknowledged and agreed that those rights and obligations which by their very nature are intended to survive. shall survive, including:
 - (a) 10.6 - repair of ingress and egress footprint
 - (b) 11.1 - Hydro obligation to repair Floodway, Designated Area
 - 11.5 no Manitoba liability for no approval to undertake significant work during (c) Actual or Forecasted Flood Event or Emergency Situation
 - (d) 12.5(c) - Lieutenant Government in Council
 - 12.6 no Manitoba liability for direction of water flow (e)
 - 12.7 reimbursement of costs to Manitoba incurred as a result of relocation (f)
 - 13.2(d)(ii) Hydro to repair damage caused by removal of conductors (g)
 - (h) 14.4 - relocation and removal of Facilities
 - 14.5 restoration by Hydro on abandonment of Facilities (i)
 - (j) Section 15 - restoration of Designated Area
 - (k) Section 16 - Confidentiality.
 - (I)Section 17 - Liability and Indemnity
 - Section 18 Insurance (m)
 - (n) Section 22 - Dispute Resolution
 - (0)23.1 - costs to remedy defaults
 - (p) 27.10 - survival provision.
- 27.11 This Agreement may be executed in several counterparts each of which, when so executed, shall be deemed to be an original of this Agreement and such counterparts together shall constitute one and the same instrument. Delivery of this Agreement (including an executed signature page) by any Party by electronic transmission will be as effective as delivery of a manually executed copy of the Agreement by such Party.

The Parties have caused this Agreement to be executed by their duly authorized representatives.

SIGNED AND DELIVERED in the presence of

Witness

THE GOVERNMENT OF MANITOBA

Per:

Position or office: Deputy

THE MANITOBA HYDRO-ELECTRIC BOARD

Position or office: RANSM Per Position or office:

SCHEDULE A – MINISTERIAL APPROVAL AND AUTHORIZATION UNDER THE WATER RESOURCES ADMINISTRATION ACT

•...

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2nd Floor 280 Broadway Avenue Winnipeg MB R3C 0R8

RED RIVER FLOODWAY APPROVAL under The Water Resources Administration Act, C.C.S.M. c. W70

Subsection 2.1

AND

PROVINCIAL WATERWAY AUTHORIZATION under The Water Resources Administration Act, C.C.S.M. c. W70 Subsection 14(4)

WHEREAS

- A. The Red River Floodway has been designated a provincial waterway in accordance with The Water Resources Administration Act, C.C.S.M. c. W70 (the "Act");
- B. As a provincial waterway, Her Majesty the Queen in Right of the Province of Manitoba ("Manitoba") has jurisdiction over, and control and possession of, the Red River Floodway;
- C. Manitoba Hydro proposes to construct and use two (2) electric power transmission lines and/or distribution lines and related plant, equipment and facilities ("Hydro Infrastructure") on and across certain provincial waterway lands and within the boundaries of the Red River Floodway;
- D. Manitoba Hydro and Manitoba have entered into an agreement dated December 8, 2017, attached to this Approval and Authorization as Appendix 1 ("Agreement"), identifying the provincial waterway lands and the area within the boundaries of the Red River Floodway where the Hydro Infrastructure is proposed to be constructed;

The **MINISTER OF INFRASTRUCTURE** (the "Minister") grants Manitoba Hydro approval under subsection 2.1 of the Act and authorization under subsection 14(4) of the Act to construct, place, operate, inspect, maintain, repair and remove the Hydro Infrastructure on, over, and across those provincial waterway lands and within that part of the Red River Floodway identified in the plan attached to the Agreement as Schedule B subject to the following the terms and conditions:

- 1. Manitoba Hydro will comply with all of the terms, conditions and covenants set out and contained in the Agreement entered into by Manitoba Hydro and Manitoba dated December 8, 2017, attached to this Approval and Authorization as Appendix 1, and as may be amended from time to time.
- The breach of any of the terms, conditions or covenants set out and contained in the Agreement shall result in this Approval and Authorization being immediately cancelled by the Minister.

3. This Authorization and Approval applies only to subsection 2.1 and subsection 14(4) of the Act. It does not include any other approvals, authorizations, permits or licenses that may be required.

Minister of Manitoba Infrastructure

an Date

SCHEDULE B – PLAN OF DESIGNATED AREA AND FACILITIES

-

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SCHEDULE C – LIST OF INDIVIDUALS FOR DISPUTE RESOLUTION PROCESS

For the purposes of the Dispute Resolution Process set out in Section 22:

- C.1 For the purposes of subsection 22.1(a), the first level individuals are:
 - (a) for Manitoba: Assistant Deputy Minister, Water Management and Structures Division
 - (b) for Hydro: Vice President Transmission
- C.2 For the purposes of subsection 22.1(b), the second level individuals are:
 - (b) for Manitoba: Deputy Minister, Manitoba Infrastructure
 - (b) for Hydro: President

Appendix K:

Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat

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MANITOBA STREAM CROSSING GUIDELINES FOR THE PROTECTION OF FISH AND FISH HABITAT





Fisheries Pêches and Oceans et Océns

May, 1996

Manitoba Natural Resources Albert Driedger Minister



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Preface

Preface

This document is an update of the previous *Recommended Fish Protection Procedures for Stream Crossings in Manitoba.* The guidelines provide practical advice and information on mitigation measures to protect fish and fish habitat. The guidelines have been developed for use by individuals, corporations, and government agencies involved in the design, construction, and maintenance of stream crossings.

Stream crossings refer to any temporary or permanent structure that is built to cross a waterbody. Emphasis has been placed on stream crossings for temporary and permanent access roads. However, the concepts presented are also relevant for other types of stream crossings such as those associated with transmission lines, cable crossings, pipelines and railroads.

This manual describes the impacts of development activity on fish and fish habitat as well as the pertinent legislation and application procedures involved (Section 1). Section 2 outlines good practices for the protection of fish and fish habitat throughout the route planning, design, scheduling, construction, maintenance, and clean-up phases of the crossing. Section 3 describes erosion and sedimentation mitigation techniques that should be incorporated as a part of stream crossing design and construction.

The guidelines are intended for a wide audience. Technical terms used in the guidelines are listed in the glossary at the end of the document.

This document was prepared for the Department of Natural Resources (DNR) and the Department of Fisheries and Oceans (DFO) by Marr Consulting & Communications Ltd. We would like to thank the individuals and organizations who provided valuable comments on the draft document. Acknowledgements are extended to the Ontario Ministry of Natural Resources (OMNR) for allowing liberal use of figures from their guidelines and to other Canadian jurisdictions for providing relevant information in their guidelines.

1

1.0 Introduction

The Need for Guidelines

The Province of Manitoba has an abundance of natural streams which support a rich variety of freshwater fish and other aquatic life.

Development activities such as access roads, electrical transmission lines, cables and pipelines must cross natural streams. When these crossings are poorly designed, constructed, or maintained, negative impacts on fish and fish habitat can result. These impacts can be eliminated or reduced with careful planning, design, and construction of stream crossings.

These stream crossing guidelines are intended to provide information to biologists, engineers, contractors, corporations and government agencies involved in stream crossing construction. The guidelines apply to any waterbody that is used by migratory or resident fish during any period of the year, as well as to any waterbody which is linked to downstream waters which support fish. They apply to new crossings, poorly designed crossings that must be corrected, and existing crossings which must be repaired, replaced or removed.

These stream crossing guidelines are intended to meet the following fisheries protection objectives:

i) To allow free and unobstructed fish passage through stream crossings so that fish may migrate to spawning, rearing, feeding, overwintering, or other important areas without harmful delay.

ii) To protect stream bottom and banks from accelerated erosion

processes thereby minimizing disturbance to fish habitat.

iii) To avoid damage to fish and their habitats which may result from the introduction of deleterious substances into the stream.

These guidelines are not regulations. There may be situations where they are not applicable or other regulations take precedence. As well, detailed specifications for crossings can vary in each situation. Proponents should consult with the Regional Fisheries Manager (Appendix 1) regarding these guidelines and the specifics of a stream crossing project.

The guidelines in this document apply to the proponents or owners of a stream crossing. It is their responsibility to ensure that their agency or firm, and its contractors and subcontractors, adhere to the intent of these guidelines.

The Need to Protect Fish and Fish Habitat

Fish and fish habitat are defined under the Fisheries Act as follows:

Fish: all fish, shellfish, crustaceans and marine animals, and the eggs, spawn, spat and juvenile stages of fish, shellfish, crustaceans and marine animals.

Fish habitat: the spawning grounds, nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in rder to carry out their life processes.

In Manitoba, fish habitat is found in lakes, reservoirs, rivers,

2
streams, marshes, ponds, and swamps. It can even be a hay meadow that floods for only a few weeks in spring - as long as it supplies the food, shelter, and water that fish need.

Fish live where they can best satisfy their needs. If some of their requirements are not met, through damage or loss of habitat, their numbers drop, and in time the entire population may die out. No habitat eventually means no fish.

Fish habitat, the ultimate source of future-fish catches, is important to commercial and sport fishing. By protecting fish and fish habitat in Manitoba, we are safeguarding sport fishing and commercial industries annually worth millions of dollars.

Fish and fish habitat have a special significance for aboriginal peoples who have fished for centuries as a way of life. For some, fishing is still a traditional pursuit that provides a source of food and income.

Fish habitat is vulnerable to land uses of all kinds, from forestry and agriculture to cottaging and road construction. As the pressure on fish habitat increases, the efforts of individuals, corporations and agencies will become more important in the struggle to conserve and protect our fisheries habitat.

1.1 Impacts of Stream Crossings on Fish and Fish Habitat

Improperly designed, constructed, and maintained stream crossings can impact fish and fish habitat either directly or indirectly by blocking migration, causing sedimentation, removing vegetation, and adding deleterious substances to the water.

Migration Blockage

Fish migrations are most commonly associated with spawning, feeding, or finding suitable overwintering habitat. Improperly constructed stream crossing structures can block normal fish movements and migrations. This can lead to reduced spawning success because fish may abandon their spawning run or spawn in less suitable habitat. If blockage is complete and permanent, some fish species could be eliminated from portions of the drainage basin. Blockage of fish migration could also result in the

fish being more vulnerable to predators or exploitation by man.

One of the most common problems associated with stream crossings is increased water velocity caused by water flow constriction. In undisturbed watercourses, the stream bottom configuration intersperses zones of high and low water velocities. The low velocity areas are used by fish for resting spaces. In elliptical and circular culverts, the absence of bottom substrates often creates a velocity barrier. If the water velocity exceeds the swimming ability of the fish, migration will be effectively blocked. This is particularly true for spring spawners such as walleye, pike and suckers, whose migration runs often coincide with peak water flows from April to June.

Even if some fish manage to pass through the culvert, they may

be weakened or injured by strong currents. Injured fish are vulnerable to fungus, disease, and predators. If the energy needed to swim through the crossing is excessive, then spawning may not occur or the spawn may have a reduced chance of survival.

The second way a stream crossing can halt migration is by physically blocking the opening under a crossing. For example, sediment, gravel, logs, vegetation, or ice jams can accumulate at the entrances of an installation, making it impossible for fish to pass. Beaver activity can also block a crossing.

The third way a stream crossing could halt migration is by lowering the water levels at the crossing. Fish require a certain depth of water to be able to swim through a culvert. The larger the fish, the deeper the water must be. Fall spawners, such as whitefish and cisco, are particularly at risk since fall water levels may already be low. If erosion is not checked at the culvert outlet this may also, over time, lead to lower water levels at the crossing.



Inadequate opening size can lead to washout during floods.



Washed out culvert replaced with a new arched culvert having sufficient opening.

Culverts which are installed without regard for the natural stream slope may be perched and cause a waterfall effect at the outlet. If the outlet is higher than the jumping ability of the fish, then upstream migration is effectively blocked. Improperly placed culverts may also cause a drop in water level and high velocities at the culvert inlet.

Sedimentation

Construction activities which remove vegetation and topsoil without proper erosion control measures cause an increased sediment load in the stream. As well, improperly designed stream crossings, particularly culverts, can alter water velocities, leading to scour of the stream bed and banks.

Suspended sediments directly impact fish because they clog and abrade fish gills, causing suffocation. Suspended sediments also reduce water clarity, making it difficult for some fish to find food or detect predators.

Sediment may have an indirect effect on fish by altering or destroying their habitats. For many fish species, eggs are deposited in the spaces among gravel on the stream bottom. When the spaces become clogged with sediment, the free flow of oxygenated water and removal of wastes is impaired, resulting in egg suffocation and mortalities.

In some fish species, fry also need the spaces between gravel in the stream bed for protection. If sediments fill the spaces, fry are vulnerable to predation.

Sediments may also have an indirect impact on fish by altering

their food supply. For example, benthic invertebrates which are a food source for some fish species may become smothered or displaced by sediments.

Sedimentation may also alter photosynthesis or primary production by plants and microorganisms in the stream. In some cases, sediments can screen out available sunlight which decreases primary production. In other cases, nutrients attached to sediment can increase primary production. A change in primary production will alter the food supply for many organisms.

Removal of Vegetation

The removal of bank vegetation during activities such as stream crossing construction increases the amount of sunlight that reaches a stream which then increases water temperature. An increase in temperature of a few degrees may cause stress in some fish species. Heat also reduces the amount of dissolved oxygen available to fish in the stream.

The removal of vegetation also reduces the amount of food sources entering the system. For example, leaf litter is a source of essential nutrients to benthic organisms and the fish that eat them. Also, when there is no bank vegetation, there will be a loss of terrestrial insects falling into the stream.

Deleterious Substances

Grease, oil, gas, and other hazardous materials may enter streams from accidental leaks or spills during equipment maintenance. If fuel or other materials are stored near streams,

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leaks or spills can impact the stream and cause fish kills. Construction camp sewage and garbage which is accidentally washed into adjacent streams can cause contamination. Accidental spills of road salts used for de-icing during construction and maintenance can also have a negative effect on water quality, while waste water produced during concrete preparation may detrimentally increase instream pH levels.

The federal Fisheries Act Fisheries Act prohibits any person 1.2 Legislation regulates the environmental impacts from carrying on any work or of projects and activities which may undertaking that results in the affect fish and fish habitat. The harmful alteration, disruption or sections of the Fisheries Act which destruction of fish habitat, unless authorized. The Act also prevents may apply to stream crossings include: any person from depositing a deleterious substance in waters Section 20 - Construction of frequented by fish, unless • Fishways at Obstructions authorized. In Manitoba, various Section 22 - Need for Adequate provisions of the Fisheries Act are • Instream Flows administered by Manitoba DNR, Section 30 - Fish Guards and DFO, Manitoba Environment, and Screens on Water Intakes Environment Canada. . Section 32 - Destruction of Fish The Fisheries Act or the publication entitled Canada's Fish Prohibited Section 35 - Harmful Alteration, Habitat Law (DFO, 1991) should be Disruption or Destruction of referenced for further information Fish Habitat Prohibited on any of the above sections. Section 36 - Pollution of Fish Proponents planning to conduct Habitat Prohibited work in or near water must ensure that they meet the requirements of federal, provincial and municipal Protection of fish depends on the protection of fish habitat. The legislation (Table 1).

 Table 1: Partial list of legislation potentially affecting development activity in or near water.
 Adapted from

 Sentar Consultants (1994).
 Image: Consultant of the sentence of

Authority	Legislation	Description
Federal:		
Department of Fisheries and Oceans	Fisheries Act	Regulates activities that impact fish and fish habitat in Canada.

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Transport Canada	Navigable Waters Protection Act	Regulates activities that are liable to interfere with navigation.
Environment Canada	Canadian Environmental Protection Act (CEPA)	Provides the framework for protecting Canadians from all forms of pollution caused by toxic substances. It encompasses the entire life cycle of toxic substances including their transport, use and storage.
Environment Canada	International River Improvements Act	Regulates activities affecting water quality and environment of international rivers flowing from Canada.
Provincial:		
Manitoba Environment	Environment Act	Provides for an environmental licencing process for developments that are likely to have a significant effect on the environment.
Department of Natural Resources (DNR)	Endangered Species Act	Provides for the protection of endangered and threatened species in the province; enables the reintroduction of extinct species; and the designation of species endangered or threatened with extinction.
DNR	Rivers and Streams Act	Provides for the protection of the whole or any portion of any river or stream in the province. This Act also prohibits depositing of material that would impede the flow of water or endanger the stability of the banks.
DNR	Water Power Act	The Water Power Act applies to all provincial water powers, all lands and properties still used or required in connection with the provincial water powers, and the power and energy produced or is producible from the waters or within those lands.
DNR	Water Rights Act	Provides for the administration of matters related to the construction or operation of certain water control works.
DNR	Forest Act	Provides for the regulation and administration of forests within Crown lands and provincial forests.
DNR	Provincial Park Lands Act	Provides for development and maintenance of provincial park lands for the conservation and management of their flora and fauna; and for preservation of specified areas and objects of geological, cultural, ecological, or other scientific interest; and facilitation of the use and enjoyment of outdoor recreation.
DNR	Conservation Districts Act	Provides for the conservation, control and prudent use of resources through the establishment of conservation districts, and for protection of the correlative rights of owners.

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DNR and Department of Agriculture	Crown Lands Act	Provides for the protection, control and prudent use of "Crown Lands". This includes land vested in the Crown and includes "Provincial Lands".
Department of Municipal Affairs	Planning Act	Provides for the protection and conservation of the environment and natural resources such as lakes, rivers, shore lands, forests, agricultural lands and recreational lands, and anything else for the purpose of preventing damage to and destruction of lands, sites or buildings, or preventing interference with their use within municipal lands.
Department of Health	Public Health Act	Provides for the regulation of potable water supplies, sewage disposal, sanitation and food supply operations, and in general for the preservation of life and health of the people of the province.
Municipal:		
Local Municipal Councils	Municipal By- laws	Permits construction, clearing and burning; approves zoning or re- zoning; regulates local land use and building codes; owns and controls shore land in municipal (public) reserves.

1.3 Policy

The Department of Fisheries and Oceans has developed a Policy for the Management of Fish Habitat. The Policy is designed to achieve an overall Net Gain of the productive capacity of fish habitats. The Policy, which is endorsed by Manitoba DNR (Fisheries Branch) has three goals: the conservation, restoration and development of fish habitat.

The conservation goal is guided by the principle of No Net Loss of productive capacity, and is aimed at maintaining the current productive capacity of fish habitats supporting Canada's fisheries resources, so that fish suitable for human consumption may be produced. Under this goal, DNR and DFO will strive to balance unavoidable habitat loss with habitat replacement on a project by project basis so that further reductions to fisheries resources due to habitat loss or damage may be avoided.

The restoration goal is aimed at rehabilitating the productive capacity of fish habitats in selected areas where economic or social benefits can be achieved through the fisheries resource.

The development goal is aimed at improving and creating fish habitats in selected areas where the production of fisheries resources can be increased for the social or economic benefit of Canadians.

Proponents planning to conduct work in or near water should ensure that their development activities result in No Net Loss.

1.4 Environmental Review Process and Approvals

Manitoba Environment Act

A Manitoba Environment Act Licence is required for those developments that are likely to have a significant effect on the environment including construction and replacement of stream crossings. Proponents should contact Manitoba Environment to determine whether an Environment Act Licence is required.

To acquire a licence, an application must be submitted with a description of the proposed development including land ownership, existing land use, previous studies, proposed development, potential impacts and proposed environmental management practices. The application must also include work schedules and dates for commencement of construction and operation, and source of funding, if applicable.

The proposal will be reviewed by Manitoba Environment and other federal and provincial departments. Fish and fish habitat protection measures are often included as Environment Act Licence conditions for approved projects.

Work Permits

Provincial Work Permits are used to authorize activities taking place on Crown Land. Generally they are issued by the Natural Resources Officer (NRO) in the District where the activity is occurring and the District is responsible for ensuring that the conditions on the Work Permits are met. Work Permits are often required under Environment Act Licences and are used to ensure habitat is adequately protected in the manner described in an Environment Act Licence.

Work Permits are issued for a variety of activities including stream crossing installation and any activities which may alter aquatic habitat. Site specific conditions to protect natural resources or mitigate resource concerns are attached to the Work Permit. These are developed on site in consultation with the Permittee, and address site specific concerns.

Fisheries Act Authorizations (Section 35)

If the harmful alteration, disruption, or destruction of fish habitat cannot be avoided through project redesign, relocation, rescheduling or the use of mitigation measures, proponents should contact DFO (Appendix II) regarding authorization and compensation options for lost or damaged habitats.

Other

Costs associated with meeting information requirements as well as installing and maintaining mitigation and compensation measures are the responsibility of the project proponent. Proponents may also be required to conduct follow-up monitoring programs to determine the effectiveness of mitigation measures. For larger projects, a financial guarantee may be required.

2.0 Good Practices

2.0 Good Practices: Protection of Fish and Fish Habitat	The potential impacts of stream crossings on fish and fish habitat can be eliminated or reduced by using appropriate mitigation measures during every phase of the design and construction process from scheduling and route planning to clean-up and maintenance.	
2.1 Route Planning	Give consideration to the environment when planning the route of the road or development as well as the location of stream crossings. Use the guidelines below for selecting the best route to eliminate or reduce impacts.	 slopes, and unstable or erodible soils. Minimize the number of streams to be crossed, as each crossing involves potential environmental damage and increased costs.
	• Consult with the Regional Fisheries Manager during the planning stage so that environmentally sensitive areas are identified and avoided.	• As a general rule, keep roads a minimum of 100 m away from a watercourse except when crossing the watercourse. This often forces the alignment onto drier sites.
	• Begin planning the route well in advance of construction. Allow time to collect and analyze fisheries data if necessary for making informed decisions.	• If a 100 m distance is not possible, allow a buffer zone of undisturbed vegetation between the road and the waterway, using a buffer zone width of
	• Design routes that are consistent with the topography. Avoid wetlands and marshes, steep	approximately 10 m plus 1.5 times the slope gradient (see Table 2).

Table 2: Recommended widths for buffer zones. Adapted fromMcCubbin, et al. (1985).

Slope of land entering waterway (%)	Width of buffer zone (m)
0	10
10	25
20	40
30	55
40	70
50	85

2.2 Crossing Site Selection	 Crossings should be located at least 500 m upstream of spawning areas, or important rearing, feeding or overwintering areas. If important habitats cannot be avoided, use a bridge with a high approach such that no instream activities will be required. Maintain a distance of at least 500 m upstream from a river mouth and downstream from lake outlets. Fish often congregate in these areas. Place crossings upstream from existing natural barriers to fish passage. For example, a high waterfall imposes a barrier to fish, so a water crossing that is placed upstream of the waterfall will not affect fish passage. Utilize existing crossings if possible. Avoid crossing at the braided portion of a stream to prevent 	 flooding, stream siltation, or crossing failure. Choose a straight reach with relatively shallow water depths (i.e. less than 2 m). Minimize the crossing length by selecting a narrow section and constructing the crossing at right angles to the channel. Select stream areas where the bed and banks are stable and resistant to erosion. Avoid crossing where actively slumping banks are evident or suspected. Crossing sites should be selected where the approach slopes are minimized for at least 15 m on each side of the watercourse. A grade of greater than 10% is generally considered too steep.
2.3 Design	Once a suitable crossing site has been identified in the route plan, the appropriate design for the crossing structure must be selected. The proponent is responsible for the stream crossing design. The Regional Fisheries Manager should be consulted at this stage for advice in developing a site-specific crossing that allows unhindered fish passage through the watercourse. Several alternative crossing structures are listed below in order of preference for protection of fish and fish habitat.	 bridge open-bottom arch culvert open-bottom box culvert horizontal ellipse culvert closed-bottom arch culvert closed-bottom box culvert closed-bottom box culvert round culvert(s) Table 3 illustrates the stream crossing structures listed above and their characteristics. Crossing design should ensure that the stream flow velocity through the crossing is below the maximum prolonged swimming capability of the fish species in that

2.0 Good Practices

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stream. This is particularly important in the design of culverts. Maximum prolonged swimming capacity will vary depending on the species, size, and age of the fish as well as crossing length, water temperature, and dissolved oxygen level. Typical maximum flow velocities for some fish species are given in the figure below.

As a general rule, crossing design should ensure that the stream flow velocity through the crossing does not exceed 1 m/s for culverts less than 25 m in length and 0.8 m/s for culverts greater than 25 m in length. Lower velocities may be required for weaker swimmers such as northern pike and juvenile fish.

Prevent or avoid delays in fish migration by designing the crossing to have a sufficiently large opening and a minimum of debris-catching structures.

Use a large safety factor in the water crossing design to protect fish and fish habitat, especially if hydrological and biological information is lacking or unavailable.

Table 3: Fisheries and design considerations for stream crossing guidelines. Source: Chilibeck et al. (1993) and McCubbin et al. (1985).

Type of Structure	Fisheries Considerations	Design Considerations
Bridge	 Can retain existing bottom substrate, bank structure and riparian vegetation. Does not alter bed load transport capacity of stream reach. Can retain natural fish passage stream qualities. 	 No limit to stream hydraulic capacity if encroachment of piers or footings is limited. Ability to cross large streams and rivers. Structure can often be designed with no instream work required.
Open-Bottom Arch Culvert	 Does not limit fish passage if properly designed and constructed. Retains natural stream substrate. Water velocities are not significantly increased if culvert is as wide as the natural stream. Potential loss of riparian vegetation. 	 Design to normal stream width. Wide bottom area provides good flow capacity with limited depth increase. Large waterway opening for low clearance installations.
Open-Bottom Box Culvert	 Does not limit fish passage if properly designed and constructed. Retains natural stream substrate. Water velocities are not significantly increased if culvert is as wide as the natural stream. Potential loss of riparian vegetation. 	 Design to normal stream width. Can be placed in multiple units to provide wider section and larger end area. Provide suitable footing for wall section to prevent undermining by stream erosion.

2.0 Good Practices

Horizontal Ellipse Culvert	 Avoid use in fish bearing stream or incorporate appropriate design modifications. Stream substrate not easily retained in culvert. Loss of natural steam substrate beneath culvert. 	 Squat profile useful in low fill situations. Shape results in deeper water depth than a closed-bottom arch culvert, but does not offer as broad a bottom area.
Closed-Bottom Arch Culvert	 Can limit fish passage at low flows due to reduced water depth in culvert. Baffles can be installed to provide fish passage. Wide bottom area allows retention of bottom substrates. Loss of natural stream substrate beneath culvert. 	 Design wide bottom area for good flow capacity with limited depth increase. Good for low clearance installation. Multiple units can be installed to provide greater capacity. Reduced depths at low flows may require backwatering.
Closed Bottom Box Culvert	 Can limit fish passage at low flows by reduced water depth in culvert. Baffles can be easily installed to provide fish passage. Wide bottom area allows retention of bottom substrates. Loss of natural stream substrate beneath culvert. 	 Can design to maintain stream width. Can be placed in multiple units to provide wider section and larger end area. Precast units can be installed quickly limiting instream construction time.
Round Culvert(s)	 Generally poor for fish passage situation. Difficult to provide passage in small diameters. Concentrates flows and velocities. Loss of habitat because of infilling around culvert. Loss of natural stream substrate beneath culvert. 	 Concentrates flows and increases velocities and potential scour at high flows. Reduced depths at low flows may require backwatering. Can have poor bed load transport through culvert.

2.4 Scheduling

A well-planned schedule will not only provide efficient construction of the water crossing, but also the first, and most effective defence against damage to fish habitat and populations.

Fish are the least tolerant of construction activity during spawning, migration, and incubation periods. Blockage and stream disturbance must be avoided during these periods, which will vary according to which species are present. Fish spawning periods are given in the spawning calendar (see Table 4). Although the dates given in the table are generally accurate, streams should be individually considered in consultation with the Regional Fisheries Manager.

Construction should be planned for times with the lowest stream flow, usually during the hot, dry months of July and August. Winter construction is also reasonable and even preferable in some situations.

The release of sediments into water courses can be minimized by constructing when the ground is frozen. However, some species of fish such as brown, lake and brook trout spawn in the fall, leaving eggs

vulnerable to construction activities all winter. In areas where these fish are found, winter construction is restricted.

Once initiated, water crossing construction should be completed as quickly as possible. As long as construction site are active, soils are exposed to erosion. Begin reclamation activities as soon as possible after construction is complete. Give priority to areas with the greatest potential for erosion.



Swimming distance curves which apply to all Manitoba commercial and sport fish species except northern pike and burbot. Source: Katopodis (1993).

Table 4: Spawning and incubation periods and spawning sites for some fish species found in Manitoba streams. Spawning and incubation periods may vary depending on latitude and annual weather conditions. Source: Newbury and Gaboury (1993), Scott and Crossman (1979), and KGS Group and North/South Consultants Inc. (1992).

Species	Spawning Period	Incubation Period	Spawning Site
Lake Sturgeon	late May to late June	5-10 days	In rivers in swift water or rapids 0.3-5 m deep; at base of impassable falls; in large clean rubble; areas of upwelling currents; outside bends and rapidly moving water of rivers; near dams; in lakes on rocky shoals
Lake Trout	September-October over a two week period	15-21 weeks	In lakes, depth range: 15 cm - 55 m, usually <12 m; rubble substrate; angular rock; exposed shores facing prevailing winds; may occur in rivers among coarse gravel and large boulders
Brook Trout	September-October	7-14 weeks	Typically stream spawners, but also lakes/ponds at stream upwellings; coarse sand, gravel and stones
Northern Pike	April-May shortly after ice-out	12-14 days	Over dense vegetation in calm, shallow water i.e. flooded marsh, wetland, shallow pool or backwater; depths of 0.2-0.45 m
Channel Catfish	late May to mid-June	6-1 0 days	Dark and secluded areas for nesting, usually cavities, burrows, under rocks; in shallow flooded areas in large rivers; near shore; in muddy ponds; in undercut banks; under logs at depths of 2-4 m
Smallmouth Bass	mid-April to early May or July	4-10 days	Rocky lake shoals, river shallows, or backwaters, or move into creeks or tributaries to spawn; require clean stone, rock or gravel for spawning; or coarse sand
Yellow Perch	early April-late June	8- 10 days	Over sand, gravel, rubble, submerged vegetation, or debris covered bottoms; depths range from 0.6-3 m
Walleye	April-late May	12-18 days	Selects moving water and clean substrate; rocky areas in whitewater, shoals and shorelines of lakes and streams; also utilize dense mats of vegetation
Sauger	late May-early June	12-18 days	Spawns in shallows, 0.6-3.7 m, sand and gravel shoals or bars in turbid lakes or stream
Lake Whitefish	September-December	up to 25 weeks	Hard stony bottom, sometimes sand; shoals of lakes
Goldeye	late May-early July	1-2 weeks	Spawn on gravel shoals in turbid pools and ponds; prefer firm substrates

2.5 Construction: General Guidelines

Construction includes a variety of activities, each with potential to be detrimental to fish and fish habitat. The very nature of construction is to alter the environment, but with proper precautions the negative effects of construction can be prevented or minimized. Guidelines to protect fish and fish habitat during general construction activities are itemized below.

Foundation Investigations

Any major culvert or bridge will require instream foundation investigations (such as test holes, pits and piles) prior to construction. When undertaking foundation investigations, fish habitat damage can be minimized by creating the least disturbance possible as follows.

- Clear the narrowest access road possible and limit access to one location on each bank.
- Backfill test pits using the excavated material, plug test holes using soil and logs, and remove or pull out test piles at stream bed level.
- Clean-up the investigation site by removing temporary facilities, equipment, and waste construction materials (see Section 2.9: Clean-Up and Reclamation).

Clearing, Grubbing, and Stripping

Clearing, grubbing, and stripping often exposes the soil and leaves it vulnerable to erosion. Erosion damage can be minimized as follows.

- Minimize right-of-way clearing within the buffer zone (see Table 2).
- Avoid clearing slopes unless adequate erosion protection measures are used.
- Preserve vegetative cover for as long as possible (i.e. no pre-cutting).
- Halt clearing operations during heavy rainstorms.
- Utilize hand clearing instead of mechanical clearing where possible to prevent disturbance of organic soil layer.
- Retain slash and debris that is collected during clearing operations and use it to temporarily protect erosion-prone slopes.
- Prevent sediment from entering the stream by placing overburden or topsoil stockpiles well above the high water mark. Use appropriate control measures to control erosion of stockpiles.

Grading

Grading is the process of reshaping the land. This activity, which can cause both erosion and sedimentation, can be mitigated as follows.

• Prevent sedimentation by grading soils in the direction away from the watercourse and never into the stream itself.

• Minimize erosion by contouring slopes to an appropriate steepness ratio and installing erosion controls quickly (further details in Section 3.0: Erosion and Sedimentation).

Blasting

Blasting in or near water produces shock waves that can kill or damage fish and their eggs or larvae. Explosives should not be detonated in or near.fish habitat. Adequate distances must be maintained between the detonation site and fish habitat to ensure the pressure change does not harm or kill fish.

Proponents planning to use explosives in or near fish habitat should refer to the *Guidelines for the Use of Explosives in Canadian Fisheries Waters* (1994) or contact DFO for further information.

Gravel Removal

No gravel should be removed from stream beds or below the normal high water mark. Gravel removal should be limited to areas where effects on local water tables and flows in adjacent streams will not occur. Limit gravel removal to a minimum of 100 m from a stream.

Deleterious Substances

Construction activity, especially when it involves heavy machinery, has the potential to release deleterious substances into the water with detrimental effects to fish populations.

It is far easier to prevent the release of deleterious substances on a site than it is to clean it up. Pollution can be prevented as follows.

- Store chemicals, fuels, and other harmful materials at least 100 m away from the normal high water mark.
- Keep equipment in good repair to prevent leakage of fuel, oil, etc. Avoid fuelling, changing oil, or repairing equipment within 100 m of the normal high water mark.
- Construct temporary water crossings to keep equipment out of the watercourse.
- Do not wash buckets and equipment in the watercourse. It is acceptable to wash equipment with hoses if the runoff is prevented from entering the watercourse.
- The instream use of creosote or PCP treated timbers or wood materials should be avoided.
- Prevent construction materials, such as lumber, nails, etc. from entering the watercourse.

2.6 Stream Alterations

In larger streams, proper installation of a bridge or culvert may require a temporary diversion of flowing water so that stream crossings can be built under dry conditions. In order to attain dry conditions, options for stream alterations include the construction of partial or complete diversions, and the use of elevated pipes.

Partial diversions are often used in the construction of bridges while full diversions are most common for building culverts. Partial diversions consist of sheet piling or cofferdams which block the flow in a portion of the stream, and pumps that keep the work area dry. Complete diversions direct stream flow into a new temporary channel. Once the crossing is installed, the temporary channel is closed and the natural channel is rewatered. Permanent diversion of stream flow into the constructed channel is discouraged because of damage to existing fish habitat. Compensation for lost or damaged habitats may be required in these cases.

Another alternative that can be used to keep a work area dry is the use of elevated pipes. These are pipes used to divert water in a controlled manner over the area that is to be kept dry. Elevated pipes can only be used when stream flows are low and must be removed in times of fish migration as they can impede fish movement.

Temporary channel diversions are acceptable if they are built properly and do not impact fish habitat. Any stream alteration should employ the following general guidelines.

- Ensure that fish passage will be possible even in low flows.
- Construct any instream structure out of erosion resistant materials. Sheet piling is preferred followed by cofferdams built out of rows of sandbags with plastic in between rows. Clean rock fill may also be used.
- Refrain from constricting the flow by more than one third (33%) of the original stream width.
- Avoid stream cutoffs. Bypassing a meander loop increases the stream gradient causing higher stream velocities and increased erosion.
- When excavating the diversion channel, work in dry conditions where possible, beginning at the downstream end and moving upstream. The diversion channel should have gentle curves and the same approximate slope gradient as the natural stream.
- Protect the diversion channel with an erosion-resistant lining (i.e. plastic sheathing). Hold the lining in place with stones and stakes to keep water from getting underneath.
- The point where the old and new channel meet will be very susceptible to erosion. Protect vulnerable areas with erosion controls and energy dissipating measures (see Section 3.0: Erosion and Sedimentation).

- Utilize stream diversions only when stream flow is low but ensure that diversions are deep enough to withstand storm events.
- Prevent siltation by directing pumped water into settling ponds, a filter fabric dam, or a vegetated area that will provide filtration before returning the water to the stream.
- Place a "splash pad" of gravel or straw bales under the outfall of pumped water to protect erodible soil.

- Remove all diversions upon completion of the crossing.
- Do not remove instream structures during spawning and incubation seasons to minimize damage from siltation.
- When a temporary channel is no longer required, it should be infilled and erodible soils stabilized.



Stream diversion for dry crossing construction. Source: OMNR (1990).

2.7 Permanent Crossings

Either bridges or culverts can be used for permanent crossings; each option has disadvantages and advantages.

Bridges are the preferred structural type for fish and fish habitat protection but they are generally more expensive to build. In the long run, bridges may be less expensive because culverts may have to be replaced more often due to wash-outs, damage or deterioration.



Some alternative permanent crossing structures. Source: OMNR (1990).

Bridges

The following mitigation measures can be used during bridge construction to minimize impacts on the environment.

- Where possible build piers and footings outside of the stream and above the high water line.
- If it is not possible to build piers and footings outside of the stream, construct them parallel to the stream flow so as not to direct water into the banks.
- Separate instream work from the water with a cofferdam or other

structure. (see Section 2.6: Stream Alterations).

- Construct bank protection and wingwalls to prevent bank erosion. Extend bank protection only as far as necessary to protect bridge approaches.
- Avoid the use of concrete aprons. If this is not possible, allow fish passage by building a fishway, or by maintaining stream grade through use of a weir or sill immediately downsteam to backwater the apron.

- Prevent water from pouring over an apron in fast, shallow flows by sloping the apron to the centre or to one side, thereby concentrating flows.
- Cover vulnerable bridge slopes with concrete, rip rap,

vegetation, or another nonerodible material.

• Ensure that bridge slopes do not directly receive highway drainage and that the slope is not too steep (see Table 6).



Components of a bridge. Source: OMNR (1990).

Culverts

A culvert is a conduit used to allow the passage of fish and water through an embankment or under a road. Culverts can be designed in a variety of shapes and sizes (see Table 3 for details).

When fish passage is a factor, the best type of culvert is the open bottomed arch culvert or box culvert because they maintain the natural stream bottom.

Multiple culverts are not recommended for fish-bearing streams because they are more likely to become blocked than a single large culvert. However, if more than one culvert is required, establish a minimum of 2 m between adjacent culverts to provide adequate downstream resting areas for fish. There should be no more than three culverts at any one crossing.

When culverts are placed in crossings that will support fish movements, use the guidelines below.

 Culvert velocity should not exceed the maximum prolonged swimming capacity of fish. As a general rule, the average crosssectional velocity should not exceed 0.8 m/s for culverts longer than 25 m and 1.0 m/s for culverts less than 25 m. Lower culvert velocities will be required for weaker swimmers such as pike or juvenile fish.
 Specific considerations for each stream should be determined in consultation with the Regional Fisheries Manager.

2.0 Good Practices

- When designing a crossing structure, consider the maximum period of delay that can be tolerated by fish. There should be no delay if the spawning grounds are located immediately upstream of a stream crossing and no delay during the average annual flow. The crossing should not be impassable for longer than seven consecutive days once in 50 years.
- Ensure that normal water levels rise no higher than half the diameter of the pipe during fish migration periods.
- Choose a culvert that does not significantly constrict the width of the stream bed. Culverts with diameters of less than 1.0 m are not recommended.
- Ensure that the culvert opening size is sufficiently large to allow the passage of debris.
- Minimize culvert length to aid fish passage. Fish swimming capabilities under high velocity conditions decrease rapidly with distance.
- Align the crossing perpendicular to the direction of flow to minimize crossing length.
- Maintain a culvert gradient as close to the natural stream grade as possible. The maximum culvert slope that may be

installed when employing baffles is 5%.

- Position culverts where there are no sudden increases in water velocity above, below, or at the crossing location.
- Install culverts a minimum of 30 cm or 10% of culvert diameter (whichever is greater) below the normal stream bed. Fill with granular material to stream bed level.
- Position culverts to fit the stream channel alignment on a straight section of the stream so that discharge is not directed at a potentially unstable riverbank.
- Protect stream banks, and stream bed at culvert openings with erosion-resistant material such as rip rap (see Section 3.7: Rip Rap).
- Ensure that culverts are installed on a firm bed and avoid wet muck, muskeg, sod, frozen earth, permafrost or large rocks. Soft, unsuitable foundation material should be excavated below gradeline and backfilled with compacted granular material.
- Avoid using frozen backfill. Compact backfill to avoid settling, hydrostatic uplifting or side movements of the culvert that may lead to blockage of fish passage or washouts.

• Considering safety factors, a depression may be carved in low traffic access roads to allow water to spill over the road in time of flood. Ensure the depression is protected from erosion.



Culvert with erosion protection and a depression to allow spillage over the road. Source: OMNR (1990).

Culvert Fishways

Fishways aid fish passage through culverts by slowing the water velocity and providing places to rest. They are baffles made of wood, metal or concrete placed along the bottom of a culvert. Fishways work best when water depth and velocities are matched to the swimming capabilities of the species.

Avoid constructing fishways in culverts unless all other alternatives are unsatisfactory, as there is a risk that they will become ineffective over time.

If a fishway is required in a crossing with multiple culverts, install it into one culvert near the stream bank. Make it as easy as possible for fish to find the culvert that allows for safe passage.

For fishways to be effective they must be routinely maintained. For example, the resting areas created by baffles can become filled with sediment. Baffles may also catch large debris, causing flooding or washout and preventing fish passage.

Other options to slow the velocity in a culvert include replacing the culvert or constructing low head weirs downstream to create a backwater effect into the structure. For additional information on the design of fishways, consult Clay (1995).

2.8 Temporary Crossings

Temporary crossings can be very practical during short-term forestry and mineral explorations, transmission line and pipeline construction, or for use while a permanent crossing is under construction. Although they are only used on a short-term basis,

Fords

Fords are temporary or permanent stream crossings that allow vehicles to drive directly through a watercourse. They are formed by lowering the road grade to the stream bed level from bank to bank. Fording is only recommended with the appropriate fish habitat protection measures as described below.

- Construct and use fords during the driest time of year and when there will be infrequent traffic.
- Ensure that fords will not be used during fish spawning, incubation, or migration periods. Choose fording areas that are well away from spawning and nursery areas.
- Seek fording sites with low, stable approaches and a firm stream bed of rock or coarse gravel.
- Select an area with a natural water depth of less than 100 cm but maintain a minimum water depth of 20 cm to allow fish passage.

temporary crossings should be constructed using the same general guidelines for fish habitat protection as permanent crossings. Examples of temporary crossings include fords, summer crossings, and ice bridges.

- Minimize the area disturbed by building crossings that are perpendicular to the stream and not more than 10 m wide.
- Prevent erosion by minimizing the amount of vegetation removed from the stream bed and banks.
- Stabilize approaches if necessary with non-erodible material 15 m up the bank on both sides.
- Log corduroy, coarse gravel, and rock fill can be used to improve the roadway through the stream.
- Construction equipment and vehicles crossing the ford should be free of contaminants and leaks.
- When the ford is no longer in use, any materials added to the stream bed should be removed and banks should be contoured to their original condition.

Temporary Bridges and Culverts

Temporary bridges and culverts are a viable alternative where fording is inappropriate. However, it is important to maintain the natural stream flow and prevent stream blockage. Temporary crossings can be made out of preconstructed standard components (i.e. Bailey bridge) or out of available metal, and logs.

Bailey bridges are patented bridges that are made into a variety of lengths out of standard components and then lowered into position. They should be used on low volume roads only.

All temporary bridges and culverts should give due consideration to the protection of fish and fish habitat.

- Time the placement and removal of the bridge to avoid periods of high fish movement.
- Temporary bridges and culverts are not intended to survive extreme floods so it is acceptable that they span just above normal water level.
- Culverts and bridges should be sized to accommodate flows expected during the period of use and to provide for fish passage.
- Ensure that there are sufficient openings for fish and water to pass and to prevent excessive water backup.

- When the temporary bridge or culvert is no longer required it should be removed and the site should be restored to its original condition.
- When logs are used to create temporary bridges, the logs should be delimbed. Untreated log poles are acceptable for temporary bridges. Chain logs together on the ends for stability and to facilitate removal of the logs when the temporary bridge is no longer required.
- If material such as gravel is used to fill in gaps between planking on the bridge deck, it should be held in place and separated from the decking by geotextile fabric or a natural mat. This will allow fill material to be removed when the bridge is eventually dismantled without adding excessive sediment to the stream.

Ice Bridges

Ice bridges are temporary crossings constructed of ice, snow, and logs for reinforcement.

- Locate ice bridges where the winter stream flow is slow.
- Minimize disturbance by locating ice bridges at an area that requires the minimum approach grading and the shortest crossing route.
- Avoid using debris as reinforcement material, to prevent downstream siltation problems during spring break up.

- Ensure that any logs used for reinforcement are clean, delimbed, and placed on the surface of the ice. Chain logs together to facilitate removal.
- Prevent spring ice jams and flooding by removing any reinforcement logs and cutting a V-shaped notch into the middle of the ice bridge before thaw begins.



Ice bridge - temporary water crossing for winter access. Source: OMNR (1990).

2.9 Post-Construction Activities

Clean-Up and Reclamation

When construction is completed, the site should be cleaned-up as quickly as possible to protect the site from environmental degradation and to improve the aesthetic quality of the site. Most clean-up activities take only a few days and are worthwhile compared to future costs of returning to the site to repair on-going damage.

Reclamation becomes more effective if care has been taken to prevent environmental disturbance throughout the construction period, using the guidelines listed below.

- Begin reclamation and clean-up as soon as possible after construction is complete.
- Remove temporary stream crossings or diversions.
- Replace topsoil and salvaged vegetation plugs.
- Stabilize slopes with contouring, rip rap, and revegetation (see Section 3.0: Erosion and Sedimentation).
- Remove all material that was brought onto the site and collect any debris that may have floated downstream. Dispose of all materials in an approved manner.
- Mitigation or compensation of construction impacts may require that fish habitat be restored or enhanced. For more information on fish habitat enhancement, see Newbury and Gaboury (1993), Goodchild and Metikosh (1994), or contact the Regional Fisheries Manager.

Maintenance

Maintenance includes postconstruction inspections and repair or replacement of stream crossings. Throughout the life of the crossing, structures must be inspected periodically, especially prior to and during spring breakup and prior to the winter freeze. During inspection and maintenance activities the general good practices for construction identified in Section 2.5 should be adhered to, as well as the following.

- Inspect after the crossing has sustained its first heavy rains to check on the condition of the stream bed and banks. If heavy erosion has occurred, additional control measures should be immediately installed (see Section 3.0: Erosion and Sedimentation).
- Look for and remove any debris caught on piers or at the entrance to culverts to prevent flooding upstream, reduce stress on the structure, and allow for fish passage.
- If blockage of the stream crossing is the result of beaver activity, the method of beaver control should be determined in cooperation with the local Natural Resources Officer.
- Stabilize slopes of approaches with erosion-resistant material if inspection shows that vegetation will not grow.

2.0 Good Practices

- Clean out check dams and sediment traps at least once a year to maintain effective sediment control.
- Use mechanical vegetation control instead of herbicides where possible to prevent the release of chemicals into the stream.
- If herbicides must be used, maintain a safe distance from the stream, depending on the method

of application. Maintain a distance of 100 m from the stream when aerial spraying, 50 m when using mechanical application from the ground, and 30 m when using hand application.

• Consider wind velocity and direction prior to herbicide spraying to prevent contamination of waterbodies.

Decommissioning

When a road is no longer required, stream crossings should be removed. Crossings that are left unmaintained are prone to erosion and decay and leave the stream vulnerable to sedimentation or blockage. Decommissioning procedures are very similar to those listed under the 'Clean-up and Reclamation' subsection on page 27.

Removal of abandoned water crossings includes the excavation of all structures below the high water mark, with the exception of erosion protection works. Materials used in the construction of the crossing should be disposed of at least 100 m away from the water and in an approved manner. Where possible, use overburden and vegetation taken from the stream crossing to reconstruct stream banks and approaches. In the case of steep approaches where revegetation may be difficult, diagonal berms may be constructed across the abandoned roadway to prevent erosion (see following figure).

Prevent erosion at the abandoned crossing using the techniques described in Section 3.0: Erosion and Sedimentation. Begin stabilization and revegetation as quickly as possible, particularly when seeding and planting is required. The abandoned crossing should be clearly marked to prevent vehicle access and subsequent environmental damage.



Erosion control on sloped approaches to streams. Source: British Columbia Ministry of Environment (1986).

3.0 Erosion and Sedimentation

Erosion is the weathering of land surfaces by the action of moving water, wind, or other geological processes. Sedimentation, or, siltation, is the deposition of soil particles that fill in waterbodies. Erosion and sedimentation processes occur naturally in any area over time. However, construction activity at stream crossings can accelerate erosion rates.

Erosion rates are affected by precipitation, soil characteristics, topography, and vegetation. When constructing a stream crossing, use the eight principles of erosion and sediment control as follows:

- 1) Fit the road to the terrain and ensure road bed material will prevent erosion of roadway surface.
- 2) Minimize the duration of soil exposure.
- 3) Retain existing vegetation where feasible.
- 4) Grade disturbed soil to a stable slope.
- 5) Encourage revegetation.
- 6) Divert runoff away from exposed soil.
- 7) Keep runoff velocities low.
- 8) Trap sediment before it can cause damage.

The objective of implementing mitigation measures is to prevent excessive erosion and sedimentation from occurring and to eventually restore the site to pre-disturbance conditions. In the short term, erosion cannot be entirely avoided on construction sites. Sedimentation controls such as sediment traps, silt fences, brush barriers, forest floor filters, and check dams are very effective for arresting the migration of erodible soils.

Revegetation, rip rap, and slope modification are primarily considered long-term erosion control techniques. They also control sedimentation either directly by trapping sediments or indirectly by preventing soils from becoming detached and transported.

The erosion and sedimentation control techniques described below are generalized and it is possible to use variations and combinations. No attempt has been made to provide an exhaustive list of techniques as each individual site will present problems that require unique solutions. In particular, erosion problems associated with the disturbance of permafrost have not been addressed in these guidelines. Experts should be consulted when dealing with construction activities in permafrost areas.

Erosion and sedimentation control measures should be part of the planning and design of a stream crossing. Sediment control plans should be developed well in advance of any construction activity. Discuss mitigation measures with the Regional Fisheries Manager, including any changes to plans.

3.1 Sediment Traps

Drainage from a disturbed area containing excessive sediment load must not enter the stream through surface runoff. One way to control siltation is to divert runoff into sediment traps, or small ponds, that are constructed downstream from the sediment source. The water velocity slows when it reaches the trap, allowing large suspended particles to settle out before the water enters a stream.

Sediment traps are intended as temporary measures in erodible soil sites. They are to be used only until more permanent erosion controls and vegetation are in place. Use the guidelines below when designing and constructing sediment traps.

• Situate sediment traps in lowlying areas that are close to an earth cut or any other source of sediment. Do not place sediment traps in or near the watercourse.

- Plan the size and spacing between traps carefully, so that they will fill in at the same time vegetation is established preventing further erosion.
- Design each trap to have a ratio of length to width of approximately 2:1. For example, a two hectare (2 ha) drainage area typically requires a trap of approximately 4 m long by 2 m wide by 0.6 m deep.
- Construct a sediment trap by excavating a hole in the ground or utilizing a borrow pit.
- If necessary, install temporary weirs at the downstream end to impound the water.
- Protect the outlet end of the sediment trap against erosion.



Dug sediment trap. Source: OMNR (1990).

- Maintain sediment traps throughout their use by cleaning out silt, sand and debris regularly.
- Upon completion of work, remove all temporary structures and stabilize the area.

If the drainage area is larger than two hectares, a more sophisticated version of a sediment trap known as a sediment control pond must be used. For instruction on building a sediment control pond, see Chilibeck, et al. (1993) or consult a geotechnical engineer.

3.2 Silt Fences

Silt fences are filtering devices that trap sediments and slow the velocity of water runoff to encourage deposition. Silt fences consist of woven geotextile fabric or straw bales.

Straw bales, if available, are useful as short-term sediment barriers, but they will degrade after three to six months. Silt fences made of geotextile fabric, with proper installation, have a longer life expectancy than straw bales.

Both brush barriers (see Section 3.3) and silt fences halt the migration of sediments, but silt fences are not as effective as brush barriers in protecting exposed soils from erosion.

It is imperative that silt fences are only placed in areas with small volumes or low flow velocities, and are installed correctly, using the following guidelines.

- Build silt fences before construction activity begins by placing straw bales or geotextile fabric directly in the path of runoff.
- Utilize silt fences to trap sediments from small drainage areas, on the lower one half to one third of a slope, or where erodibility is high (i.e. downstream from an earth cut, on the toe of a slope, or surrounding a temporary stockpile of erodible soil).
- Install silt fences on a slope that is no longer than 30 m and no steeper than about 2:1.
- Support geotextile fabric with vertical wooden posts that are spaced not more than 3 m apart.

- Dig a trench along the upstream side of the posts that is 10 cm deep and 10 cm wide.
- Attach the geotextile fabric to the upstream side of the posts and anchor it in the trench. The trench prevents water from flowing under the fence.
- When one silt fence becomes full, maintain sediment control by installing another fence further downhill.
- Repair or replace old, ineffective geotextile fabric and degraded straw bales immediately.



Construction of a silt fence. Source: OMNR (1990).

3.3 Brush Barriers



Brush barrier at toe of fill. Source: OMNR (1990).

Brush barriers are piles of slash debris that control short-term erosion and sedimentation. The materials in the barrier, such as logs, limbs, and branches, act as filters to slow the velocity of runoff water and trap sediments. Barriers of this kind have been estimated to be 75 to 85% efficient at trapping sediments.

- Utilize brush barriers on water crossing approaches and for at least 100 m along the roadsides before and after a crossing
- Install brush barriers on slopes that are not longer than 30 m.
- Begin preparation of brush barriers during the clearing phase of construction.
- Stockpile large anchor logs and any slash debris that is no larger than 4 m long and 15 cm in diameter.

- Ensure that the stockpiles are accessible for later use but are not blocking drainage or located below the high water mark.
- Place the brush barrier as soon as any necessary contouring and backfilling on the slopes has been completed.
- Employ large anchor logs when the barrier is being used on the toe of an earth fill slope. Anchor logs against rocks, trees, or stumps and lay them parallel to the road.
- Place slash from the stockpile on the fill slope above the anchor logs or on any other erodible soils.
- Ensure that all slash piles are dense enough to prevent flow from going underneath by embedding them with a backhoe bucket or trampling them with tracked construction equipment.

3.4 Forest Floor Filter

Undisturbed natural terrain has a high resistance to erosion and is very effective as a filter for removing silt load from water. Take advantage of natural filters by dispersing drainage water over the terrain instead of steering it into the stream.

The use of a forest floor filter will prevent stream crossings from directly receiving large volumes of highly turbid runoff water. Ensure that the forest floor filter is most effective by following the guidelines below.

- Ensure that the forest floor area is large enough for effective filtering. The minimum length of undisturbed area or buffer is listed in Table 2.
- Divert water from the ditches into the forest floor with the use of a diversion berm and excavated channel if necessary.

- Place diversions so that the drainage area upstream of the berm is less than 2 ha.
- Ensure that the terrain has a downhill slope of at least 1% to prevent pooling behind the berm.
- Construct the diversion berm to be at least 50 cm in height and width and strong enough to resist the expected flow velocities.
- Prevent erosion of the berm by constructing side slopes at a steepness of 2:1 or flatter and utilizing erosion-resistant material.
- Space ditch outlets from between 100 to 600 m apart, depending on slope steepness and soil type. For example, a slope that is steep (over 10%) with highly erodible silt-clay soil will need the smallest space between ditches (100 m).



Forest floor filter - flow directed off right-of-way using a diversion berm. Source: OMNR (1990).

3.5 Check Dam

Check dams are overflow weirs that are placed across channels, alone or in series, to reduce erosion until vegetation is established. They maintain a low water velocity in sloping ditches by forcing water to pass over a series of steps instead of flowing directly downhill.

- Minimize erosion around a stream crossing site by installing a series of check dams in the roadway ditches.
- Use check dams to service a maximum drainage area of 4 ha. Steeper ditches will require a greater frequency of check dams to control the water velocity. On average, space the check dams at an interval of six times the width of the check dam.
- Construct check dams out of erosion-resistant material such as

logs, boulders, straw bales, and sandbags.

- Build dams to a maximum height of 60 cm.
- Avoid washout by making the check dam large enough to keep water from flowing past the outside edges or through the soil.
- Make a notch in the centre of the dam that is at least 15 cm below maximum height. Water should only flow over the notch in the centre.
- Embed construction materials securely into the channel bottom to prevent water from flowing underneath the dam.
- Clean accumulated sediments out of the dam regularly.



Two types of check dams. Source: OMNR (1990).

3.6 Revegetation

Vegetation provides very effective protection against erosion and sedimentation processes. Even after the best efforts have been made to minimize the loss of vegetation, it may be necessary to revegetate exposed areas. This will not only prevent further erosion but may also improve aesthetics of the stream crossing site.

Revegetation occurs naturally over time under favourable conditions, but techniques such as seeding, mulching, and fertilization will speed up the growth process and improve chances of success.

Mulch prevents erosion before vegetation is established and assists germination by holding seeds, soil, and moisture in place. Examples of mulch include straw, shredded paper, wood chips, matting, and slash debris.

Fertilizer helps to speed the establishment of vegetation by providing necessary nutrients for growth.

Use the guidelines below when undertaking revegetation.

- Choose species that are fastgrowing, well-adapted to the local environment, and easy to plant and maintain. When seeding, mixtures of grass and legumes in a variety of species tend to be the most successful.
- Roughen the surface if necessary to hold seed and mulch by scarifying up to a maximum depth of 2.5 cm.
- Distribute the seeds as evenly as possible, making certain that they come in contact with the soil.

• Utilize hand broadcast seeders in small areas and hydraulic seeders in large areas. Hydraulic seeders have an added capability of spraying water, fertilizer, and mulch at the same time.



Hand broadcast seeding helps to establish vegetation in the area of water crossings.

- Cover the seeds with a shallow layer of soil about 1 cm thick.
- Apply any fertilizer used according to the manufacturer's instructions and prevent it from entering the watercourse.
- A mulch of straw or another plant matting may be used to cover and stabilize exposed slopes to allow time for vegetation to reestablish.

3.7 Rip Rap

Rip rap refers to a layer of boulders and rock fragments that are placed over exposed soil to slow the flow of water and trap sediments. This prevents erosion by not only protecting the soil but also allowing for the infiltration of water into the ground and encouraging vegetative growth between particles.

Rip rap is necessary for erosion control at most water crossings. Areas of particular concern are those with steep slopes, high water velocity, and any place where vegetation is inadequate to prevent erosion.

Rip rap usually consists of blasted rock fragments or borrow pit boulders. Blasted rock fragments are the most desirable because they have a rough, angular shape and they can be made to a specified size range. Borrow pit boulders are rounder and may require a flattened surface to prevent them from rolling out of place. Use rip rap according to the guidelines below.

- Grade the surface before placing a rip rap layer to ensure that the slope receiving the rip rap has an appropriate steepness (see Section 3.8: Slope Modification).
- Do not use mine slag or acid generating rock.
- Choose the size of rip rap to ensure that particles cannot be displaced by the stream flow. Particle size of rip rap ranges from about 1 to 50 cm, depending on the type of application, water velocity, and steepness of slope (see Table 5).

Mean Velocity (m/sec)	Mean Diameter (cm)
<2.0	8-11
2.0-2.5	11-18
2.5-3.0	18-22
3.0-3.5	22-33
>3.5 * *	

Table 5: Size of rip rap materials that various velocities of water cantransport*. Source: Ontario Conservation Authorities (1981).

*Assuming a graded channel Manning's roughness of 0.030. **Velocities greater than 3.5 m/sec require a more extensive design in consultation with a geotechnical engineer.
- Install a filter under the rip rap layer in areas where ground water rises from the soil under the rip rap or where velocities are excessive. Filters should be either granular or geotextile material, and should be accompanied by a sand or gravel filler.
- Lay the rip rap using a backhoe or other machine.

- Make rip rap layers uniform with a thickness at least 1.5 times the median rock size and no less than 30 cm.
- Position rip rap on the bottom of the stream bed to 0.3 m above normal high water mark, or to the top of the existing bank, whichever is less.
- Rip rap only those areas requiring erosion protection.



Erosion control using rip rap in three different situations. Source: Ontario Ministry of Natural Resources (1990).



Rip rap and a check dam.

3.8 Slope Modification

Steep slopes are very vulnerable to erosion because they are unstable and unable to hold vegetation. Generally, a slope is considered to have a high risk of erosion if it has a steepness of greater than 2:1. Slopes with smooth surfaces and erodible soils (i.e. fine sand, clay, or silt) are also at a high risk. Prevent erosion in these areas by flattening steep slopes to a gentler angle and roughening the surface to encourage vegetative growth.

- Conduct necessary slope modification during initial rough grade construction, as it is usually easier to construct a gentle slope the first time than to flatten a steep slope later.
- Flatten a graded slope that is too steep by adding fill or cutting the slope to a stable angle.
- Construct fill slopes by starting from the bottom and working up.
- Try to build a slope that is short but not too steep, and gentle but not too long. Further flattening beyond a stable angle is unnecessary and only increases the area of soil that is exposed to erosion.
- Recall that soil type affects slope stability (see Table 6). The most stable soils contain coarse particles, mixed particle sizes or cohesive clay while soils with particles that are fine and uniformly sized are the most unstable.

Table 6: Recommended side slopefor major soil types.Source:Ontario Conservation Authorities,1981.

Soil	Recommended Side Slope
hard clay	2.5:1
clay loam	2:1
silty loam	2:1
sandy loam	3:1
sand	3:1

- Protect any slopes that cannot be effectively graded using rip rap or a retaining wall.
- Round off slopes to blend with the natural landscape, especially at the top of cut excavations.
- Roughen the surface of graded areas in order to slow or prevent the movement of water, sediment, and seeds downslope.

Roughening can be accomplished by using a technique called track walking. This is when a tracked machine such as a bulldozer is driven on the slopes to create tread indentations in the surface. Ensure that the indentations run parallel to the contours of the slope otherwise they create vertical channels that actually increase the erosional potential of runoff water.

4.0 Glossary

Abutment	The structure supporting the ends of a bridge and retaining the approach fills.
Active Floodplain	The portion of the floodplain that contains flowing channels, high water channels, sand bars and land that floods frequently.
Alignment	The horizontal route or direction of an access road. It is made up of straight line sections and curves.
Angle of Repose	The maximum slope or angle at which a material such as soil or loose rock remains stable.
Apron	Erosion protection placed below the stream bed in an area of high flow velocity, such as downstream of a culvert.
Backwater	The rise in water level at an upstream location arising from a downstream constriction.
Baffles	An obstruction used for deflecting, checking or slowing fluid flow. Sometimes used in culverts to provide areas of slower velocity, which act as resting places for fish.
Bailey Bridge	A patented pre-fabricated type of bridge used since 1942 on low volume roads. A variety of bridge lengths and configurations can be assembled from standard components and the unit can be "launched" into position.
Benthic Organisms	Organisms living at the bottom of a stream, or lake.
Berm	A low earth fill constructed in the path of flowing water to divert its direction.
Braided Stream Channel	The stream pattern found where deposition of sand and gravel bars on the channel floor causes the stream to split into two or more channels which shift sideways toward lower adjacent ground.
Buffer Zone Catchment	A strip of vegetation along a stream or around a lake which is left to protect the water body from disturbances on adjacent land. The topographic area which drains into a stream at a specific location as defined by all land sloping
	towards the channel and its tributaries.

Check Dam	A low head dam structure constructed in a stream in the path of flowing water to reduce erosion. Water flows over a check dam.	
Cofferdam	A temporary enclosure built in a watercourse and pumped dry to permit work on bridge abutments or piers.	
Compensation	The creation of new fish habitat as habitat Measures replacement in-kind for losses attributed to a development.	
Corduroy	Logs placed over a swamp to reinforce the natural root mat for the purpose of minimizing the risk of settlement or foundation failure. Corduroy is also used in winter road and ice bridge construction.	
Culvert	A conduit used to convey water through an embankment.	
DFO	Department of Fisheries and Oceans	
DNR	Manitoba Department of Natural Resources	
Debris	Any material including floating woody material or suspended sediment that is moved by flowing water.	
Deleterious Substance	Any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water (Fisheries Act).	
Deposition	Accumulation of material dropped due to a slower movement of the transporting agent such as water.	
Discharge	The volumetric rate of flow of water in a stream.	
Diversion	A new channel constructed to replace the existing channel for temporary or permanent use. Diversions can create dry conditions for construction or divert water from areas which cannot dispose of it safely.	
Drainage Basin	The area contributing water to a selected point along a stream channel.	
Erosion	The wearing away of the land surface by detachment and transport of soil and rock material through the action of moving water, wind or other geological processes.	

Fish	Includes parts of fish, shellfish, crustaceans, marine animals and any parts of the shellfish, crustaceans or marine animals, and the eggs, sperm, spawn, larvae, spat, and juvenile stages of fish, shellfish, crustaceans and marine animals (Fisheries Act).
Fish Habitat	Spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes (Fisheries Act). Habitat includes the water and the physical and biological components such as stream bed, banks, vegetation, etc.
Fishway	A structure that produces pockets of low velocity water flow throughout a given distance to enable fish movement past obstacles.
Floodplain	That portion of a river valley, adjacent to the river channel, which is covered with water when the river overflows its banks during floods.
Foundation	The foundation for a bridge may include the underlying soil and the lowest levels of any pier or abutment resting on it.
Geotextile	A recently-developed product used as a soil reinforcement agent. Sheets are made of polyethylene and supplied in rolls about 2 m wide.
Grade or Profile Grade	The elevation of the top of the finished road is called grade or profile grade.
Grubbing	The removal and disposal of all vegetation material within the topsoil.
Guideline	A recommended or acceptable course of action which is not a regulation.
Hydraulic Gradient	The slope of the water level profile along the channel, and is indicative of the energy of the flow system.
Hydrology	Pertaining to the study of the occurrence, circulation, distribution and properties of waters of the earth and its atmosphere.
Incubation Period	The period from egg deposition to hatching.
Invert	The floor or bottom plates of the culvert.

Legumes	Plants with nitrogen-fixing nodules on the roots, which makes them capable of using atmospheric nitrogen.	
Manning's Roughness	A factor which represents roughness or channel resistance to flow and varies with different sizes of bed paving material and depths of flow.	
Mitigation	Actions taken during the planning, design, construction and operation of works and undertakings to alleviate potential adverse effects on the productive capacity of fish habitats.	
Mulching	The practice of placing organic or inorganic materials on topsoil to facilitate the germination of seed by holding seeds, soil and moisture in place. Examples of mulch include straw, shredded paper, wood chips, matting and slash debris.	
Net Gain	An increase in the productive capacity of habitats for selected fisheries brought about by government and public efforts to conserve, restore and develop habitats.	
No Net Loss	A working principle by which Department of Fisheries and Oceans and Department of Natural Resources strive to balance unavoidable habitat losses with habitat replacement on a project-by- project basis so that further reductions to Canada's fisheries resources due to habitat loss or damage may be prevented.	
Normal High Water Mark	The location on the stream bank which visibly marks the end of terrestrial vegetation and the beginning of effects due to high flows (e.g. scouring) or aquatic vegetation.	
Pier	Intermediate supports between abutments on bridges of more than one span.	
Pools and Riffles	The naturally undulating profile of most streams, formed by coarse materials that accumulate on stream beds at intervals. Upstream from the accumulations, a shallow pool is impounded. Downstream from the crest of the accumulation, a local increase in slope causes the flow to accelerate, forming a riffle or rapids.	

Productive Capacity	The maximum natural capability of habitats to produce healthy fish, safe for human consumption, or to support or produce aquatic organisms upon which fish depend.
Prolonged Swimming Speed	The intermediate level of swimming performance which fish can maintain for periods of 15 seconds to 20 minutes. The level of swimming performance varies with species and size of fish, and decreases proportionately with the length of time.
Proponent	A person, business, corporation or government body who proposes to undertake a development.
Protection (of habitats)	Prescribing guidelines and conditions, and enforcing laws for the purpose of preventing the harmful alteration, disruption or destruction of fish habitat.
Reclamation	The process of returning a disturbed area to a condition approximating its original condition.
Restoration (of habitats)	The treatment or clean-up of altered, disrupted, or degraded fish habitat for the purpose of increasing its capability to sustain a productive fisheries resource.
Revegetation	Re-establishment of vegetation in disturbed areas.
Right-of-way	The cleared area along the road alignment which contains the roadbed, ditches, road slopes and back slopes.
Rip Rap	A layer of boulders or rock fragments placed over a soil to protect it from the erosive forces of flowing water.
Riparian	Along the banks of rivers and streams; riparian vegetation is stream side vegetation.
Scarify	The process of loosening or stirring the soil to shallow depths without turning it over.
Scour	Term used to describe soil erosion when it occurs under water, as in the case of a stream bed or river bottom.
Sediment	Fragmentary material, originating from the disintegration of rocks, which is suspended, transported or deposited by water.
Sediment Traps	Temporary water retention ponds used to trap and retain sediments.

Sedimentation	The filling-in of lakes, reservoirs, streams, channels, etc. with soil particles, mainly sand and silt resulting from erosion. Also called siltation.
Slash	Debris remaining after tree cutting.
Spawning Grounds	A specific site in a water body that is utilized by a particular fish species for reproduction.
Spawning Period	The period of fertilization and subsequent deposition of eggs.
Stream	A general term referring to natural bodies of flowing water without regard to the volume of water transported, including intermittent and ephemeral (lasting only a short while) streams.
Subcarangiform	Fish with a fusiform body shape, e.g. trout, whitefish and walleye.
Substrate	The base on which organisms live, i.e. the material forming the stream bed.
Suspended Sediment	Sediment that is supported by the buoyancy and drag forces of flowing water and that stays in suspension for an appreciable period of time.
Ten-year Flood	The maximum quantity of water flow per second expected at a particular water crossing, on average, once every ten years. It has a 10% probability of occurring in any given year.
Toe (of slope)	Where the slope stops or levels out; the bottom of the slope.
Undercutting or Undermining	Occurs when channel flow at a high velocity is concentrated along one bank as a result of meanders or an obstruction forcing the flow against the opposite bank: bank becomes vertical as soil is washed away by channel flow.
Velocity	The distance travelled per unit of time.
Watercourse	A natural or artificial channel that conveys water continuously or intermittently.
Wingwall	An extension of a bridge abutment, constructed to retain the roadway fill material and prevent its entry into a water course.

5.0 References

5.0 References

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Appendix I

tural	Central Region		
5	Box 6000		
	Gimli, Manitob	a	
	ROC IBO		
		<i>phone (204)</i>	
	Director	642-6096	
	Regional Fisheries Manager	642-6072	
	District Offices		
	Ashern	786-2368	
	Birds Hill	222-9151	
	Grand Beach	754-2728	
	Gypsumville	659-5208	
	Hodgson	372-6296	
	Lundar	762-5229	
	Morris	746-6567	
	Portage La Prairie	239-3206	
	Riverton	378-2945	
	Selkirk	785-5080	
	Winnipeg Beach	389-2752	

Eastern Region	
Box 4000	
Lac Du Bonnet, Manitoba	
ROE 1AO	
	phone (204)
Director	345-1433
Regional Fisheries Manager	345-1450
District Offices	
Beausejour	268-6184
Bissett	277-5212
Falcon Lake	349-2201
Hadashville	426-5313
Lac du Bonnet	345-2231
Pine Falls	367-2481
Rennie	369-5246
Seven Sisters	348-2203
Sprague	437-2348
Steinbach	326-4471
West Hawk Lake	349-2245
Whiteshell Park Headquarters	369-5407

Department of Natural Resources Offices

Northeastern Region	
Box 28	
Thompson, Manitoba	
R8N IX4	
	phone (204)
Director	677-6628
Regional Fisheries Manager	677-6650
District Offices	
Churchill	675-8897
Gillam/Sundance	652-2273
Gods Narrows	335-2366
Island Lake	456-2362
Leaf Rapids	473-8133
Lynn Lake	356-2413
Norway House	359-6877
Thompson	677-6634
Wabowden	689-2688

Northwest Region	
Box 2550	
The Pas, Manitoba	
R9A I M4	
	phone (204)
Director	627-8261
Regional Fisheries Manager	627-8296
District Offices	
Cranberry Portage	472-3331
Flin Flon	687-3896
Grand Rapids	639-2241
Snow Lake	338-2521
The Pas	627-8254

Appendix I

Western Region	
340-9th Street	
Brandon, Manitoba	
R7A 6C2	
	phone (204)
Director	726-6299
Regional Fisheries Manager (Brandon)	26-6449
Regional Fisheries Manager (Dauphin)	22-2101
District Offices	
Boissevain (Turtle Mountain)	534-7204
Brandon	726-6446
Carberry	834-3223
Dauphin	622-2202
Grandview	546-2701
Killarney	523-8230
Mafeking	545-2263
Manitou	242-2950
Neepawa	476-2076
Roblin	937-2181
Shoal Lake	759-2475
Swan River	734-3429
Virden	748-2043
Winnipegosis	656-4871

Winnipeg

200 Saulteaux Crescent Winnipeg, Manitoba R3J 3W3

District Office

phone (204) 945-7258 Appendix II

Department of Fisheries and Oceans

Habitat Management Section

501 University Crescent Winnipeg, Manitoba R3T 2N6

Office

phone (204) 983-5163

Appendix L: DFO Freshwater Intake End of Pipe Fish Screen Guideline

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Department of Fisheries and Oceans

Freshwater Intake End-of-Pipe Fish Screen Guideline







Department of Fisheries and Oceans

Freshwater Intake End-of-Pipe Fish Screen Guideline







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1.0

Introduction

The Department of Fisheries and Oceans (DFO) has prepared the **Freshwater Intake End-of-Pipe Fish Screen Guideline** to assist proponents in the design and installation of fish screens lfor the protection of anadromous and resident fish where freshwater is extracted from fish-bearing waters. This guideline will also assist regulatory agencies in the review of fish screen proposals.

A requirement for fish screening is stated under Section 30 of the Fisheries Act, where every water intake, ditch, channel, or canal in Canada constructed or adapted for conducting water from any Canadian fisheries waters must provide for а fish guard or a screen, covering, or netting over the entrance or intake so as to prevent the passage of fish into such water intake, ditch, channel or canal. Other sections of the Fisheries Act, or other Federal, Provincial, or Municipal Legislation and Policy may also apply to associated water extraction activities. Proponents are advised to contact the appropriate regulatory agencies regarding approvals or permits.

2.0

Guideline Objective

The objective of the guideline is to provide a National standard-of-practice and guidance for end-of-pipe fish screens at freshwater intakes to prevent potential losses of fish due to entrainment or impingement. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself. The severity of the impact on the fisheries resource and habitat depends on the abundance, distribution, size, swimming ability, and behaviour of the organisms in the vicinity of the intake, as well as, water velocity, flow and depth, intake design, screen mesh size, installation and construction procedures and other physical factors.

The **Freshwater Intake End-of-Pipe Fish Screen Guideline** deals exclusively with the sizing and design of fixed screens that are often placed at the end of a pipe used to extract water up to 0.125 m³/s, or 125 litres per second (L/s) (i.e., 2000 US gallons per minute (US gpm)). The guideline is intended for use in addressing fish screens for small permanent and temporary withdrawals for irrigation, construction, small municipal and

private water supplies, etc. It is *not* intended for application to hydroelectric or canal screen designs; however, such proposals can be considered by regulatory agencies on a site-specific basis. The guideline focuses on the technical aspects of intake screens and the protection of fish rather than on policy, legislation, or environmental assessment processes and their application. This guideline has been developed to provide protection of freshwater fish with a minimum fork length of 25 mm (approximately 1 inch) since most eggs and fish larvae remain in bottom substrates until they reach the fry stage (i.e., 25 mm fork length). Other designs, in addition to intake screens, may be appropiate to address fish and fish habitat protection associated with water withdrawals. Such proposed designs should be addressed with the appropriate regulatory agencies on a site-specific basis.



3.0

Information Requirements for Evaluation of Intake Screens

Information that should be provided to facilitate evaluation of an end-of-pipe intake screen design intended for fish protection during a freshwater withdrawal is highlighted below. Types of information requirements that may also be applicable to the water intake project as a whole are identified in Appendix A.

- fish presence, species, and possible fish size or fish habitat conditions at the project site
- rate or ranges of rates of withdrawal from the watercourse
- screen open and effective areas
- physical screen open parameters with respect to the intake and the watercourse
- screen material, method of installation and supporting structures
- screen maintenance, cleaning, or other special requirements

4.0

Design, Installation, & Maintenance of Freshwater Intake End-of-Pipe Fish Sereens



The appropriate design of a fish screen is largely dependent upon the species and the size of fish requiring protection. Appropriate installation and maintenance/cleaning of the screen are also important in keeping approach velocities low and ensuring satisfactory operation of the screen. For the purposes of this guideline, emphasis is placed on the protection of freshwater fish with a minimum fork length of 25 mm from entrainment and impingement due to water extraction activities. Depending upon site-specific circumstances, a case may be made whereby the minimum fork length size of fish to be protected is greater than 25 mm. In this instance, the fish screen criteria for open screen area (Table 2 and Figure 1) and screen mesh size (2.54 mm) presented here do not apply. Fish screen criteria and guidance for the protection of fish larger than 25 mm is provided by Katopodis (1992).

The following sections address the appropriate design of fixed freshwater intake end-of-pipe fish screens for the protection of fish with a minimum fork length of 25 mm. Guidance on

installation, cleaning, and maintenance is provided. Common types of intake screens and associated intakes are also presented. Appendix B presents a sample calculation utilizing the guideline to determine the appropriate end-of-pipe intake screen size for the protection of freshwater fish.

4.1 Fish Screen Criteria

To protect fish from impingement or entrainment, the approach velocity (i.e., the water velocity into, or perpendicular to, the face of an intake screen) should not exceed certain values based on the swimming mode (i.e., subcarangiform or anguilliform) of the fish present in the watercourse. The subcarangiform group includes fish that swim like a trout or salmon, and move through the water by undulating the posterior third to half of their bodies. The anguilliform group includes fish that swim like an eel, and move through the water by undulating most or all of their body. Table 1 presents the swimming modes of most common fish species in Canada. Contact DFO or provincial fisheries agencies regarding fish species that are not included in Table 1.

Envelope curves for approach velocities were developed for each swimming mode corresponding to a minimum fork length of 25 mm and a maximum endurance time of 10 minutes (the time the fish is in front of the face of the screen before it can elude it). To satisfy approach velocities of approximately 0.11 m/s and 0.038 m/s for the subcarangiform and anguilliform groups respectively, curves indicating the required open screen areas, based on fish swimming performance data, including fish species size (Katopodis, 1990) and and related to flows/extractions, were developed. Table 2 presents the required open screen area, in both metric and non-metric units, for end-of-pipe intake screens with a capacity up to 125 L/s (2000 US gpm). The open screen area is the area of all open spaces on the screen available for the free flow of water. The same information is presented graphically in Figure 1.



Table 1Summary ofCommon FishSpecies andSwimming Modes

SUBCARANGIFORM SWIMMING MODE

Alewife (Gaspereau)Alosa pseudoharengusArctic CharSalvelinus alpinusArctic GraylingThymallus arcticusArtantic SalmonSalmo salarBroad WhitefishCoregonus nasusBrok TroutSalvelinus fontinalisBrown TroutSalmo truttaCarpCyprinus carpioChannel CatfishIctalurus punctatusChinook SalmonOncorhynchus ketaCiscoCoregonus artediiCoho SalmonOncorhynchus kisutchCutthroat TroutOncorhynchus clarki clarkiDolly VardenSalvelinus malmaGoldeyeHiodon alosoidesGreen SturgeonAcipenser fulvescensLake SturgeonAcipenser fulvescensLake SturgeonSalvelinus namaycushLake WhitefishCoregonus clupeaformisLaygemouth BassMicropterus salmoidesLongnose SuckerCatostomus catostomusMountain WhitefishProsopium williamsoniQuananicheSalmo salar ouananichePink SalmonOncorhynchus nerkaAainbow SmeltSalmo salar ouananicheSaugerStizostedion canadenseSaugerStizostedion canadenseMite BassMorone americanaMite BassMorone chrysopsWhite SurgeonAcipenser transmontanusValleyeStizostedion canadenseMorone americanaMorone chrysopsWhite SurgeonAcipenser transmontanusValleyeStizostedio vitreumMorone americanaMorone chrysopsMite Suc	Common Name	Scientific Name
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Yellow Perch Perca flavescens	White Sucker	Catostomus commersoni
	Yellow Perch	Perca flavescens

ANGUILLIFORM SWIMMING MODE

Common Name	Scientific Name
American Eel	Anguilla rostrata
Burbot	Lota lota
Sea Lamprey	Petromyzon marinus

Note: The few data points available for Northern Pike *(Esox lucius)* are close to the anguilliform group.

4.2 Design of Fixed End-of-Pipe Fish Screens

Once the required open area has been found from Table 2 or Figure 1, the effective screen area must be calculated. It is the area occupied by the open spaces (i.e., open screen area) and the screen material available for the free flow of water. The effective screen area should be provided at the intake location and is determined as follows:

Effective Screen Area (Table 2) Area (m² or ft²) $\frac{Open Screen Area (Table 2)}{\left(\frac{\% Open Area (Table 3)}{100}\right)}$

It should be noted that if the percent (%) open screen area is maximized, then the effective screen area required for a given flow is minimized. The narrowest dimension of any opening on the screen is referred to as the design opening, regardless of opening shape. The maximum design opening for a fish of 25 mm fork length is estimated at 2.54 mm (0.10 inches). Guidance on screen openings and materials is presented below.

- The screen openings may be round, square, rectangular, or any combination thereof, but should not have any protrusions that could injure fish.
- Screen materials may include brass, bronze, aluminum, monel metal, galvanized or stainless steel, and plastics. The screen material should be resistant to corrosion and UV light.
- Note: clogging due to corrosion is minimized with the use of stainless steel.
- Welded wedge wire screens offer reduced debris clogging and increased open area and screen stiffness, in comparison to round wire mesh and punch plate.

Table 3 presents several common types of screening material that meet the requirements of wire diameter, clear opening width and percent open area,

The dimensions of the fish screen can be calculated after the correct shape, configuration, location, and method of installation have been determined. This will usually be determined after a site investigation and a review of these guidelines. Included in Figure 2 are common screen shapes and the associated



Table 2Open Screen AreaRequired for End-of-Pipe WaterIntakes

	Metric Units			on-Metric Uni	ts
Flow (L/s)	Subcarangiform (m²)	Anguilliform (m²)	Flow (US gpm)	Subcarangiform (ft²)	Anguilliform (ft²)
$\begin{array}{c}1\\5\\6\\8\\10\\14\\15\\6\\8\\22\\4\\26\\22\\4\\26\\8\\0\\24\\5\\5\\6\\6\\5\\0\\5\\0\\5\\0\\5\\0\\5\\0\\0\\0\\1\\1\\2\\5\\0\\0\\1\\1\\2\\0\\1\\1\\2\\5\\0\\0\\0\\0\\1\\1\\2\\0\\1\\1\\2\\5\\0\\0\\0\\0\\0\\0\\0\\0\\0\\0\\0\\0\\0\\0\\0\\0\\0\\0$	0.01 0.05 0.06 0.07 0.09 0.11 0.13 0.14 0.15 0.17 0.18 0.20 0.22 0.23 0.24 0.26 0.28 0.30 0.31 0.32 0.33 0.35 0.37 0.42 0.46 0.51 0.55 0.60 0.65 0.69 0.74 0.78 0.83 0.88 0.92 1.02 1.11 1.16	0.03 0.13 0.21 0.26 0.31 0.37 0.39 0.42 0.47 0.52 0.58 0.63 0.65 0.68 0.73 0.79 0.84 0.92 0.94 0.99 1.05 1.18 1.31 1.44 1.57 1.70 1.83 1.96 2.09 2.23 2.36 2.49 2.62 2.88 3.14 3.30	$\begin{array}{c} 10\\ 50\\ 100\\ 150\\ 200\\ 250\\ 300\\ 350\\ 400\\ 450\\ 500\\ 550\\ 600\\ 650\\ 700\\ 750\\ 800\\ 950\\ 1000\\ 1050\\ 1000\\ 1050\\ 1000\\ 1250\\ 1300\\ 1400\\ 1450\\ 1550\\ 1600\\ 1550\\ 1800\\ 1800\\ 1900\\ 1000\\ 1$	$\begin{array}{c} 0.1\\ 0.3\\ 0.6\\ 0.9\\ 1.3\\ 1.6\\ 1.9\\ 2.2\\ 2.5\\ 2.8\\ 3.2\\ 3.5\\ 3.8\\ 4.1\\ 4.4\\ 4.7\\ 5.0\\ 5.4\\ 5.7\\ 6.0\\ 6.3\\ 6.6\\ 6.9\\ 7.2\\ 7.6\\ 7.9\\ 8.2\\ 8.5\\ 8.8\\ 9.1\\ 9.4\\ 9.8\\ 10.1\\ 10.4\\ 10.7\\ 11.0\\ 11.3\\ 11.6\\ 12.0\\ 12.3\\ 12.6\end{array}$	0.2 0.9 1.8 2.7 3.6 4.5 5.4 6.2 7.1 8.0 8.9 9.8 10.7 11.6 12.5 13.4 14.3 15.2 16.0 16.9 17.8 18.7 19.6 20.5 21.4 22.3 23.2 24.1 25.0 25.8 26.7 27.6 28.5 29.4 30.3 31.2 32.1 33.0 33.9 34.8 35.7

Table 3Examples of SereenMaterial

Material	Wire Thickness	Opening Width	% Open Area
3x 8 Stainless Steel Alloy Mesh	0.711 mm (0.028")	2.44 mm (0.096")	60
#7 Mesh Wire Cloth	1.025mm (0.041")	2.54 mm (0.100")	51
#8 Mesh Wire Cloth	0.875 mm (0.035")	2.25 mm (0.089")	52
#8 Mesh Wire Cloth	0.700mm (0.028")	2.54 mm (0.100")	62
#60 Wedge Wire Screen	1.50mm (0.059")	2.54 mm (0.100")	63
#45Wedge Wire Screen	1.10mm (0.080")	2.54 mm (0.100")	69

dimensions and area formulae. These are just examples of the many shapes and sizes in which fish screens can be fabricated. Screens are instream structures and, as such, should have sufficient strength and durability, and be capable of withstanding any potential large forces and impacts. Figure 3, 4, and 5 illustrate some of the various configurations, applications, and screen material types of end-of-pipe fish screens.

4.3 Installation

- Screens should be located in areas and depths of water with low concentrations of fish throughout the year.
- Screens should be located away from natural or man-made structures that may attract fish that are migrating, spawning, or in rearing habitat.
- The screen face should be oriented in the same direction as the flow.
- Ensure openings in the guides and seals are less than the opening criteria to make "fish tight".
- Screens should be located a minimum of 300 mm (12 in.) above the bottom of the watercourse to prevent entrainment of sediment and aquatic organisms associated with the bottom area.
- Structural support should be provided to the screen panels to prevent sagging and collapse of the screen.
- Large cylindrical and box-type screens should have a manifold installed in them to ensure even water velocity distribution across the screen surface. The ends of the structure should be made out of solid materials and the end of the manifold capped.
- Heavier cages or trash racks can be fabricated out of bar or grating to protect the finer fish screen, especially where there is debris loading (woody material, leaves, algae mats, etc.). A 150 mm (6 in.) spacing between bars is typical.





FLOW (L/s)



Figure 2 Common Screen Shapes and Area Formulae



CIRCULAR SCREEN



Area = $\frac{\pi}{4}$ D²

SQUARE SCREEN



Area = W1 x W2





CYLINDRICAL SCREEN



Figure 3 Typical Applications and Features of End-of-Pipe Screens



PERFORATED PLATE (PUNCHED)



CIRCULAR MESH SCREEN



SQUARE MESH SCREEN



SQUARE WEDGE WIRE SCREEN



DRUM OR CYLINDER WITH PERFORATED PIPE



BOX-TYPE WITH MESH SCREEN



Figure 5 Examples of Typical Installations of Endof-Pipe Screen






4.4 Cleaning and Maintenance

- Provision should be made for the removal, inspection, and cleaning of screens.
- Ensure regular maintenance and repair of cleaning apparatus, seals, and screens is carried out to prevent debris-fouling and impingement of fish.
- Pumps should be shut down when fish screens are removed for inspection and cleaning.
- Screens may be cleaned by methods such as air or water, backwashing, removal and pressure washing or scrubbing.
- Under certain site-specific winter conditions, it may be appropriate to remove screens to prevent screen damage.
- Flexible suction pipe may be used instead of solid, fixed piping for ease of screen removal and cleaning.
- Pump suction pressure can be measured to assess the need for screen cleaning.

To facilitate intake screen cleaning/maintenance, design and installation features such as orientation of the screen (e.g., in a cove) or variation in mesh shape (i.e., square wire/bars versus round wire/bars), etc. may be considered for regularly cleaned screens. For screens that will not be cleaned regularly, provision of considerably more open screen area (e.g., four times more) than determined from Table 2/Figure 1 may be considered. Such design/installation features should be addressed with the appropriate regulatory agencies on a site-specific basis.

Appendix C presents a list of units of conversion.

For more information on the appropriate design of freshwater intake end-of-pipe fish screens, contact the nearest DFO office. In addition, a list of DFO Regional contacts is presented in Appendix D. Other appropriate regulatory agencies should also be contacted.

References

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- Katopodis, C, 1994. Analysis of ichthyomechanical data for fish passage or exclusion system design. Proc. International Fish Physiology Symposium, July 16-21, 1994, Vancouver, B.C. American Fisheries Society and Fish Physiology Association.
- Katopodis, C. and R. Gervais, 1991. *Icthyomechanics*, Working Document, Department of Fisheries and Oceans, Freshwater Institute, Winnipeg, Manitoba.

Glossary						

Anadromous: Fish species that migrate from the sea to freshwater systems in order to spawn.

Anguilliform: The type of swimming mode for fish that swim like an eel, and move through the water by undulating most or all of their body.

Effective Screen Area: The area occupied by the open spaces (i.e., open screen area) and screen material available for the free flow of water.

Entrainment: Occurs when a fish is drawn into a water intake and cannot escape.

Fork Length: The straight line distance measured from the tip of the nose to the fork of the tail of a fish.

Impingement: Occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself.

Open Screen Area: The area of all open spaces on the screen available for the free flow of water.

Subcarangiform: The type of swimming mode for fish that swim like trout or salmon, and move through the water by undulating

the posterior third to half of their body.

Appendix A Information Requirements

Appendix A Information Requirements

Types of information requirements that may be applicable to a freshwater intake proposal are highlighted below. While this listing is not intended to be all inclusive, it indicates information that may be necessary to enable regulatory agencies to review a water intake and fish screen proposal. The information highlighted below considers Section 30 and other sections of the *Fisheries Act*. These information requirements may also address other Federal, Provincial, and Municipal legislation and policies.

General and Site Information

- gazette or common name of the watercourse
- · location of the watercourse
- type of watercourse (e.g., pond or stream)
- type of water intake
- other activities associated with the development or construction of the intake/screen structure

Biophysical Information

- fish presence, species, and possible fish size or fish habitat conditions at the protect site
- physical description of the watercourse at the intake site, including channel width and depth, direction and velocity of water currents, variations in wafer levels, sediment transport processes, lateral or channel grade movement, debris loading, etc.
- location and position of the intake within the watercourse, including dimensions, alignment, depth in the water column, wetted area, etc.
- description of the site features and characteristics, including site access

Water Use Information

· purpose of water withdrawal

- average rate, or ranges of rates, of withdrawal from the watercourse
- duration and lime of withdrawal
- estimates of ranges of flow (i.e., daily, weekly, monthly) in the watercourse during times of withdrawal with dates and times of year (with particular consideration to periods of low flow)
- expected effects of withdrawal on existing watercourse (e.g., drawdown, downstream dewatering, etc)
- description of structures or activities associated with the development of the intake
- whether the application is for a new intake, or re-development or upgrading of an existing structure

Other Information

- site plans/sketches indicating intake site and location (detailed on 1:50,000 topographic map)
- photographs/video of the site are often useful

Fish Screen Information

- screen open and effective areas
- physical screen parameters with respect to the intake and the watercourse
- screen material, method of installation and supporting structures
- · screen maintenance, cleaning or other special requirements

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Appendix B Sample Calculation

A proponent wishes to withdraw water at a rate of 0.075 m³/s from a nearby pond. The pond supports populations of brown trout, brook trout, and American eel. The intake is proposed to be cylindrical with the ends solid and #60 wedge wire screen around the cylinder.

What size must the intake screen be to satisfy the guideline requirements?

There are 4 steps to finding the answer:

- 1. Determine the fish swimming mode.
- 2. Determine the open screen area.
- 3. Determine the effective screen area.
- 4. Determine the dimensions necessary to produce the effective screen area.

1. Fish Swimming Mode

The fish swimming mode is found from Table 1. Brook trout and brown trout are listed as subcarangiform swimmers, while the American eel is an anguilliform swimmer.

2. Open Screen Area

Table 2 lists the required open screen area for both subcarangiform and anguilliform swimmers under flows up to 125 L/s (2000 US gpm). To use the table, if is necessary first to convert the flow from cubic metres per second to litres per second.

$$0.075 \frac{\text{m}^3}{\text{s}} \times \frac{1000 \text{ L}}{1 \text{ m}^3} = 75 \frac{\text{L}}{\text{s}}$$

For a flow of 75 L/s, Table 2 indicates that the open screen area must be:

- 0.69 m² for subcarangiform swimmers, and
- 1.96 m² for anguilliform swimmers.

The higher number (1.96 m^2) is the more stringent requirement, therefore, it is used in the calculation of effective screen area,

3. Effective Screen Area

The screen material in this case is # 60 Wedge Wire. A review of Table 3 indicates that the % Open Area for this material is 63%, With this value and the previously determined area from Step 2, the following formula is used to determine the Effective Screen Area.

Effective Screen Area =
$$\frac{\text{Open Screen Area}}{\left(\frac{\% \text{ Open Area}}{100}\right)}$$

= $\frac{1.96 \text{ m}^2}{\left(\frac{63}{100}\right)}$
= 3.111 m^2

4. Dimensions of Intake Screen

Figure 2 lists several common screen shapes and their respective area formulae. For a cylindrical screen where the ends are solid and screening is around the cylinder, the following formula applies:

Area = π DL

The unknown dimensions are diameter (D) and length (L). These dimensions are determined by choosing a value for one and solving the equation for the other.

If the diameter is 0.600 m, then the length follows as:

Area = π DL 3.111 m² = (0.600 m)L 3.111 m² = (1.885 m)L L = $\frac{3.111 \text{ m}^2}{1.885 \text{ m}}$ L = 1.65 m

A 0.600 m diameter, 1.65 m long cylindrical screen would meet the design requirements. It should be noted that the dimensions given are representative of the screening area only; they do not include any screen that may be blocked by framing, etc. By comparison, if the pond only supported trout (subcarangiform), a 0.600 m diameter, 0.58 m long cylindrical screen would meet the design requirements.

Appendix	C
Units of	
Conversion	

To Convert	Into	Multiply By
cubic feet per second	cubic metres per second	0.0283
cubic feet per second	litres per second	28.3
cubic feet per second	US gallons per minute	448.9
cubic metres per second	cubic feet per second	35.3
cubic metres per second	US gallons per minute	15850
litres per second	cubic feet per second	0.0353
litres per second	cubic feet per minute	2.12
litres per second	cubic metres per second	0.001
litres per second	US gallons per minute	15.85
square metre	square foot	10.76
square metre	square inch	1550
square foot	square metre	0.0929
US gallons per minute	litres per second	0.0631
US gallons per minute	cubic feet per second	0.00223
US gallons per minute	Imperial gallons per minute	0.833
Imperial gallons per minute	litres per second	0.0758

Appendix D DFO Regional Contacts	NEWFOUNDLAND REGION	Habitat Management Division P.O. Box 5667 St. John's NF A1C 5X1 Tel: 709-772-6157 Fax: 709-772-5562
	GULF REGION	Habitat Management Division P.O. Box 5030 Moncton NB E1C 9B6 Tel: 506-851-6252 Fax: 506-851-6579
	SCOTIA-FUNDY REGION	Habitat Management Division P.O. Box 550 Halifax NS B3J 2S7 Tel: 902-426-6027 Fax: 902-426-1489
	QUEBEC REGION	Fish Habitat Management P.O. Box 15550 Quebec QC G1K 7Y7 Tel: 418-648-4092 Fax: 418-648-7777
	CENTRAL & ARCTIC REGION	Habitat Management 501 University Crescent Winnipeg MB R3T 2N6 Tel: 204-983-5181 Fax: 204-984-2404
	PACIFIC REGION	Habitat Management 555 W. Hastings St. Vancouver BC V6B 5G3 Tel: 604-666-6566 Fax: 604-666-7907

Local DFO offices should be contacted. Other appropriate regulatory agencies should also be contacted.

Appendix M: Handbook Identification Of Heritage Cultural Features (DRAFT)

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Heritage Resource Management Program (HRMP)

HANDBOOK

For the Identification of Heritage Cultural Features and Associated Processes



Version 3.0

Manitoba Hydro Indigenous Relations

Respect All Heritage Cultural Discoveries and Areas DO NOT Talk or Contact the Media DO NOT Post Photos on Social Media or the Internet Developed as part of Manitoba Hydro's

HERITAGE RESOURCE MANAGEMENT PROGRAM

by

InterGroup Consultants (Amber Flett, Archaeologist)

with input from

Manitoba Hydro Indigenous Relations, GIS Studies, Transmission Line Maintenance

This booklet arose out of the Heritage Resource Training provided to Manitoba Hydro Keeyask & Transmission Line Maintenance employees and was inspired by a handbook produced by the Government of Yukon.

> Published by Indigenous Relations November 2019 Photo Source: InterGroup Consultants and Manitoba Hydro

Manitoba Hydro is Committed to Safeguarding Heritage Resources

A corporate priority of Manitoba Hydro is to "Respect and Support Indigenous peoples in all aspects of our business."

Additionally, Manitoba Hydro (MH) has ongoing legal and licensing obligations related to cultural artifacts and human remains at risk due to Manitoba Hydro's operations. The *Heritage Resources Act*, several *Environmental Act* licenses, the *Northern Flood Agreement* and subsequent Implementation Agreements all contain provisions subjecting MH to ongoing liability for the costs of recovery and reinternment of cultural artifacts and human remains.

The identification and protection/recovery of artifacts is an important step contributing to the documentation of Indigenous and Non-Indigenous histories and the identification of culturally important sites and ancestral remains.

This information is managed on an ongoing basis through the Indigenous Relations (IR) Heritage Resource Management Program (see page 8 for more info).

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INTRODUCTION

Manitoba's Heritage Resources

Manitoba's rich cultural history is preserved in the material cultural and heritage resources left behind by past people. These tangible resources indicate that human beings have lived in Manitoba for a least 12,000 years.

Heritage objects comprise:

- a) a heritage site;
- b) a heritage object;
- c) any work or assembly of works of nature 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 (Province of Manitoba, 1986)

Archaeology in Manitoba

There are more than 9,000 registered archaeological sites in Manitoba. Archaeological sites may be as large as entire communities, or as small as a single projectile point, button or pottery shard.



Heritage Sites are Vulnerable

Heritage resources are significant to the reconstruction of our province's history and story. Any activity which disturbs the ground can destroy an archaeological site.

Archaeological Sites and Artifacts Are Protected

Archaeological sites are protected under Manitoba's *The Heritage Resources Act* (1986).

According to the *Act* (1986), no person shall search for or excavate for heritage objects or human remains except pursuant to a heritage permit and in accordance with such terms and conditions as may be prescribed by the minister and set out in or attached to the heritage permit.

No artifacts will be removed from an archaeological site or area without a permit, unless the artifacts are in danger of being lost (see page 30 for more details). According to the Manitoba Historic Resources Branch, an artifact is an object of archaeological or historical interest that is older than 50 years.



MANITOBA HYDRO'S HERITAGE RESOURCE **MANAGEMENT PROGRAM (HRMP)**

Manitoba Hydro manages Heritage Resources through their Heritage Resource Management Program (HRMP).

This program is managed on an ongoing basis through Indigenous Relations (IR) and is designed to aid in Heritage Resource planning, management, training, monitoring, and mitigation. It is comprised of 5 primary processes\systems; 1) the Heritage Resource Monitoring (HRM) System, 2) the Heritage Resource Tracking (HRT) System, 3) the Heritage Resource Protection Planning (HRPP) System, 4) the Heritage Resource Site Monitoring (HRSM) and 5) Heritage Cultural Discovery (HRD) Data Input Survey (see Figure 1 or page 9).

For more information see to the HRMP SharePoint Site or contact HRMP Program Leads, see page 37.



HRMP SharePoint Site

http://gisstudies.hydro.mb.ca/Pages/DIHRT.aspx



OFFICE - PRE FIELD HERITAGE RESOURCE PROJECT PLANNING (HRPP) FOR MANITOBA HYDRO OPERATION AREAS

Areas, with the potential of ground disturbance, need to be reviewed for the potential of heritage resources

Maintenance Projects

Applicable for Projects that are occurring within Existing Areas that <u>DON'T</u> Disturb the Ground

Maintenance Projects that such as vegetation brushing and hand clearing require Project Managers to obtain a MH IR Heritage Resource Screening.

Screenings require a minimum of 6 weeks lead time and are valid for 1 year.



Heritage Resource Screening Process

The following outlines the screening process;

- 1. Request a MH IR Heritage Resource Screening.
 - This can be done by submitting request from the <u>HRMP</u> <u>SharePoint Site</u>



• The request will open a Form, which you need to complete

	Save	Cancel
Project Title *		
Department.*		
Cost Code		
Project Type *	Y	
Description of Type of Work *		
Description of Work Area		
ROW Width	Required for Transmission Lines and Roads	
Type of Methods to be Used *	Blading Hand Cutting Brushing Other - Provide Description in Commerci	Section
Timing of Work *	Summer Winter Spring Fait All Seasons Unknown	

- 2. The MH HRMP Program Leads (page 37) will contact the Manitoba's Historic Resources Branch (HRB)
 - 11

- 3. HRB examines their data, the project area, and provides mitigation direction for any Heritage Resources Sites in the area.
- 4. This HRB direction is processed, mapped, and communicated with the Requestor. (see page 13 for more detail)

Construction Projects

Applicable for Projects that are occurring within New Areas or <u>DO</u> Disturb the Ground

Construction Projects such as transmission line construction and widening, road construction or widening, and shoreline rip-rap required Project Managers to obtain a Manitoba Government Permit. As part of the process the Manitoba Government sends the submitted project to the Historic Resources Branch (HRB), who typically requires a Heritage Resource Impact Assessment (HRIA) or Heritage Resource Site Monitoring to be completed.

HRIA will require an Archaeological Field Survey. Depending on the project this may take a field season to complete. HRIA's are valid for as long as outlined in the assessment.



Heritage Resource Protection Planning

Heritage Resource Sites that area identified during Maintenance and Construction Project Planning typically have Heritage Resource Protection Plans (HRPP) developed. These plans are based on direction provide by the Manitoba Historic Resources Branch and typically are buffers around the outer extents of each site with special mitigation direction, such as only hand clear or operate in the winter.

These sensitive sites are inputted into the central HRPP database, which all Manitoba Hydro projects can access via a <u>Heritage Resource Protection Plan Web Map</u>.



The developed plan data is also provided directly to the appropriate groups (e.g. to TLM who puts it into TGIS for field crews to access), who will provide appropriate access to the information.

FIELD - HERITAGE & CULTURAL DISCOVERIES (HCD)

Discoveries of Unanticipated Heritage & Cultural Features will sometime occur during normal field operation activities.

These heritage & cultural discoveries need be recorded, reported, and treated with respect during field operations.

The following describes what to look for and how to identify potential archaeological, historic and culturally significant sites:

- A change in vegetation, such as a grassy clearing of a patch of poplar and birch amid a spruce forest, is a clue that there might have been a camp at that location.
- Habitation sites are generally on well-drained, elevated ground, not too far away from a potable water source. Please remember that water courses change over time and ancient sites may be associated with former water courses and relic streams.
- Stream confluences and lake outlets/inlets are particularly interesting areas.
- High terraces, ridges and elevations were favored game lookouts and where traditionally preferred for burial sites.
- Winter sites, particularly related to trapping, are scattered and may not be associated with water or elevated ground and may be found inland.
- Limbed trees and axe-cut stumps are a sign that people were camping in an area.
- Ribbons on tree branches.
- Boulder formations and rock paintings.
 - 14

Heritage & Cultural Site Types

Site Type	Features		Page
Artifact	0 0	clay pottery lithics (stone flakes, projectile points, tools)	16
Burial	0 0 0	grave fence cross unmarked or ground disturbances, depression	20
Campsites	0 0 0	fire cracked rock calcined bone lithics (stone flakes, projectile points, tools)	18
Historic Material	0 0 0	tin cans glass bottles axe head	1918
Human Remains	0	bones	20
Modified Tree	0	birch tree – bark removed	21
Monuments	0 0	plaque cairn	27
Ribbon Tree	0	trees with ribbons	22
Stone Feature	0 0	rock pile chimney mound	26
Structure	0 0	tent frame log building	24
Subsistence		trap hunting blind snares nets	28
Travel	0 0 0	trails watercraft portages	29

Artifact (e.g. Stone Flakes, Projectile Points, Pottery, Tools)

<u>Operation Direction:</u> If encountered, stop work at that location, record and report *(see page 30)*.

Pre-European Contact artifacts are heritage resources that were used by Indigenous people prior to the arrival of European. Artifacts can include lithic (stone) flakes, tools (projectile points) and clay pottery sherds.





Campsite (e.g. Fire Cracked Rocks, Soil Discolourations)

<u>Operation Direction:</u> If encountered, be aware that there may be heritage resources associated.

Fire cracked rock is the result of camp fires.

Soil discolouration does occur naturally in the soil. It also occurs with human activity such as campfires. Mottling (spots or blotches of different colour or shade) of soils occurs with burials.



Historic Material (e.g. Tin Cans, Glass Bottles)

<u>Operation Direction:</u> If encountered, be aware that there may be cabin features in the area.

Tin can middens can often be found near cabin and tent frame structures. Do not disregard a tin can midden as modern. Canning in tin began in the 1820's.



Evaporated milk cans almost exclusively of this type by 1920



Hole-in-top – sealed with a drop of lead

Burial (e.g. Grave, Memorial Cross)

<u>Operation Direction:</u> If encountered, DO NOT DISTURB, stop work at that location, record and report *(see page 30)*.

A memorial site is erected in order to remind people of a person or event. You can find memorial crosses where a death occurred or gravestone marking a burial location.



Human Remains (e.g. Bones)

<u>Operation Direction:</u> If encountered, DO NOT DISTURB, stop work at that location, record and report *(see page 30)*.

Refer to page 33 of this Handbook.



Respect All Heritage Cultural Discoveries and Areas

DO NOT Talk or Contact the Media

DO NOT Post Photos on Social Media or the Internet

Modified Tree

<u>Operation Direction:</u> If encountered, be aware that there may be heritage resources or cultural sites within the area.

Humans modify trees for many different reasons, including removal of the inner and outer bark for bark for marking directional waypoints, basketry or making birch moose calls.



Ribbon Tree

<u>Operation Direction:</u> If encountered, stop work at that location, record and report *(see page 30)*.

Ribbons tied in trees are offerings placed by Indigenous communities that have historic ties to this landscape. If you happen to see or come across ribbon trees please keep in mind they are sacred.



Structure (e.g. Cabin, Tipi Ring, Tent Frame)

<u>Operation Direction</u>: If encountered, stop work at that location, record and report *(see page 30)*.

Cabins built by resource users are found throughout Manitoba. These are usually small buildings, constructed of logs.



More difficult to detect are former cabin locations. All the remains are basal logs and a slightly bermed rectangular outline where dirt was mounded up around the base of the cabin.







Vegetation growth is lusher inside the cabin due to the higher organic content.



25
Stone Features (e.g. Rock Piles, Chimney Mound)

<u>Operation Direction:</u> If encountered, DO NOT DISTURB, stop work at that location, record and report *(see page 30)*.

While some rock features may be natural occurrences, others may have been constructed by humans. Man-made features include way-markers, tent rings, petroforms, hearth features, caches, burials or remnants of stone chimneys.



Rock pile



Chimney mound

Monuments (e.g. Cairns, Commemorative Plaques)

<u>Operation Direction</u>: If encountered, DO NOT DISTURB, stop work at that location, record and report *(see page 30)*.

Monuments can be commemorative plaques, cairns, etc., that recognize a place, building or event for their heritage significance.



Subsistence (e.g. Traps, Snares, Hunting Blinds, Nets)

<u>Operation Direction:</u> If encountered, be aware that there may be heritage resources in the area. If encountered, at that location, record and report *(see page 30)*.



Travel (e.g. Trails, Watercraft, Portages)

<u>Operation Direction:</u> Be aware that there may be heritage resources in the area. If encountered, at that location, record and report *(see page 30)*.

In Manitoba, portages are as important as modern roads. These trails have been used for hundreds if not thousands of years. Many trails are still visible today. Be aware that there may be heritage resources in the area.



PROTOCOLS FOR HERITAGE CULTURAL FIELD

DISCOVERIES

This section details the procedures to follow when you come upon unanticipated field discoveries. This includes how to record and report the discovery.

Record Discovery

- 1. Stop Work at that location
- Do not disturb the artifact or feature. Leave the find in its original position and location



- 3. Cordon off the area
- Record the discovery though capturing GPS coordinates, photos, and date. This discovery can be recorded and submitted using;
 - a. Manitoba Hydro's "Heritage Cultural Discovery Survey" available for download through the App Survey 123. See Page 33 for more details.



b. Email or Text.

Note: *If you do not have a GPS*, create a detailed description of artifact location, and how to arrive at the spot. Try to use immovable landmarks for reference points (e.g. 10 paces south from large oak tree)

5. Prepare the site for photos; mark the location with pin flags or flagging tape if you have them. To prepare the artifact/ feature for photos, place an item to be used for scale next to the artifact (e.g. coin, pocketknife, glove).



- a. Take 3 photos, that capture the following:
 - The artifact/object
 - The area directly surrounding the artifact/object
 - An overview of the area



6. Report Discovery (see next page for reporting details)

Note: *If the artifact(s) is in Immediate risk* of being lost, disturbed, or destroyed, follow the above procedure then collect the artifact in a clean container (e.g. plastic bag, Tupperware, cardboard box, rinsed out coffee cup). Make sure to keep your notes and photos with the corresponding artifact.



Report Discovery

Report the finding to the Field Supervisor or delegate (i.e., Site Environmental Lead, Environmental Inspector(s) or another delegate) by sending in your finding using Survey123 or email.

The Field Supervisor (or delegate) will contact the HRMP Program Leads (page 37), who will contact the Project Archaeologist.



Human Remain Find (e.g. Bones)

If you discovery unidentifiable bones follow the procedures mentioned above (page 30) in Protocols For Heritage Cultural Field Discoveries.

If you are positive that you have found human remains, contact the Field Supervisor or delegate, who will contact the HRMP Program Leads (page 37), who will contact the Project Archaeologist, Historic Resources Branch, and RCMP.

Historic Resources Branch Sport, Culture and Heritage Main Floor, 213 Notre Dame Avenue Winnipeg MB R3B 1N3 In Winnipeg: (204) 945-2118 Toll free in MB: 1-800-282-8069 ext. 2118 24 hr. emergency cellular (204) 792-5370 Email: <u>hrb.archaeology@gov.mb.ca</u>

Respect All Heritage Cultural Discoveries and Areas

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HERITAGE CULTURAL DISCOVERY SURVEY – How To Guide

Manitoba Hydro's Heritage Cultural Discovery Survey is design to easily collect and submit you field discovery, using a free app called Survey123. The following presents an example of the Survey Data Input Form which is one of the available Data Entry Options outlined on page 30.

If you have any questions, contact the HRMP System Lead (see page 37)



Data Entry

Survey Option 1 - Tablet or Smart Phone (FIELD)

Note this is the preferred method

Pre-Field Steps - Wi-Fi or Cell Service Required

- 1. Download the Survey123 App.
- Login using your MH AGOL username. If you don't have one contact the System Lead (page 37)
- Download the Survey called Heritage Cultural Discovery





- 1. Open the Survey called Heritage Cultural Discovery
- 2. Stand over or near the discover
- 3. Select collect
- 4. Fill out the Survey and submit it.
 - Notes:
 - This Survey will require you to collect the location and some photos.
 - Location services need to be on.
 - If you don't have Cell Service or Wi-Fi Service see following Post Field Steps

Post Field Steps - - WI-FI or Cell Service Required

- 1. Open Survey123
- 2. Select Outbox and then Send -

Note:

- Your information has now been submitted.
 - 35

Survey Option 2 - HRMP SharePoint (OFFICE)

- 1. Go to the <u>HRMP SharePoint Site</u>
- 2. Click on the Heritage Culture Discovery Survey Icon. This will open the Survey
- 3. Fill out the Survey and submit it.
 - a. Note: Your information has now been submitted.



HRMP CONTACTS

Program Leads	
Mark Manzer -	Community Relations Advisor, 204-360-3258, mmanzer@hydro.mb.ca
Angela Heese -	Community Relations Advisor, 204-360-3623, aheese@hydro.mb.ca
System Lead	

Jennifer Lidgett - GIS Specialist, 204-360-5945, jlidgett@hydro.mb.ca

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Government of Manitoba. 1986. The Heritage Resources Act. C.C.S.M. c H391.1

Government of Manitoba. 1987. *Policy Concerning the Respecting, the Reporting, Exhumation and Reburial of Found Human Remains.*

Keeyask Hydropower Limited Partnership, 2014. *Keeyask Generation Project Construction Heritage Resources Protection Plan.* Winnipeg, Manitoba.

Manitoba Hydro. 2014. *Keeyask Transmission Project: Cultural and Heritage Resources Protection Plan.* Winnipeg, Manitoba.

Notes



Available in accessible formats upon request.