TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF MAPS

8.0 EFFECTS ASSESSMENT AND MITIGATION

8.1 INTRODUCTION

This chapter identifies and assesses the environmental effects of the Project and proposed mitigation to avoid or remedy potential adverse environmental effects, and includes the following sections:

- Biophysical Effects of the Project;
- Socio-economic Effects of the Project;
- Accidents and Malfunctions; and
- Effects of the Environment on the Project.

Environmental effects and mitigation are identified and assessed separately as regards construction and operation phases for each of the Project's components, using the assessment approach and sources of information described in Chapter 4 (Approach to Assessment), including information from the public and stakeholder consultation activities carried out in accordance with the Project Environmental Assessment Consultation Program (EACP) as described in Chapter 5.

Environmental effects are assessed for the proposed preferred sites and route for the Project components, subsequent to the evaluation of alternative routes and station sites as described in Chapter 7. Spatial avoidance of adverse environmental effects as a result of the site and route selection process is a powerful tool for dramatically reducing potential negative effects of the Project. While decisions regarding avoidance mitigation must be balanced against technical feasibility and associated cost, avoidance is also accomplished by scheduling construction activities to avoid sensitive/important time periods for some species (e.g., bird nesting, caribou calving).

As reviewed in Chapter 4, the environmental assessment of the Project's potential effects is structured by broad biophysical and socio-economic environmental components. Specific biophysical and socio-economic environmental components that could potentially be impacted by the Project are identified as Valued Environmental Components (VECs) to facilitate assessment of the interactions between the Project components and specific valued components of the environment. In addition to VECs, the assessment discusses relevant Potential Effects and Key Topics for each broader component. The assessment utilizes the Chapter 6 description of the existing environment (without the Project) for the biophysical and socio-economic components in the Project Study Area.

Predicted positive and negative residual environmental effects (i.e., effects on VECs after mitigation) are identified in the assessment and the regulatory significance of these residual effects is evaluated using the framework and approach described in Chapter 4, Section 4.2.10. As described in Chapter 4, potential effects of the Project on VECs are initially ranked as "Significant" (high residual effect), "Potentially Significant" (moderate residual effect) or "Not Significant or Insignificant or Negligible" (low residual effect) based on three criteria: duration, magnitude and geographic extent[1] of the effect. For effects initially ranked as "Potentially Significant" or "Significant", a final determination of regulatory significance is made after consideration of the other significance criteria described in Chapter 4 (i.e., frequency and reversibility of the effect, and the ecological/societal importance or resilience of the VEC).

Assessment of cumulative effects is described in a separate chapter (Chapter 9). Inclusion of cumulative effects is implicit in good environmental assessment and is touched on in various sections of Chapter 8, particularly when addressing Project effects that overlap with the effects of past and current projects and activities. The sensitivity of significance determinations in Chapter 8 for adverse environmental effects is tested where relevant in Chapter 9 for cumulative effects related to reasonably foreseeable future projects that may not have been fully considered in the Chapter 8 assessment.

This chapter also provides a summary of follow up and monitoring activities related to each major environmental component. All mitigation measures are consolidated and organized into a draft Environmental Protection Plan (EnvPP) which accompanies this Environmental Impact Assessment EIS (see Chapter 11). This EnvPP defines the specific impact management measures to be applied to the Project to minimize adverse residual effects. It has been prepared to address environmentally sensitive areas/sites potentially affected by development of the Project. Mitigation measures are taken from applicable legislation, standards, guidelines, best practices, experience, and other recognized sources. A final EnvPP will be revised and submitted to the regulatory authorities following the environmental assessment review and approval process and prior to project construction.

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[1] "Geographic extent" is assessed based on the definitions in Chapter 4 regarding Project Site/Footprint (i.e., right-of-way or sites for Project Components); Local Study Area (i.e., the 4.8 km (three-mile) wide band centred on the alternative routes for the Project HVdc transmission line (i.e., 1.5 miles on either side of the centreline of the right of way) and the area immediately surrounding the Project components, including the ac collector transmission line right-of-way, the converter stations and ground electrodes, and the electrode lines between the stations and the electrodes); and the Project Study Area (i.e., the wider regional area, including surrounding communities).

8.2 BIOPHYSICAL EFFECTS ASSESSMENT

Biophysical effects of the Project are identified and assessed below separately for each major biophysical component of the environment. In each instance, the following are examined:

- Overview;
- Potential effects and key topics;
- Valued Environmental Components;
- Environmental effects assessment and mitigation (by VEC, effects by Project component and phase);
- Summary of residual environmental effects and significances (includes summary table for each VEC with a residual effect from the Project that is not negligible); and
- Follow-up.

Biophysical effects are examined separately for linear project components (HVdc line and ac collector lines), the Keewatinoow Station and Area (and related construction camp, borrow pits, and other elements), the Riel Station and Area, and the Ground Electrodes and Lines.

8.2.1 Terrain and Soils

8.2.1.1 Overview

The following section presents an assessment of the terrain and soil environment, a description of valued environmental components of the terrain and soil environment, and a detailed assessment of anticipated effects to those VECs and measures to mitigate these effects.

As described in Chapter 6 (Existing Environment Chapter) and detailed in the Bipole III Terrain and Soils Technical Report, the terrain and soil environment includes surficial geology, physiography, landforms and soils. A diverse terrain and soil environment is found across the Project Study Area. It traverses the three main bedrock geologies – the sedimentary Hudson Bay Basin (HBB) in the northeast portion, the Precambrian Shield bedrock in the central portion and the Western Canada Sedimentary Basin (WCSB) in the southwest portion. The Precambrian Shield is composed of igneous and metamorphic bedrock. The WCSB consists of carbonate and shale; whereas, the HBB consists mainly of carbonates.

8.2.1.2 Potential Effects and Key Topics

There are a number of key topics that influence how the Project may affect the soil and terrain environment. These primarily consist of the following:

- Loss of soil structure and increase in soil bulk density due to compaction;
- Loss of topsoil due to erosion by wind or water;
- Loss of permafrost due to degradation;
- Loss or impairment of landscape integrity of unique features;
- Loss of terrain material due to mass wasting;
- Soil mixing;
- Soil temperature increases;
- Herbicide residue; and
- Surficial and bedrock removal.

These general effects are discussed further below, with an examination of their aggregate and Project-specific effects to VECs described in Section 8.2.1.4.

Compaction

Soil compaction refers to the squeezing together of soil particles which results in reduced space available for air and water and a loss of soil structure. The movement of vehicles and equipment, the temporary and long-term storage of materials, and the placement of structures can result in soil compaction and rutting. Imperfectly to poorly drained mineral and organic soils (i.e., moist drainage regime) that are medium to fine textured, such as loams and clays, are most susceptible to compaction and rutting. Indirect effects of soil compaction can include increased run-off, decreased vegetative growth and potentially reduced crop yields (MAFRI 2008).

The effects of soil compaction can be mitigated by targeting dry or frozen ground conditions for construction activities, using temporary ground cover or matting in problem areas, reducing the extent of traffic movements, and rehabilitating areas that have been compacted by ploughing.

Erosion

Erosion is a natural process and refers to the detachment, movement and removal of soil from the land by wind or water. Project activities that disturb and expose soil surfaces or concentrate water drainage, such as moving equipment, clearing and removing vegetation, stripping and stockpiling soils can accelerate naturally occurring erosional processes. Sand-textured soils are most susceptible to wind erosion, particularly during early spring and proceeding fall tillage in agricultural lands, whereas clay or loam textured soils are more susceptible to water erosion, particularly during spring snowmelt and during May and June (MAFRI 2008). Indirect effects of soil erosion include the deposition of eroded materials in surface water bodies and low areas, such as ditches, and may also affect soil productivity and crop yields due to loss of organic material, nutrients and degradation of physical soil properties.

Effects of water erosion can be mitigated by targeting frozen soils and reducing soil-water contact, particularly on slopes; whereas, effects of wind erosion can be mitigated by targeting moist soils and reducing periods of bare soil exposure.

Permafrost Degradation

Permafrost degradation refers to decreases in the lateral/areal or vertical extent of permafrost soils. Activities that compact or remove the seasonally-thawed active soil layer (i.e., the soil that insulates the underlying permafrost) such as moving vehicles and equipment and clearing or removing vegetation can result in a loss of permafrost. Other activities, such as concentrating natural drainage, can also contribute to a loss of permafrost. Permafrost degradation can affect terrain features and result in reduced terrain stability. This may occur in the form of visually-identifiable, distinct landforms, including retrogressive thaw slumps (bowl or horseshoe-shaped), active layer detachments (material accumulates at the toe) and thermokarst terrain (depressions that may collect water) (Kotler 2003). Areas of continuous, discontinuous and isolated patches of permafrost are susceptible to degradation. Indirect effects of permafrost degradation and loss include adverse effects to infrastructure engineering, alteration to drainage patterns and increases in greenhouse gas releases to the atmosphere.

Strategies for reducing the degradation of permafrost include avoidance, construction under frozen conditions and minimizing compaction or removal of the insulating active layer cover.

Landscape Integrity

Landscape integrity refers to the intactness of a feature's natural state and can be measured by "representation" or the proportion of natural features, such as unique terrain and soil features, within a natural region that are formally protected or available for formal protection. The physical presence of infrastructure components such as transmission lines alters the natural state of these features resulting in a loss or impairment of landscape integrity and reduction of areas available for representation. Single and rare-occurrence Protected Areas Initiative (PAI) enduring features and other unique terrain and soil features, such as beach ridges and salt flats, are considered to be unique terrain and soil features and vulnerable to impairment or loss of landscape integrity. Single-occurrence enduring features are defined as a particular type of enduring feature occurring in only one distinct area that may be large or small, within a natural region, whereas, rare-occurrence enduring features are considered to be a particular type of enduring feature occurring as two or four distinct areas concentrated in one or two localized geographic area(s) within a natural region (Manitoba Conservation 2006). Potential indirect adverse effects as a result of impairment or loss of landscape integrity include loss of biodiversity and impairment of aesthetic experiences which contribute to human physical and mental well-being (Manitoba Conservation N.D.).

Generally, effects to landscape integrity can be mitigated through routing avoidance of unique terrain and soil features, where possible, and minimization of affected areas where avoidance is not possible.

Mass Wasting

Mass wasting, or the downhill movement of soil under the influence of gravity, particularly on steep or unstable slopes, is a natural process that results in the loss of terrain material. Human activities, such as the creation of steep slopes, can initiate or accelerate mass wasting events. Very steep slopes and unstable soils are susceptible to mass wasting, particularly along waterbodies and other areas of sloped land. Mass wasting does not commonly occur in agricultural areas, with the exception of steep pasturelands (Brady and Weil 2008). Water is an important factor in slope instability, as water can add weight to the soil and affect its strength properties (Nelson 2010). Mass wasting may result in large increases of sediment to surface waters, loss of associated vegetation and potential increased risk of personnel injury.

The avoidance of construction on and creation of very steep slopes, as well as the avoidance of concentrating water in sloped areas can generally reduce the risk of mass wasting.

Soil Mixing

Soil mixing, or admixing, refers to the blending of organic, nutrient-rich surface soils with subsoil materials that are less suitable, due to salinity content, stoniness or texture, resulting in a loss of soil capability (National Energy Board 1995). The movement of vehicles and equipment, stripping and grading of work areas and excavation and trenching of foundations and lines can result in admixing. Soils with thin topsoil horizons or Solozenetic (saline) subsoils are susceptible to a loss of capability due to admixing. Indirect effects of admixing can potentially include decreased plant growth.

Mitigation measures such as constructing during dry or frozen ground conditions, stripping and stockpiling topsoil and subsoil separately for use in site rehabilitation, using liners under stockpiles of excavated saline subsoils and filling excavations with suitable material may prevent or reduce adverse effects due to soil admixing.

Soil Temperature Increases

Soil temperature is influenced by soil cover and may be increased when soil cover, such as tree canopy cover, low vegetation and forest litter, is removed. Increases to the mean soil temperature can result in changes to moisture conditions causing dry or droughty soils where soil moisture is currently a limitation, loss of permafrost and potentially positive effects of increased productivity as a result of earlier spring thaw and an extended growing season.

Soil temperature increases can be mitigated by reducing the extent of clearing required by utilizing existing access routes and siting temporary work areas in natural openings, retaining ground cover and allowing for natural vegetation establishment, where appropriate.

Herbicide Residues

Herbicides are an issue for a number of other environmental components, including vegetation. Herbicide residue refers to herbicides which persist into periods beyond the application season due to slowed decay. The rate of breakdown for herbicides that are not bound to soil is influenced primarily by soil type, application rate, chemical and microbial degradation, photodecomposition, volatility and climatic factors (Horowitz *et al.* 1974). The climatic variables involved in herbicide degradation are moisture, temperature and sunlight (Hager and Nordby 2007). Under optimum climatic conditions, herbicides can have a soil residual life (persistence) of one month to more than 12 months, depending on the herbicide applied (Hager and Nordby 2007). Herbicide residuals may result in reduced soil productivity, which may have an indirect adverse effect of reduced vegetative growth (Government of Saskatchewan 2007); however, this is not expected if industry standards and best practices are used. Relevant criteria within the Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME 1999) would form the threshold level for a given herbicide residual concentration.

Since 1985, Manitoba Hydro has significantly reduced the use of soil residual herbicide products for management of vegetation (operation phase) along transmission line rights-of-way. Use of herbicide products is currently more selective than it has been in the past, resulting in minimal soil residue lingering into the next growing season. Manitoba Hydro does not use aircraft to apply herbicides to rights-of-way and large-scale herbicide use on northern transmission lines was discontinued in 1990, in favour of practicing the winter shearing method instead. Manitoba Hydro completes annual reporting of the product and quantity of herbicides, as well as the locations of application to Manitoba Conservation in accordance with Pesticide Use Permits issued pursuant to the provisions of *The (Manitoba) Environment Act*.

Surficial and Bedrock Material Removal

The removal of mineral, organic and surficial (unconsolidated), and bedrock (consolidated) aggregate materials for the backfill of excavations and construction of tower foundations will result in a loss of material at those sites. These materials may be removed by stripping, excavating or using explosives (blasting) at existing and new off-site borrow areas. Indirect effects include surface reconfiguration, including potential creation or destabilization of steep or unstable slopes, increased water erosion risk and risk of fish mortality and mammal disruption due to the use of explosives.

A potential residual effect to surficial and bedrock materials is anticipated as a result of a loss of these materials required to infill foundations and other excavations. Activities to be undertaken to reduce the effect of the removal of surficial and bedrock materials include utilizing existing sources, where possible; conducting work in accordance with the Department of Fisheries and Oceans Guidelines for the Use of Explosives In or Near Canadian Fisheries (Wright and Hopky 1998); and preparing and implementing rehabilitation plans for new borrow sites to be abandoned.

Through Project mitigation, the residual effect to surficial and bedrock materials is not anticipated to effect any of the valued environmental components of the soil and terrain environment.

Residual effects to surficial and bedrock materials are anticipated to be adverse, of low ecological and societal importance, small magnitude, affecting the local assessment area on an infrequent basis over the long-term with irreversible effects that are within regulatory requirements and objectives regarding the use of minerals.

8.2.1.3 Valued Environmental Components

For the purposes of focusing the environmental effects assessment, the following VECs of the soil and terrain environment have been identified: soil productivity; and terrain stability. VECs were chosen based on field studies, desktop review, literature review, stakeholder input and professional judgement.

The following is a description of these VECs.

Soil productivity is valued by resource harvesters and society in general as it is necessary to support natural and human-made ecosystems, including wildlife, traditionally-valued plants and agriculture. Productive soil includes quality mineral and organic topsoil in non-agro Manitoba indicated by parameters such as horizon thickness and carbon content and agriculturally capable soils (Class 1 – 3) in agri-Manitoba. The maintenance of soil productivity formed the objective of mitigation measures proposed to reduce the adversity of anticipated effects.

Terrain stability, for the purposes of this assessment, refers to terrain which is unaffected or unmoved by non-natural, or artificial, instability resulting from Project-related activity. Terrain stability has ecological and socioeconomic value, as a function of its role in supporting existing ecosystems and human infrastructure (Duan and Naterer 2009). The concept of terrain stability as a VEC aided in the identification of areas of potential destabilized terrain as environmentally sensitive sites requiring specific mitigation measures, including at stream crossing locations. Features of the terrain environment which are susceptible to human-induced instability include sloped terrain and permafrost terrain.

8.2.1.4 Environmental Effects Assessment and Mitigation

The following is an assessment of the potential environmental effects of the Project on the selected VECs of the terrain and soils environment. Mitigation measures are described that reduce or prevent environmental effects. Soil productivity is valued by resource harvesters and society in general as it is necessary to support natural and human-made ecosystems, including wildlife, traditionally-valued plants and agriculture. The maintenance of terrain stability has ecological and socioeconomic value, as a function of its role in supporting existing ecosystems and human infrastructure.

The following is an assessment of the potential environmental effects that may be experienced by the VECs of the soil and terrain environment and mitigation measures to minimize or preclude potential effects to VECs. Potential environmental effects of the Project were identified using a combination of methods, including an environmental interaction matrix, feature mapping, professional opinion and review of Aboriginal Traditional Knowledge (ATK), key perspectives and comments from the Environmental Assessment Consultation Process and literature (Bipole III Terrain and Soils Technical Report).

Within the Local Study Area, site-specific mitigation measures are identified based on environmentally sensitive sites/areas (ESSs) of the soil and terrain environment. ESS sites are mapped in the Bipole III Environmental Protection Plan that accompanies the EIS.

The assessment covers the construction (including site cleanup/remediation) and operation/maintenance of the following Project components:

- HVdc Transmission and ac Collector Lines;
- Keewatinoow Converter Station;
- Riel Converter Station; and
- Ground Electrodes and Lines.

HVdc Transmission and ac Collector Lines

Soil Productivity

Construction

Soil productivity, in the form of agricultural capability of soils in rural Manitoba, would likely be affected primarily due to the use of heavy equipment and vehicles, disturbance of surface materials during grading, excavation of foundations, and removal of vegetation. These activities are anticipated to result in compaction, accelerated wind and water erosion, admixing of soil horizons and destabilization of soils in sloped terrain. The resultant losses of soil structure, losses of topsoil and subsoil material, impairment of soil quality and increase in soil temperature are anticipated to have an aggregate effect on agricultural capability.

Soil productivity of organic soils in northern Manitoba may be affected due to the combined effects of lost soil structure from heavy equipment and vehicle traffic; lost surficial material due to accelerated wind and water erosion caused by surface disturbance from clearing and grading and increased mean soil temperature from clearing.

The following mitigation measures are recommended to reduce the potential for a reduction in the agricultural capability of soils during construction of the HVdc transmission line in agri-Manitoba. The measures have been targeted to areas of higher risk and/or environmentally sensitive sites to the extent possible.

- Construction activities in southern Manitoba will be undertaken , where possible, under dry conditions in high compaction risk areas (Bipole III Terrain and Soils Technical Report) and moist conditions in high to severe wind erosion risk areas, where possible;
- Snow will be ploughed or compacted to facilitate deeper frost penetration;

- Access routes will be located along existing traffic routes where possible and will be determined in advance. Vehicles should be restricted to those routes;
- Low ground-pressure vehicles (i.e., wide tracked machinery) will be used, particularly in areas of high compaction risk, where possible;
- Topsoil will be stripped and stockpiled separately from subsoil, based on visual assessment of colour change, prior to excavation or establishment of temporary workspaces;
- In areas of known salinity, excavated soils will be stored on liners or at designated work/spoil areas, where possible;
- Runoff will be directed away from disturbed areas to prevent further site degradation where necessary;
- In agricultural land, at least 300 mm of topsoil will be spread on any excavation site;
- Vegetation establishment in areas not identified as requiring special treatment will occur naturally or through annual cropping; and
- Where required, the right-of-way should be graded, disced or deep-ploughed to alleviate compaction and remove ruts caused by rubber-tired and tracked vehicles after construction to restore soil productivity.

Potential residual effects of loss of soil structure from compaction and rutting of heavy equipment in Organic soil on soil productivity is considered primarily negative. This medium-term residual effect would be moderate in magnitude, confined to the Project Site/Footprint, occur on an infrequent basis, and is reversible during the life of the Project. No significant residual effects to soil productivity are anticipated as a result of the Project.

Operation

Soil productivity could be affected by respective reductions in agricultural capability and soil productivity in agricultural and northern Manitoba during inspection and maintenance and right-of way vegetation management activities for the HVdc transmission and ac collector lines. These reductions would be caused by the aggregate effect of lost mineral or organic soil structure due to compaction from vehicles and heavy equipment used during inspection, maintenance and vegetation management activities and increased herbicide residuals in herbicide treatment areas.

Adverse effects to agricultural capability and soil productivity may be mitigated by the following:

- Inspection and maintenance activities will be conducted during frozen and dry ground conditions, where feasible; and
- Herbicides will be applied according to standard Manitoba Hydro practices, outlined in Chapter 3(Project Description).

Residual effects to soil productivity are not anticipated during the operation of the HVdc transmission and ac collector lines.

Terrain Stability

Terrain stability may be affected by grading, moving equipment, clearing, using explosives (where required) and altering natural drainage patterns. The removal and compaction of insulating surface vegetation and soils overlying permafrost-affected soils may increase the potential for permafrost thaw and subsidence. In addition, the creation of steep slopes, use of explosives and alteration of natural drainage patterns may initiate or accelerate mass wasting of steep or unstable slopes, particularly near waterbody crossings. These activities are anticipated to result in a loss of terrain material or permafrost area. Effects to terrain stability would be visually identifiable in the field.

Investigations determined that there are four existing sites along the transmission line route that have unstable or steep slopes within the Local Study Area (Chapter 6). These sites have been identified as ESS where tower placement and equipment access will be carefully selected to avoid de-stabilizing the slopes.

The following mitigation measures are recommended to prevent the destabilization of terrain during transmission and collector line construction:

- The removal of natural vegetation on sloped terrain, particularly adjacent to waterways, will be avoided to the greatest extent possible;
- Stripping through organic vegetative layers will be avoided to the extent possible on permafrost-affected soils. The top layer of organic soil and ground vegetation will be retained to prevent or minimize disturbance, where practical and feasible;
- Snow will be graded and compacted in right-of-way work areas and along access routes, where possible or required for safety, to prevent thaw and increase frost penetration;
- Where vegetation is removed from sloped terrain, the area will be replanted with deep-rooted shrubs, such as willow, where feasible to prevent slope degradation;

- Slope undercutting and slope modification at angles greater than 30° will be avoided, to prevent sliding or slumping and any slopes over-steepened beyond 30° will be graded to reduce the slope;
- Diversion berms of compacted native soils or logs will be used on moderate and steep slopes (i.e., greater than 15-20%) to divert water away from the slope after construction. Berms will be spaced 45 m or less apart and skewed with a downstream gradient of 5-10% and end in natural vegetation;
- Borrow pits will not be located within 100 m of identified steep slopes and/or unstable slopes, to prevent initiation or acceleration of instability due to blasting;
- The introduction of water to slopes will be limited to the greatest extent possible; and
- Drainage will not be altered to concentrate flows, especially in sloped terrain.

Potential for loss of terrain stability due to mass wasting and permafrost thaw following disturbance are considered residual effects. The residual effects are considered primarily negative. These long-term residual effects would be moderate in magnitude, confined to the Project Site/Footprint, occur on an infrequent basis, and are irreversible. No significant residual effects to terrain stability are anticipated as a result of the Project.

Terrain stability is not anticipated to be affected by the operation of the HVdc transmission and ac collector lines.

Keewatinoow Converter Station and Area

Soil Productivity

Soil productivity within the Keewatinoow Converter Station Site footprint would be affected by an impairment of soil quality due to compaction and admixing during site preparation activities, such as clearing, grading and compacting imported materials. The following mitigation measures should be conducted to prevent a loss of productive soils at the Keewatinoow Converter Station site:

- Topsoil or surface organic soil will be stripped and stockpiled prior to site grading for use in reclamation of temporary work spaces, where possible; and
- After construction the site will be remediated by measures such as, replacement of topsoil and recontouring.

No residual effects to soil productivity are anticipated during the construction or operation phase of Keewatinoow Converter Station.

Terrain Stability

Terrain stability at the Keewatinoow Converter Station Site footprint is not anticipated to be affected by construction of the Keewatinoow Converter Station site as potentially unstable permafrost materials will be excavated from the Project Footprint and replaced with suitable fill, as described in Chapter 3 (Project Description). The following mitigation measures may prevent the destabilization of terrain within immediately adjacent areas during construction:

- The burning of slash from clearing on adjacent permafrost soils will be avoided to prevent melting; and
- Site drainage will be directed through existing drainage channels or pathways to prevent degradation of additional permafrost materials.

Residual effects to terrain stability are not anticipated by the construction or operation phase of Keewatinoow Converter Station.

Borrow Areas

Borrow areas and excavated material placement areas have been identified in the vicinity of Keewatinoow Converter Station for use at northern project components. Quarry leases have been applied for within the deposit areas where the terrain and soil conditions for these areas are generally understood. Additional existing and new borrow sites will be identified for other project components (i.e., HVdc Transmission Line and Access Roads); however, these locations are presently unknown.

Material from borrow sites will be excavated, and excavated material placement areas will be utilized for temporary storage, during Project construction and will generally be decommissioned prior to Project operation. Excavated material placement areas may also be utilized for medium-term storage of excavated materials; therefore, extending into the Project operation phase. Upland, mineral soil sites will generally be accessed for borrow materials.

Depending on the planned future use for the site, aggregate borrow sites should be closed, or reclaimed, in accordance with the Mine Closure Regulation, M.R. 67/99 and Manitoba Mine Closure Regulation 67-99 General Closure Plan Guidelines (Manitoba Industry, Trades and Mines 2006).

Soil Productivity

Soil productivity is anticipated to be affected by the combined effects of topsoil removal and subsurface soil excavation and removal and increased water erosion potential. Soil-landscape alteration (i.e., surface elevation and depth to water table) as a result of soil excavation will further affect soil productivity. The following activities may minimize the effect of borrow areas and excavated material placement areas on soil productivity:

- Borrow areas and excavated material placement areas will be sited in upland areas with well-drained, mineral soils, where possible;
- Topsoil (i.e., mineral or organic) will be stripped and temporarily stockpiled prior to borrow material excavation and placement of excavated materials;
- Borrow materials will not be excavated below the upper surface of the water table;
- Runoff will be directed away from disturbed areas (e.g., quarry walls, access routes) with control measures prior to excavation;
- Borrow sites will be contoured following excavation to ensure functional site drainage;
- Topsoil will be replaced following completion of construction activities; and
- Borrow pits will be re-vegetated by seeding or promotion of natural encroachment of native species.

The potential residual effects of borrow pit excavation to soil productivity are considered primarily negative in direction. These long-term residual effects would be small in magnitude, confined to the Project Site/Footprint, occur on an infrequent basis, and are irreversible. No significant residual effects to soil productivity are anticipated as a result of the Project.

Terrain Stability

Terrain stability is anticipated to be affected as a result of the creation or destabilization of steep or unstable slopes within existing and new borrow sites. The use of explosives, if used, within borrow sites may also contribute to the destabilization of slopes. In addition, surface disturbance and removal of vegetation for the creation of new borrow sites in permafrost-affected soils is anticipated to result in permafrost degradation at the site. The following activities may minimize the effect of utilizing existing and new borrow sites on terrain stability:

- Existing permitted borrow sources will be utilized, to the extent possible, especially in regions of permafrost-affected soils;
- Borrow pits will not be located within 100 m of steep slopes, where possible;
- Access trail grades should not exceed 12%; and
- Excavations will be backfilled or re-sloped to a stable profile in accordance with site reclamation plans.

Potential residual effects to terrain stability are considered negative. These long-term residual effects would be small in magnitude, confined to the Project Site/Footprint, occur on an infrequent basis and are irreversible. No significant residual effects to terrain stability are anticipated as a result of the Project.

Riel Converter Station

Due to the current developed nature of the site (see Chapter 3) and lack of unique or potentially unstable features, soil and terrain effects at the Riel Converter Station site for all phases are primarily related to the effects of accidents and malfunctions and the future land use of the site following decommissioning.

Soil Productivity

Soil productivity in the form of agricultural capability is not anticipated to be affected by construction or operation of the Riel Converter Station, as the site is not currently under agricultural production.

Terrain Stability

Terrain stability and unique terrain and soil features are not anticipated to be affected by the construction or operation of the Riel Converter Station site due to the absence of susceptible terrain features, including slopes and permafrost and unique features.

Ground Electrodes and Lines

Soil Productivity

Soil productivity is anticipated to be affected by the combined effects of lost soil structure, lost topsoil, lost soil capability and increased mean soil temperature resulting from compaction by heavy equipment, accelerated erosion events and increased soil temperature on surfaces disturbed and exposed during clearing and admixing of soils during electrode ring excavation and trenching activities, although this will be short-term in nature. The following activities may minimize the effect of construction of the ground electrodes and associated lines on soil productivity:

- Ground electrodes will be constructed during winter, to target frozen or dry ground conditions, where possible;
- Ploughed or compacted snow will be placed over the sites to facilitate deeper frost penetration (northern electrode site only);

- Topsoil will be stripped and stockpiled at site prior to excavation for ground electrode installation for replacement following completion of construction activities;
- Existing access routes will be used, where possible, and any new access routes, if required will be planned in advance of mobilization; and
- The southern ground electrode site will be graded, disced or deep-ploughed following construction to alleviate compaction and remove ruts caused by rubber-tired and tracked vehicles after construction to restore agricultural productivity or grassland.

Potential residual effects of loss of soil structure from compaction and rutting of heavy equipment in Organic soil (northern electrode site).to soil productivity are considered primarily negative. These medium-term residual effects would be moderate in magnitude, confined to the Project Site/Footprint, occur on an infrequent basis, and are reversible during the life of the Project. No significant residual effects to soil productivity are anticipated as a result of the Project.

Terrain Stability

Terrain stability is anticipated to be affected by the loss or melting of discontinuous permafrost at the northern ground electrode site as a result of compaction and disturbance of insulating organic layers and thaw from the burning disposal of clearing debris. The burning of slash from clearing on adjacent permafrost soils will be avoided to prevent melting in order to minimize the effect of construction of the northern ground electrode and electrode line on terrain stability.

Potential residual effects of loss of terrain stability due to permafrost thaw following disturbance (northern electrode site) to terrain stability are considered primarily negative. These long-term residual effects would be medium in magnitude, confined to the Project site or footprint, occur on an infrequent basis, and are irreversible. No significant residual effects to terrain stability are anticipated as a result of the Project.

Operation of the ground electrode and associated lines is not anticipated to result in any effects to valued components of the soil and terrain environment.

8.2.1.5 Summary of Residual Environmental Effects and Significance

A characterization and summary of individual residual effects to the soil and terrain environment is presented in Table 8.2-1. The following is an identification of anticipated residual effects to the VECs of the soil and terrain environment, followed by a determination of the significance of these residual effects.

Soil Productivity

Residual effects to soil productivity will be primarily related to some loss of soil structure due to compaction and rutting along portions of transmission and electrode lines rights-of-way in northern Manitoba and increased soil temperatures in areas of cleared vegetation. Despite the use of best management practices and environmental protection planning, unmitigated compaction will occur at Project sites and along Project rights-of-way in northern Manitoba. Previously forested segments of Project rights-of-way will experience an increase in annual mean soil temperature over baseline conditions, resulting from soil surface exposure and subsequent change in vegetative cover. Increased soil temperatures would lead to positive effects of earlier spring thaw and adverse effects of contributing to droughty or dry soils where soil moisture is currently a limitation.

There is a potential for some impairment of soil quality to occur within any area of the Project Footprint in the event of a major spill event; however, the likelihood of such an event is considered low.

No significant adverse effects to soil productivity are anticipated as a result of the Project.

Terrain Stability

Residual effects to terrain stability will be primarily related to some potential for loss of terrain stability due to mass wasting and permafrost thaw. Mass wasting and permafrost subsidence could occur in areas somewhat important to ecological function (e.g. riparian areas).

No significant adverse effects to terrain stability are anticipated as a result of the Project.

Table 8.2-1: Residual Environmental Effects Assessment Summary - Terrain and Soils

VEC	Project Component	Phase	Residual Effects	Assessment[1]
Soil Productivity	HVdc Transmission and ac Collector Lines	Construction	Loss of soil structure from compaction and rutting of heavy equipment in Organic soil	Direction – Negative Magnitude – Moderate Geographic Extent– Project Site/Footprint Duration – Medium Overall – Not Significant
	Keewatinoow Station and Area	Construction	Borrow pit excavation	Direction - Negative Magnitude - Small Geographic Extent – Project Site/Footprint Duration – Long-Term Overall – Not Significant
	Ground Electrodes and Lines	Construction	Loss of soil structure from compaction and rutting of heavy equipment in Organic soil (northern electrode site)	Direction – Negative Magnitude – Moderate Geographic Extent– Project Site/Footprint Duration – Medium Overall – Not Significant
Terrain Stability	HVdc Transmission and ac Collector Lines	Construction	Potential for loss of terrain stability due to mass wasting and permafrost thaw following disturbance	Direction – Negative Magnitude – Moderate Geographic Extent– Project Site/Footprint Duration – Long-Term Overall – Not Significant
	Keewatinoow Station and Area	Construction	Borrow pit slope stability	Direction - Negative Magnitude - Small Geographic Extent – Project Site/Footprint Duration – Long-Term Overall – Not Significant
	Ground Electrodes and Lines	Construction	Potential for loss of terrain stability due to permafrost thaw following disturbance (northern electrode site)	Direction – Negative Magnitude – Moderate Geographic Extent– Project Site/Footprint Duration – Long-Term Overall – Not Significant

Note:

1. Expected residual effects (i.e., effects after mitigation) of the Project on each VEC are assessed using the regulatory significance evaluation approach and methods defined in Chapter 4, Section 4.2.10. Where feasible, regulatory significance is assessed for each non-negligible expected residual effect based on its expected direction, magnitude, geographic extent and duration (as each term is defined in Section 4.2.10); if an adverse residual effect is evaluated to be potentially significant, other factors are also considered (frequency, reversibility, ecological importance and societal importance). Scientific uncertainty is noted where it may materially affect the assessment.

8.2.1.6 Follow-up

In addition to environmental protection planning measures to be implemented, follow-up and monitoring activities will be undertaken to assess the success of proposed mitigation measures and verifying the effects related to compaction mitigation on agricultural lands and potential accidental releases to the soil environment. Additional monitoring may be required for on site-specific measures during construction, such as erosion and sediment control, as described below.

Post-construction Follow-up

Post-construction follow-up or reclamation plans are a typical extension of mitigation and environmental protection measures for terrain and soil environs in other linear infrastructure developments (Conoco Phillips and TCPL 2008A, Enbridge Pipelines Inc. 2011; Stantec Consulting Ltd. 2010; Universal Ensco Inc. 2006).

The primary focus of post-construction follow-up is loss of agricultural capability or productivity. Approximately 42.5% or 1810 hectar (ha) of the HVdc footprint in agri-Manitoba has an Agricultural Capability rating of Class 1 to Class 3 with no limitations to moderate limitations to agricultural crop production, while approximately 38.5% or 1637 ha has an Agricultural Capability rating of Class 4 to Class 5 with moderately severe to severe limitations. However most of this area will not be affected by construction or maintenance as there will be limited use of the right-of way to construct and inspect towers on existing agricultural land. The access and tower construction area on the right-of-way is subject to effects that are reversible given satisfactory mitigation and reclamation; and is a valued environmental component. The following post-construction follow-up plan should be undertaken to confirm that mitigation measures to alleviate compaction are effective and ensure a loss of agricultural productivity is not experienced as a result of the Project.

Monitoring of crops or vegetation condition is the key indicator of land productivity (Enbridge Pipelines Inc. 2011; CH2M Hill 2008). Semi-annual monitoring of crops using aerial or ground patrols should be undertaken for two years following construction on agricultural lands, to assess any compaction or other soil issues, as is typically done on pipeline projects (CH2M Hill 2008). Project footprints found to have signs of soil-related effects (often displayed in vegetation growth/colour, etc.) can be identified for follow-up. If mechanical post-construction measures are not sufficient in relieving compaction, alternative measures including the plowing under of organic matter, such as wood chips or a green manure crop planting (e.g., alfalfa) should be considered to improve lost soil structure (Conoco Phillips and TCPL 2008).

Inspection

During construction of right-of-ways, the work areas, marshalling yard sites, trafficking paths and access trails, if any, will be inspected by the Manitoba Hydro inspector for staining and/or stressed vegetation that may have been caused by equipment leaks or accidental spills and debris, prior to decommissioning. Any instances of staining or stressed vegetation will be documented by the inspector. Soil samples of suspect areas may be required to confirm and delineate any contamination. Any contaminated soil should be remediated on-site or removed to an approved landfill or other soil treatment facility. Similar inspections will be conducted at infrastructure component sites.

Monitoring

The condition of any erosion and sediment control environmental protection measures implement should be monitored by the Contractor and/or Manitoba Hydro Inspector during construction of the Project. Any deficiencies in the condition of the control measures should be addressed as soon as possible, to prevent loss of soil material or potential deposition in waterways. Erosion and sediment control measures should remain in place until vegetation has re-established.

8.2.2 Air Quality and Climate

8.2.2.1 Overview

Air quality is an important environmental component that requires protection and monitoring to maintain the current high level of quality enjoyed in Manitoba. Concerns in Manitoba usually tend to be of a localized nature, where an activity has a potential impact on nearby people and their environment. Large construction activities need to be reviewed for the contribution to local air quality and its protection.

Climate is not static and changes due to volcanic eruptions, solar energy output and atmospheric additions of carbon dioxide and equivalent greenhouse gases. Emissions resulting from human activities are substantially increasing the atmospheric concentrations of several important Greenhouse Gases (GHGs), especially carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). These gases are increasing the greenhouse effect, resulting in a projected overall average warming of the earth's surface. The effect of climate and climate change on the Project is reviewed in Section 8.5.

8.2.2.2 Potential Effects and Key Topics

This section covers the effect of the Project on climate and potential climate change as well as the effects of climate and climate change on other bio-physical components that will be affected by the Project.

Climate-related issues include the potential for increased Greenhouse Gas emissions from vehicles during construction, operation and maintenance, and accidental release of electrical insulating gases during converter station operation and maintenance.

Potential impact on air quality from waste incineration at the construction camp and converter station operation is also considered.

The Project contribution to GHG emissions was analyzed using a life cycle assessment approach that includes all GHC implications from the manufacture and transportation of construction materials to land-use changes and fuel burning in equipment.

8.2.2.3 Valued Environmental Components

The VECs for this environmental assessment are:

- Climate; and
- Air quality.

8.2.2.4 Environmental Effects Assessment and Mitigation

The nature of climate and atmosphere is very broadly based and regional in scope. As such the assessment of these environmental components was done for the project as a single regional entity. The potential effects on air quality are generally very localized, temporary and occur mostly in rural areas. The review of air quality is applicable anywhere in the vicinity of the project footprint and is not assessed by project component.

Climate

Greenhouse Gases

The primary climate change implications of the Project are those associated with its greenhouse gas emissions. Manitoba Hydro contracted the Pembina Institute to prepare a quantitative GHG life cycle assessment (LCA) of the Bipole III Transmission Project (Bipole III Greenhouse Gas Lifecycle Assessment Technical Report). GHG implications of the Project were determined through an analysis of the materials and energy use associated with the proposed route and capital equipment. The analysis covers all phases and sources of GHG for the projected life of the project.

The project is estimated to generate 923,273 tonnes CO_{2eq} where the construction of the transmission line accounts for 760,989 CO_{2eq} tonnes and the converter stations 162,284 tonnes CO_{2eq}. Figure 8.2-1 summarizes the results of the analysis by life cycle stage.

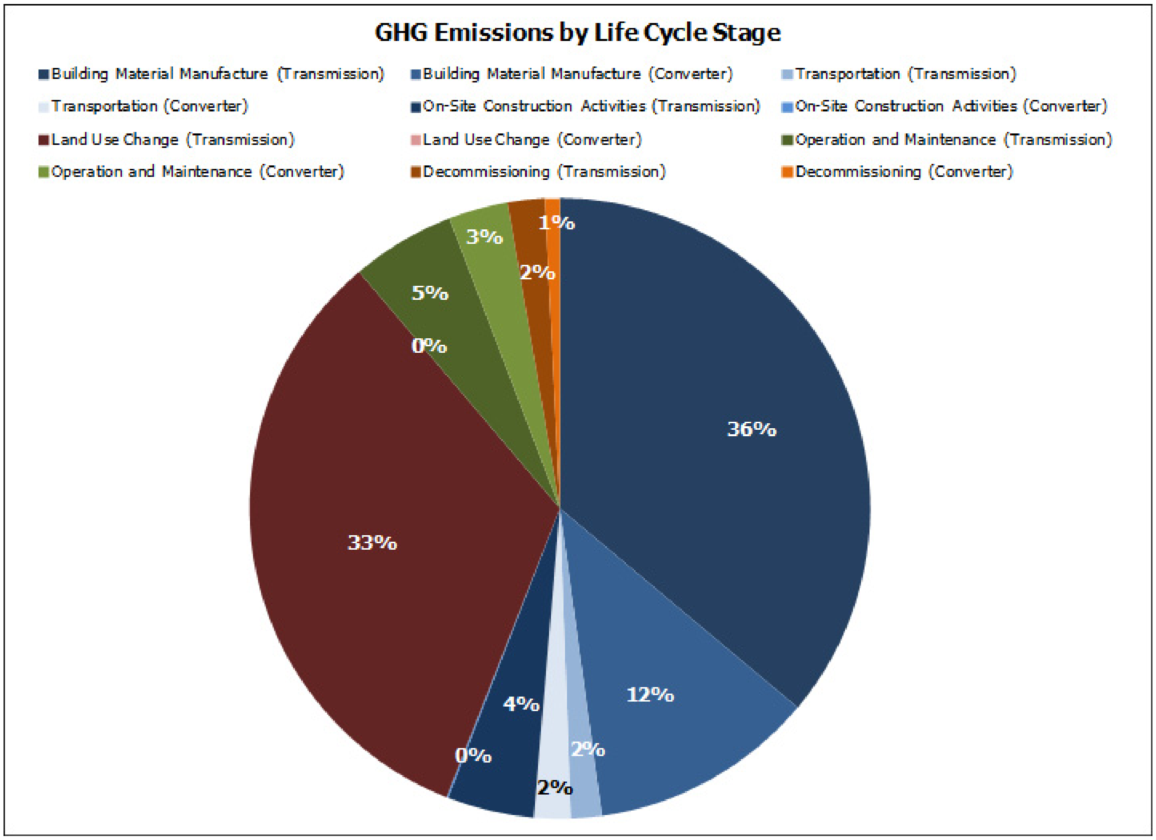

Figure 8.2-1: Summary of GHG Emissions by Life-Cycle Stage

Eighty-two percent of the GHG implications are attributed to the transmission line portion of the project. Fifty-six percent of all emissions are associated with aluminum production activities and land use changes from right-of way clearing. The Project will disturb 9,017 ha of land of which 3,270 ha of land will be permanently altered to maintain the right-of-way. The land-use contribution is estimated based on the difference in carbon content between forested land and the resulting vegetation cover on a cleared right-of-way, as well as the impact of any biomass combustion at the time of clearing.

The LCA for the Bipole project presents figures for the entire duration of the Project. The 923,273 tonnes of CO_2 equivalent is quite small when compared to provincial GHG emissions of approximately 7 million tonnes just from the transportation sector in Manitoba in a single year (Environment Canada 2008).

Other potential sources of GHG include sulphur hexafluoride (SF_6), which is used as insulating medium in high voltage switch gear, circuit breakers, and other electrical equipment. SF_6 insulating gas will be used in circuit breakers and other high voltage electrical apparatus at the Keewatinoow and Riel converter stations. To reduce the potential effects on the environment from an accidental release, the SF_6 is contained within hermetically-sealed containers. Manitoba Hydro will manage equipment operation and the decommissioning of old equipment using proper handling and recycling procedures so that there is minimal opportunity for gas to be released into the.

GHG implication of transmission project activities are expected to be dispersed among the various sources of materials, refining, manufacturing, transportation, and along the transmission line rights-of-way. The long-term effect relates to the spatial removal of areas required for project development leading to a reduction in biomass. Mitigation measures to limit effects to carbon stocks include the following:

- Where feasible, cleared merchantable timber will be salvaged and reused;
- Care will be taken to maintain all existing above and below ground drainage patterns through proper culvert/bridge placements;
- Post-construction rehabilitation will include previously cleared sites, where rehabilitation is feasible, and will include the spreading of salvaged organic soils on the surface to encourage site re-vegetation;
- Where possible, overburden materials will be stockpiled and compacted to reduce carbon losses and capped where feasible to maintain sequestered carbon stocks within the soil; and
- Where construction occurs over permafrost the level of disturbance will be minimized and efforts made to retain natural thermal insulation, including the promotion of natural thermal cover re-establishment.

The residual effect on climate is that there will be some GHG emissions over the life cycle of the Project. The emissions are considered to be small in magnitude, of short duration during manufacture and construction, of medium duration during operation, regional in extent (Project Study Area), continuous in frequency, reversible, and not significant.

Climate Change

A major concern relating to climate change is its potential to affect components of the bio-physical environment such as terrestrial habitat and species distribution. Climate change predictions were assembled from literature and then reviewed by environmental team experts for potential effects on the various plant and animal groups being assessed for the Project.

The Manitoba task force on Climate Change published the following predictions (Manitoba 2001):

- Precipitation is expected to increase, be less predictable and concentrated in severe weather events;
- Spring will likely arrive earlier and be warmer, wetter, resulting in higher risk of flooding; and
- Summer will be hotter, resulting in higher rates of evaporation, with precipitation declining by 10% – 20%.

Anticipated changes will impact Manitoba in a variety of ways:

- Longer growing season;
- Water and drought management will be important; and
- More frost-free days.

Earlier, wetter springs, warmer, drier summers and shorter, milder winters are projected for Manitoba. Although increases in rainfall are projected in some areas, these may be offset by higher temperatures, which would result in increased evaporation and transpiration from plants (Natural Resources Canada 2007). A summary of climate change predictions for use in the Bipole III Project are listed in Table 8.2-2.

Table 8.2-2: Climate Change Predictions for Manitoba

Parameter	Trend/Prediction
Precipitation	Increased precipitation in the wet season (winter) months
Water	Winter Higher temperature Higher precipitation levels in wet season months Summer Higher evapotranspiration rates Increasing challenges in terms of water availability Increased chances for drought in the dry season (summer) months Increased frequency of forest fires
Temperature	Increased temperature, particularly in the winter
Wind	Increased fluctuations in wind speeds Increased wind speeds

Climate change will occur to the existing environment without the Project. Some of the potential effects might include shifts in species distributions due to habitat changes, increased incidence and extent of forest fires, change in predator-prey relationships, increase in the spread of wildlife diseases and parasites, and spread of invasive and non-native species.

Climate change impacts on habitat and species disruption and other components of the existing environment are likely to occur in a medium to longer term period well beyond when the Project has its largest impacts on the environment, i.e., well beyond the Project's construction phase and initial years of operation. Accordingly, climate change was generally concluded not to affect the assessment of the Project's effects on the bio-physical or socio-economic environment.

Air Quality

Construction

Potential effects on air quality can result from clearing, construction and operation and maintenance activities. There will be a temporary increase in vehicular and equipment traffic during clearing and construction activities associated with the Project. As a result, there will potentially be higher vehicle (i.e., engine exhaust and hydrocarbon vapours) and dust emissions affecting local air quality. The concentration of vehicles and equipment will be localized to specific sites for limited amounts of time. As the air quality in Manitoba is very good in general and the Bipole III activities are mostly away from urban areas, there is limited effect on air quality for workers or any surrounding public. To mitigate the emissions from internal combustion engines used for construction, low-sulphur diesel fuels should be used and unnecessary idling restricted. This will also contribute to reduction of GHG produced during the construction of the project. Proper maintenance of construction vehicles and equipment to emission standards will also help to mitigate potential effects.

Winter clearing and construction activities will minimize any potential dust impacts resulting from these activities. Clearing activities along the rights-of-way will involve the cutting, piling and burning of slash, resulting in emissions that will potentially affect local air quality. Burning will only be carried out under suitable weather conditions, to confine fire to the cleared material on the right-of-way. Burning will be supervised at all times to limit off-site drift of smoke into areas that could cause nuisance or visibility issues for transportation or surrounding activities.

With proper mitigation, potential effects on local air quality will not likely be an issue for worker or public health. The residual effects related to operating construction equipment, burning of unsalvaged timber and slash will be negative, small in magnitude, short-term in duration, in the Local Study Area, infrequent, reversible, and not significant.

Operation

Ongoing operation and maintenance activities are unlikely to affect local air quality, as inspection and maintenance patrols of the right-of-way, structures and hardware (to ensure the safe and reliable operation of transmission lines) are typically undertaken two or three times per year by fixed-wing aircraft or helicopters. Ground patrols are typically conducted once per year. Non-scheduled patrols or maintenance may also be conducted by ground or air should unexpected repairs to the lines be required. Potential effects are not expected to be a concern as the effects will be short-term in duration and localized.

Hazardous materials could potentially be released into the air as result of an accidental spill of solvents, fuels, etc. during construction or operation and maintenance activities for project components. Manitoba Hydro will store fuel, lubricants, and other potentially hazardous materials within dedicated storage areas at work camps, marshalling yards, and station sites. Dedicated areas would provide appropriate spill containment measures and spill response equipment, and would be located away from any sensitive features. Any products transferred from storage sites to work areas would not exceed the daily requirement. Manitoba Hydro also requires its contractors to have an emergency response plan in place that is consistent with Manitoba Hydro's spill response procedure.

Manitoba Hydro has standard protocols in place, which would minimize potential effects on air quality if a contingency event such as fire occurred. The Keewatinoow and Riel converter station sites will be designed and operated in accordance with Manitoba Hydro's Fire Manual. Deluge water for fire suppression will be provided at both sites, with reservoir fill either from groundwater sources or from a connection to a municipal system (i.e., the City of Winnipeg in the case of Riel Converter Station). Potential operational effects on air quality are negative, small in magnitude, extending to the Local Study Area of medium-term duration, reversible, and not significant.

8.2.2.5 Summary of Residual Environmental Effects and Significance

A characterization and summary of residual effects on Climate and Air Quality VECs is presented in Table 8.2-3.

Table 8.2-3: Residual Environmental Effects Summary - Air Quality and Climate

VEC	Project Component	Phase	Residual Effects	Assessment[1]
Climate	HVdc Transmission primarily; plus other Components	Construction & Operation	GHG Emissions (building materials manufacture, land use change & other factors)	Direction – Negative Magnitude – Small Geographic Extent – Project Study Area Duration – Short to Medium-Term Overall – Not Significant
Air Quality	HVdc Transmission primarily; plus other Components	Construction	Local emissions from construction activities.	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Short-Term Overall – Not Significant
		Operation	Local emissions from operation & maintenance activities.	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term Overall – Not Significant

Note:

1. Expected residual effects (i.e., effects after mitigation) of the Project on each VEC are assessed using the regulatory significance evaluation approach and methods defined in Chapter 4, Section 4.2.10. Where feasible, regulatory significance is assessed for each non-negligible expected residual effect based on its expected direction, magnitude, geographic extent and duration (as each term is defined in Section 4.2.10); if an adverse residual effect is evaluated to be potentially significant, other factors are also considered (frequency, reversibility, ecological importance and societal importance). Scientific uncertainty is noted where it may materially affect the assessment.

8.2.2.6 Follow-up

Follow-up is not required in relation to GHG emissions other than to record project inputs and volumes to improve the accuracy of the GHG contribution. Manitoba Hydro engineers will monitor the performance of the transmission line structures in response to severe climate events. Data form investigations can then be used to modify and improve future designs to deal with climate change predictions.

Air quality monitoring will not be required due to the very localized area and short-term nature of any residual effects from construction activities. The only follow-up will be to ensure that mitigation is properly implemented and that any complaints or unforeseen effects are responded to a timely manner.

8.2.3 Groundwater

8.2.3.1 Overview

The following section consists of a description of key topic potential groundwater effects, an identification of valued components of the groundwater environment, an assessment of potential effects of development of the Project on this environment and an identification of proposed mitigation measures to address these potential effects. The groundwater environment includes the groundwater regime (i.e., aquifer characteristics and recharge) and quality.

The assessment focuses on the major hydrogeological features located in the vicinity of the proposed route of the transmission line due to regional extent of the Project, but considers the local groundwater environments near the proposed converter stations and electrode sites.

The proposed Bipole III transmission line preferred linear route will be constructed over the bedrock of the Precambrian Shield and two large sedimentary basins (specifically the WCSB and the HBB). Due to the length of proposed route, various different groundwater conditions are encountered.

8.2.3.2 Potential Effects and Key Topics

The potential effects of the Project to groundwater can be divided into the following three key topic areas:

- Groundwater quality;
- Aquifer productivity; and
- Unintended discharges.

Each category includes effects under normal construction and operation and contingency events.

8.2.3.3 Valued Environmental Components

VECs were chosen based on field studies, desktop review, literature review, stakeholder input and professional judgement.

Aquifer sustainability is important to provide a safe water supply for multiple uses, including: human consumption, agricultural production, recreational uses, and surface water recharge. The maintenance of productivity and quality of groundwater is important to the sustainability of aquifers. Therefore, aquifer productivity and aquifer quality have been identified as VECs.

Aquifer quality can be measured through many physical and chemical parameters of groundwater, such as turbidity, pH, redox conditions, and concentrations of major ions, trace elements, and organic contaminants. Measurable parameters of aquifer productivity include, but are not limited to, groundwater levels, hydraulic conductivity, aquifer extents (size, thickness) and aquifer yield.

8.2.3.4 Environmental Effects Assessment and Mitigation

The following is an assessment of potential environmental effects to the identified VECs of the groundwater environment and mitigation measures to minimize or preclude anticipated effects, where identified.

The Project will require the construction of wastewater treatment lagoons, for the Construction Camp and the Keewatinoow Converter Station. However this will be subject to separate licensing under *The (Manitoba) Environment Act* and not assessed in this EIS.

HVdc Transmission and ac Collector Lines

Aquifer Quality

Construction

In general, groundwater quality is not expected to be affected under normal conditions of construction and operation of the proposed Bipole III transmission line and associated infrastructure; however there is the potential for environmental effects to groundwater quality through entry of contaminants into groundwater, such as herbicides, and ground electrode coke leachate described further below. Foundation drilling for tower installation also creates the potential for ground and surface water interconnection.

The main potential issue with transmission line construction in regards to groundwater is related to drilling for tower foundations, especially in sensitive areas such as artesian areas. Normal pile foundation construction procedures, described in Chapter 3 (Project Description), may intercept an aquifer but are not expected to negatively affect groundwater resources in terms of either flow or quality. In areas with artesian (free flowing) wells or springs (see Map 6-7 in Chapter 6), however, the potential exists for disturbance from construction activities, including geotechnical drilling or foundation installations, to result in a direct groundwater discharge to the surface or interconnections of aquifers if auger holes are not sealed properly or quickly enough. In the event of an unintended groundwater discharge to the surface, there is a potential for a local drop in the aquifer level and/or an effect on the surficial environment (soils and/or surface water), especially in areas where there may be saline artesian aquifers (Map 6-7) Interconnections of artesian saline aquifers with potable aquifers may result in degradation of groundwater quality.

The effect on the surficial environment from an unintended discharge is dependent on a number of factors including, among other things, the salinity of the discharging groundwater, the quantity of groundwater discharged, and the proximity of receiving streams or sensitive vegetation/habitats. The areas with known saline artesian wells or springs are considered to have a higher risk of such an event and are mapped as ESS sites in the Bipole III draft EnvPP.

The following activities will be conducted to minimize or preclude unintended groundwater discharge during drilling and foundation installations in areas of documented springs and artesian groundwater conditions:

- A qualified driller with appropriate experience will always be used for work in areas underlain by artesian aquifers;
- Water levels will be monitored during drilling and foundation installation;
- Emergency response plans will be in place for sealing/grouting and pumping in artesian areas; and
- Follow up inspections of installed foundations will be undertaken to monitor for excess moisture.

Implementation of appropriate mitigation should preclude any residual effects on groundwater from tower foundation drilling.

Operation

Aquifer quality along the HVdc transmission and ac collector lines could potentially be affected by an impairment of groundwater quality due to application of herbicides for vegetation management along rights-of-way during operation.

Manitoba Hydro will apply herbicides along the transmission line and at electrode and station sites for vegetation management. Under normal application conditions, most of these chemicals should degrade within the vadose zone (i.e., unsaturated zone above the water table). In the event of a spill or improper application, the potential exists for entry into the aquifer resulting in an indirect effect (groundwater contamination) and exceedences of the stipulated herbicide regulatory guidelines (e.g., CCME 1999).

Aquifer vulnerability mapping was compared to the project components of Bipole III for potential interaction and effects. Vulnerable un-confined aquifers in proximity to project components were deemed environmentally sensitive sites where particular attention is paid to mitigation and protection of the resource. The ESSs for groundwater are contained in the EnvPP that accompanies the Bipole III EIS.

There is a regulatory process that Manitoba Hydro must go through to carry out vegetation management programs involving herbicides. This ensures proper use and application. Manitoba Hydro must apply each year to Manitoba Conservation for "Pesticide Use Permits" issued under *The (Manitoba) Environment Act* before any herbicide program is implemented. The Province of Manitoba decides which herbicide products can be used in Manitoba and under what conditions they may be used. The Province also sets guidelines for the rates at which products may be used, how and when they may be applied; and where they may not be used, such as environmentally sensitive sites. In areas where herbicides are prohibited, alternate vegetation control measures are implemented (e.g., mechanical methods).

Direct supervisors of herbicide applicators working on Manitoba Hydro rights-of-way must be trained and licensed by the Province before applying herbicides. Manitoba Hydro must also provide a "Post Seasonal Report" to Manitoba Conservation, providing specific information on the work that was done including the herbicide products used, respective quantities, specific application locations, applicator(s) name and other information as required by the Province. These regulatory requirements that Manitoba Hydro adheres to are in place to ensure only approved herbicides are used safely and properly.

Mitigation measures that will be employed to minimize or preclude any potential for impairment of groundwater quality along rights-of-way will include the following:

- No herbicides are used in clearing new rights-of-way. (Manitoba Hydro *et al*. 2003);
- If herbicides are required to control vegetation growth, all applicable permits and provincial regulations will be followed;
- On private lands, prior to any vegetation management work, landowners or appropriate authorities will be contacted to obtain the necessary permission; and
- Based on the above mitigation measures there are no anticipated residual effects.

Aquifer Productivity

Aquifer productivity is not anticipated to be affected by normal operation of the HVdc transmission and ac collector lines, due to the absence of effect pathways or interactions.

Keewatinoow Converter Station and Area

Aquifer Quality

Construction

Potential effects on groundwater quality consist mainly of excavation of borrow materials and accidental spills and leaks from construction equipment and installation of station equipment.

Construction materials for the proposed Project development will generally be sourced locally. Excavation of the borrow materials, such as sand and gravel will be generally limited to the area of the proposed Bipole III construction camp and the Keewatinoow Converter Station. The excavation of borrow materials would unlikely result in the exposure of perched water table within the granular deposits, which are approximately 30 below the ground surface. However, construction activity within the in borrow pits involves frequent machinery use and increases risk of accidental hydrocarbon spills discussed in Accidents and Malfunctions.

There are no anticipated residual effects of the construction on groundwater quality.

Operation

Aquifer quality at the Construction Camp may potentially be affected by an impairment of groundwater quality from the operation of the required septic lagoon. However the assessment of the construction and operation of a wastewater lagoon for the Keewatinoow station and workcamps will be the subject of a separate licence application to Manitoba Conservation.

It is expected that with proper design and normal operation in accordance with licence requirements, the rates of leachate migration to groundwater should be negligible providing protection of the aquifer from pathogens or contaminants (specifically nitrogen and bacteria). The carbonate aquifer, which will be used for water supply, is additionally protected by 60-80 m of the overburden mostly consisting of silty and clayey till layers, characterized by low permeability.

Aquifer quality at the Keewatinoow Converter Station site and area could also be potentially affected by an impairment of groundwater quality due to application of herbicides for vegetation management along rights-of-way during operation. Based on the mitigation measures that will be employed to minimize or preclude any potential for impairment of groundwater quality, there are no anticipated residual effects.

Aquifer Productivity

Construction

Groundwater withdrawal will be required to provide water resources for both the proposed Bipole III construction camp and the Keewatinoow Converter Station. Interpretation of previous groundwater investigations in the vicinity of the construction camp and Keewatinoow Converter station conducted by Betcher (1995) indicate that the confined bedrock aquifer in the area could serve as the main source of groundwater supply for the construction camp and Keewatinoow Converter station. The bedrock aquifer has a high permeability, is hydraulically connected to the Nelson River, and is overlain by a thick (between 60 and 80 m) low permeability confining till layer.

Engineering designs for the groundwater withdrawal, as described in Chapter 3 (Project Description) are underway. Unless properly sited and designed groundwater use has the potential to deplete the local aquifer and/or draw surface water from the connected Nelson River into the aquifer. A residual effect on aquifer productivity is anticipated as discussed in Section 8.2.3.5.

The following assumptions have been made in assessing Project effects:

- Groundwater will be withdrawn from the bedrock aquifer underlying both proposed sites;
- Approximately 230 L/person/day will be required based on the average daily domestic water use in Canada (Environment Canada 2011); and
- In addition to daily workforce consumption requirements, estimates for groundwater withdrawal also include fire protection provisions.

Groundwater drawdown curves were determined in the vicinity of the construction camp and Keewatinoow Converter Station by KGS Group (2008) to evaluate the potential for water demand two orders of magnitude larger than that anticipated for the camp workforce. Bipole III construction force will consist of a start-up camp and a main camp having capacities of 350 and 550 persons, respectively. At a pumping rate of 28.5 L/s (2,500,000 L/day), groundwater drawdown was estimated to range from less than 9 m in the immediate vicinity of the supply well to less than 2 m at a distance of 150 m from the well. The influence of the drawdown cone may be measureable as far as 3 km from the supply well; however, there are no other known users within this radius. The largest drawdown will occur during the construction phase, while water demand and associated drawdown will decrease during the operation phase following decommissioning of the construction camp. The time to recovery, which was also estimated by KGS Group (2008), indicated that the piezometric head drop in the area would recover to original levels within several days of pumping cessation.

Productivity of the bedrock aquifer at the Construction Camp will be influenced by groundwater drawdown from the use of groundwater to supply potable water to workers. The drawdown could be measured by the groundwater level in monitoring wells. Aquifer productivity (specific yield) will be affected with the 2 km radius of drawdown cone. Within this radius, there are no expected issues of reduced groundwater discharge to local creeks (springs) from drawdown as water levels in the aquifer are approximately 50-60 m below ground surface and surficial drainage is separated from the bedrock aquifer by thick overburden. No aquifer users other than the Construction Camp are known to occur within zone of well influence. Therefore, temporary reduction of the aquifer productivity should not have any effect on the existing aquatic environment in the surrounding area.

There are no mitigation activities required for the drawdown of groundwater at the camp due to reversibility of the effect and absence of impact to the surficial environment or other aquifer users. The residual effect of aquifer drawdown is characterized as negative in direction, medium term in duration, small in magnitude, confined to the Project Site/Footprint, will occur on a regular/continuous basis, and is reversible during the life of the Project. The effects are therefore considered to be not significant.

Operation

Aquifer productivity at the Keewatinoow Converter Station may be affected by groundwater drawdown from the use of groundwater to supply water to the station. The drawdown will be minimal during on-going operation of the station with 40 people on site. There are no mitigation activities for the drawdown of groundwater at the northern converter station during operation.

The residual effect of aquifer drawdown is characterized as negative in direction. These medium-term residual effects would be small in magnitude, confined to the Project Site/

Footprint, will occur on a regular/continuous basis, will be reversible during the life of the Project and therefore are considered not significant.

Riel Converter Station

Aquifer Quality and Aquifer Productivity

Aquifer quality and aquifer productivity are not anticipated to be affected by construction or operation of the Riel Converter Station, due to the absence of effect pathways/interactions. Water supply and wastewater disposal systems will be connected to the City of Winnipeg systems precluding effect pathways/interactions.

Ground Electrodes and Lines

Aquifer Quality

Construction

Aquifer quality is not anticipated to be affected by normal construction of the ground electrodes and lines, due to the shallow, horizontal ring electrode design.

Operation

The potential for aquifer quality to be impaired at the ground electrode sites exists due to leachate from the continually-saturated buried coke beds at the electrode sites and along line rights-of-way due to application of herbicides for vegetation management.

The ground electrode for the converter stations is buried underground in a bed of carbon rich coke to improve earth contact and conductivity. Ground electrode locations also require occasional moisture addition to facilitate adequate soil moisture conditions. The ground electrode site will be equipped with underground irrigation systems fed from wells located on site to facilitate maintenance of adequate moisture conditions during dry conditions. The requirement for the coke beds to be kept saturated may cause any naturally occurring components in this material to leach which could directly affect groundwater quality. Leachate from coke commonly contains metals such as aluminum, manganese, nickel and vanadium (Puttaswamy *et al.* 2010). Within in-situ experiments, metal concentrations were often found to not be significantly elevated; however, this was likely due to the metals being taken up by organic and inorganic constituents (peat, naphthenic acids and other dissolved organic carbon species) (Squires 2005; Baker *et al.* 2007; Baker *et al.* 2008). Minute to no levels of polycyclic aromatic hydrocarbons were found in coke leachate (Squires 2005).

The aquifer at the preferred southern electrode site is protected by 10 to 20 m of clay that underlies the site and acts as a barrier, and the site is characterized by an upward hydraulic gradient which provides further protection against the potential entry of contaminants into the aquifer. The subsurface conditions at the northern electrode site are not well understood, but available information can be summarized as follows:

- The potable bedrock aquifer is covered by approximately 60 to 80 m of overburden, primarily till deposits characterized by low permeability;
- Surficial soils at the site are characterized as a mix of medium-textured fluvial mineral deposits and organic deposits overlying medium-textured till materials;
- It would be expected that drainage through the fluvial materials found in the eastern portion of the site would be faster than the relatively low-permeability materials in the western portion of the site; and
- The nature of the subsurface material stratigraphy generally corresponds to the surface topography, which is located at the approach to the banks of the Nelson River to the east and the stratigraphy at the preferred northern electrode site suggests a pathway to the surface waters of the Nelson River may exist.

The till overburden provides good protection to the underlying bedrock aquifer from the downward migration of leachate at the preferred northern electrode site. There is, however, potential that leachate will migrate downwards from the surface at this site, reach the low permeability till layer, migrate laterally to the east and seep out on the Nelson river bank, potentially reaching an aquatic receptor. A dilution effect will occur in this situation, reducing the potential effect to the aquatic environment However the actual dilution in the subsurface environment will depend on irrigation rates and local groundwater flow under the site, which are currently not well understood.

The following activities will be conducted to prevent impairment of groundwater quality at the sites due to use of coke material for ground electrode construction:

- The coke material will be tested (e.g., leachate analysis) prior to use for potential contaminants and the need for monitoring based on the results; and
- Ground electrode irrigation will only be conducted during dry soil conditions and in amounts not exceeding what is required to maintain saturated soil conditions to prevent leaching.

Herbicide use and mitigation will be the same as described for the HVdc Transmission line maintenance. Based on the above mitigation measures there are no anticipated residual effects.

Aquifer Productivity

Construction

Aquifer productivity is not anticipated to be affected by normal construction of the ground electrodes and lines.

Operation

Underground irrigation systems will be installed at the ground electrode sites to allow for soil wetting during periods of dry soil conditions, with irrigation water being sourced from groundwater at the sites. The location of ground electrode sites have been selected such that soil moisture conditions are favourable for electrode operation, and, when required, irrigation will only be used to wet the immediate area around the electrode. The groundwater withdrawal requirements for electrode irrigation are anticipated to be minimal; therefore disturbance to aquifer productivity is not anticipated and there are no anticipated residual environmental effects.

The existing infrastructure at the Riel Station site currently relies on surface water resources provided by Deacon Reservoir and it is understood that this will not change with the proposed addition of the converter station infrastructure at this location. Accordingly, an assessment of the effect of the operation of the proposed Riel Converter Station on groundwater was determined to not be required.

8.2.3.5 Summary of Residual Environmental Effects and Significance

A characterization of the significance of anticipated residual effects to the groundwater environment, based on proposed mitigation measures, is presented in Table 8.2-4 and discussed below.

Construction and Operation

Aquifer Quality

While not highly likely, an unintended groundwater discharge to the surface could result in a residual effect which would be negative in direction and could impact both the surface and subsurface environments. The surficial discharge may have high ecological and social importance depending on the quality of the discharging groundwater and the effect may range from low to high in magnitude. The geographic extent would likely be localized and the impact is considered to be short-term and sporadic. Reversibility of the impact would be dependent on the quality and quantity of the discharging groundwater. Saline groundwater discharges could also directly or indirectly affect other local environments (e.g., terrestrial/soils) and these effects could potentially outlast those to the groundwater or surface water environments. After mitigation measures and remediation activities, the residual effects are is anticipated to be not significant.

Aquifer Productivity

Following the implementation of the mitigation measures proposed, the apparent residual effects to aquifer productivity are solely related to groundwater withdrawal at the northern construction camp and the Keewatinoow Converter Station. As previously indicated, withdrawal will create a depression cone around each of the proposed supply wells. Due to the larger demand, the greater cone of depression will occur during the operation of the supply well for the construction camp (in comparison with the northern Converter Station). This residual effect is not considered to be significant.

Table 8.2-4: Residual Environmental Effects Summary - Groundwater

VEC	Project Component	Phase	Residual Effects	Assessment[1]
Aquifer Productivity	Keewatinoow Converter Station	Construction	Ground-water withdrawal	Direction – Negative Magnitude – Small Geographic Extent – Project Site/ Footprint Duration – Medium-Term Overall – Not Significant
		Operation		Direction – Negative Magnitude – Small Geographic Extent – Project Site/ Footprint Duration – Medium-Term Overall – Not Significant

Note:

1. Expected residual effects (i.e., effects after mitigation) of the Project on each VEC are assessed using the regulatory significance evaluation approach and methods defined in Chapter 4, Section 4.2.10. Where feasible, regulatory significance is assessed for each non-negligible expected residual effect based on its expected direction, magnitude, geographic extent and duration (as each term is defined in Section 4.2.10); if an adverse residual effect is evaluated to be potentially significant, other factors are also considered (frequency, reversibility, ecological importance and societal importance). Scientific uncertainty is noted where it may materially affect the assessment.

8.2.3.6 Follow-up

During regular or periodic inspection of the towers and foundations, reporting of visual changes in soil moisture, swamping and spring appearance in areas of artesian aquifers will be conducted. Assuming normal construction and operation of the towers, no other follow-up or monitoring of the existing groundwater regime appears warranted.

Groundwater level and water quality monitoring will accompany groundwater withdrawal for the construction camp and the Converter Station. KGS (2008) recommended long-term raw water quality monitoring to address possible changes to aquifer water quality over longer time periods and possible surface water intrusion from the Nelson River to the aquifer during long term (e.g., multi-year) pumping in the water treatment process stream; particularly during high river staging (e.g., winter ice staging) events. At a minimum, the monitoring program will include the continuous recording of water levels and the regular testing of groundwater quality. The groundwater will be analyzed for routine water chemistry potability parameters.

Follow-up monitoring will be triggered by any contingency events or may be set at the beginning of the Project.

In the case of groundwater discharge to the surface, pumping and grouting procedures will be triggered pursuant to the emergency response plans that will be developed by the Contractor for Project construction and operation. As previously indicated, the nature of this risk means that measures will be primarily reactionary but will follow the protocols that have been planned in advance. The effects from this event will then be assessed by relevant experts to develop and implement an appropriate remediation and follow-up monitoring strategy.

8.2.4 Aquatic Environment

8.2.4.1 Overview

The aquatic environment includes both the non-living (water, rocks, soil) and living (plants, invertebrates, fish) components of rivers, creeks, lakes and ponds. A detailed description of the aquatic environment within the overall Project Study Area and specific to project components is available in Chapter 6 and the Bipole III Aquatics Technical Report.

The Bipole III Project encompasses a large area, extending from the lower Nelson River near Gillam southwest towards The Pas and then south of Lake Manitoba to Winnipeg.

Considering the extent of the Project, there is considerable variation in the aquatic environment within the Project Study Area and among specific Project components.

Surface water quality throughout the Project Area is influenced by overall drainage patterns, bedrock and surficial geology, soils, topography, climate, precipitation, and land use practices. Given the expanse of the Project Study Area, a large range of natural and impacted surface water conditions are experienced throughout the region.

There are at least 82 species of fish found within the Project Study Area. The Project Study Area covers a large expanse, with variations in the fish community from northern to southern Manitoba. This variation has been described in Chapter 6. Department of Fisheries and Oceans (DFO) Operation Statements will be used where applicable to mitigate any potential effects on fish and fish habitat.

8.2.4.2 Potential Effects and Key Topics

Environmental effects to the aquatic environment were identified based on a review of Project components (Chapter 3) and the results of the biological assessment of the aquatic environment at the Project component locations (Chapter 6). Overlap of Project activities with the aquatic component of the environment was the focus of review. Potential effects identified from the literature and study results are assessed, followed by mitigation measures and then an assessment of residual effects.

Potential effects of all Project-related activities on the aquatic environment can generally be divided into several areas:

- Loss of riparian vegetation;
- Erosion and sediment entering water courses;
- Direct loss or alteration of fish habitat;
- Coke leachate from installation of ground electrodes;
- Contamination from structures and foundations; and
- Blockage in fish passage, and/or alterations in flows.

Riparian Loss

Riparian vegetation plays an important role in the maintenance of water quality and fish habitat in water courses. It aids in bank stability and erosion protection, and contributes nutrients to streams and lakes through litter and terrestrial insect drop. The removal of riparian vegetation can result in the reduction of nutrient inputs into aquatic food webs as well as increased erosion and sedimentation of water courses. In many streams, terrestrial insects contribute a significant portion of fish diet and leaf litter and other organic matter are consumed by aquatic invertebrates, another important food source for many fish species, including salmonids (Allan *et al*. 2003).

Riparian losses can result in increased water temperatures due to loss of shading by canopy species. Furthermore, increases in plant growth can also occur due to increased light exposure. The loss of low, overhanging vegetation represents a loss of cover for fish.

Fisheries and Oceans Canada has developed operational statements for both Overhead Line Construction and Maintenance of Riparian Vegetation within Existing Rights-of-Way (DFO 2007a and 2007e). Mitigation outlined in these two documents will serve to avoid any potential effects of riparian vegetation clearing on fish habitat.

Erosion and Sedimentation

Vegetation removal and improper construction practices near watercourses can result in increased erosion leading to sedimentation of streams. Clearing streamside vegetation for transmission line crossings may result in decreased bank stability and exposure of bare soils that are prone to erosion. Machinery and equipment working in or near watercourses can cause rutting and erosion of floodplains, streambeds and channel banks. Increased levels of suspended sediment and deposited sediment can have multiple negative effects the aquatic environment, including impacts to the primary producers, invertebrates, and fish.

Decreased light penetration due to higher turbidity (suspended sediment) can result in decreased photosynthesis by primary producers. Since primary producers form the base of the food chain, reductions in productivity can impact higher trophic levels, such as invertebrates and fish. Furthermore, large influxes of sediment can bury aquatic invertebrates, an important food item for many fish species, resulting in reductions in invertebrate species diversity and abundances. Deposition of fine streambed materials over larger substrates may create unsuitable habitat for invertebrate species that anchor to coarse substrates.

Sedimentation may result in the loss of spawning habitats and/or decreased spawning success for some fish species. Fine sediment deposition may bury existing coarse or rocky substrates creating unsuitable spawning habitat. Deposited eggs can be smothered by sediments and larval emergence from spawning substrates may be inhibited by infilling of interstitial spaces (Kondolf 2000).

Short and long-term increases in turbidity from suspended sediments can decrease feeding success by visual feeders (Berg and Northcote 1985; Gardner 1981). Suspended sediment can also be harmful to fish by clogging their gills, decreasing oxygen exchange and reducing growth rates (Wood and Armitage 1997).

Because riparian vegetation plays an important role in reducing erosion and sedimentation of water courses, adhering to riparian vegetation mitigation, as described in Operational Statements (DFO 2007a and 2007e) will help reduce erosion and sedimentation at stream crossings.

Direct Loss or Alteration of Fish Habitat

Infilling a water body would represent a loss of fish habitat and potentially block fish migration routes. Change of substrate or bank configuration would represent an alteration of fish habitat, which may be a neutral, positive or negative end effect to fish habitat. Construction of infrastructure within waterbodies may require the infilling or alteration of stream bed and banks. In addition to loss or alteration, sediment can also be introduced outside of the construction location through improper erosion controls. DFO operation statements for temporary crossings, ice bridges and snow-fills, isolated or dry open-cut crossings, will be used where applicable to avoid potential environmental effect on fish habitat.

Coke Leachate

Petroleum coke is a solid, carbonaceous material that is placed around the ground electrode rod to increase its conducting surface. The rod along with the coke is located approximately 3 m under the ground. The coke has the potential to leach various hazardous substances, such as metals and PAHs (polycyclic aromatic hydrocarbons). Effects during construction include the deposition of fine particulate coke material resulting in an increase in Total Suspended Solids (TSS) of a water course and the introduction of PAH and metals to the water course.

Contamination from Structure Foundations and Installations

Construction of cast-in-place concrete structures (e.g., foundations) near watercourses may result in accidental releases of concrete or concrete wash water into watercourses. Uncured or partly cured concrete and other lime-containing materials (e.g., Portland cement, mortar and grout) have a high pH and are extremely toxic to many aquatic animals, including fish. Releases into aquatic environments can cause increases in pH of the water resulting in damage to fish tissue. Also, elevated pH levels may increase toxicity of other substance in the water, such as ammonia.

Blockage in Fish Passage and/or Alteration of Flow

Installing the ground electrodes might entail isolating the construction area while maintaining downstream flows (method used if there is flowing water in the watercourse at the time of construction).

8.2.4.3 Valued Environmental Components

The previously described potential environmental effects were investigated for the project by assessing the effects on VECs. Two VECs were chosen for the aquatic environment component of the proposed developments: surface water quality and fish habitat. While water quality is a component of fish habitat, it is important to distinguish the chemical and physical effects from the biological effects in the aquatic environment. VECs were chosen based on field studies, desktop review, literature review, stakeholder input and professional judgement.

The key indicator resources associated with fish habitat, and the measurable parameters in parentheses that may facilitate quantitative or qualitative measurement of potential Project and cumulative effects, include the following:

- Physical fish habitat (substrate composition, channel characteristics, cover composition and habitat units);
- Water quality (DO, TSS and turbidity);
- Hydrology (velocity and water depth); and
- Riparian vegetation (riparian health and riparian vegetation composition).

A detailed description of water courses associated with each Project component is available in Chapter 6 and in the Bipole III Aquatic Environment Technical Report.

8.2.4.4 Environmental Effects Assessment and Mitigation

Potential environmental effects were identified based on the Project description (Chapter 3) for each component of the Project, review of available literature, ATK and local knowledge and habitat assessment results. Project components likely to affect aquatic habitats are discussed below, followed by mitigation measures and then an assessment of residual effects.

Water courses were assessed based on fish habitat quality and the sensitivity of the habitat to determine the potential effect of the Project component. Fish habitat quality refers to the habitat within the potentially impacted portion of the stream as it currently exists. Sensitivity to disturbance considers the potential for immediate or residual impacts that could result from disturbance of the streambed, banks, or riparian zones. Existing aquatic environment information was collected and analyzed for the project areas. This information included the review of available fish and fish habitat information, local knowledge obtained through ATK studies, and field studies conducted at a selected subsample (57) of the stream crossing sites for the transmission line, converter station, and ground electrode sites. Further details of the fish habitat assessment are available in Chapter 6 and in the Bipole III Aquatics Technical Report.

The Project description was reviewed and activities identified that could contribute to the potential environmental effects previously described that may affect the aquatic environment. These include the following:

- Clearing and maintenance of riparian vegetation at water course crossings on the HVdc Transmission Line, ac Collector lines and Northern Ground Electrode Line rights-of-way;
- Installation of permanent transmission line towers;
- Stream crossings at electrode sites;
- Construction of the northern converter station;
- Installation of ground electrode rings;
- Development and operation of the construction camp; and
- Accumulation of waste materials on-site during construction and operation of the Project.

The following sections assess the potential aquatic effects by major project component for both construction and operation phases of the project. Project phases are dealt with together due to overlap in areas such as vegetation removal for construction and vegetation management for operation.

HVdc Transmission and ac Collector Lines

Construction

The Project will require overhead line crossings of 360 water courses (317 crossings for the HVdc Transmission Line, 43 crossings for the ac Collector Lines and five crossings for the northern ground electrode line). The right-of-way of the overhead lines is adjacent to the riparian areas of an additional 58 water courses (57 for the HVdc Transmission Line, and one for the ac Collector Lines).

Fish habitat was assessed for each water course crossing site. None was considered as critical habitat, 86 were assessed as important fish habitat, 216 as marginal fish habitat and 58 as no fish habitat. Sites rated as important included perennial watercourses supporting a diversity of habitat features and fish species throughout most of the year; whereas Marginal habitat sites were often temporary streams with low habitat and fish species diversity, supporting fish for only a short portion of the year.

Of the 360 water course crossing sites, only eight were rated high with respect to sensitivity of the site. This was due to a combination of quality of fish habitat and stability of the site (e.g., eroding and highly unstable banks). Moderately sensitive sites represented 175 stream crossings and included sites where broad saturated floodplains were susceptible to rutting as well as sites with erosion prone banks. The remaining 177 sites were rated as Low sensitivity due largely to low quality fish habitat. Further details are available within the Bipole III Aquatics Technical Report.

The High sensitivity sites include: Burntwood River; Mitishto River (Site 143); Steeprock River; Woody River; North Duck River; Assiniboine River; Red River; and Rat River. These eight sites are all classified as important fish habitat and will be susceptible to bank erosion from construction vehicles and machinery and are considered ESS. Excessive removal of streamside vegetation may also increase instability at these sites; however, riparian clearing will be limited to hand clearing of select plants (tree species) within the right-of-way with all shrubs and other understory species retained to maintain stability. Increased precautionary measures, with respect erosion protection and right-of-way clearing and maintenance at sensitive sites will be required.

Based on the assessment, mitigation measures are specified to minimize the potential effects of project activity for stream crossings and riparian zones. As the nature of stream crossing work for overhead transmission lines can be accomplished with a low risk to fish habitat and minimal effect on the aquatic environment DFO has specified operational statements that if applicable and adhered to, do not require further assessment or authorization under *The Federal Fisheries Act*. Manitoba Hydro intends to use the Operation Statements for all aspects of potential effects on stream and riparian areas from the construction and maintenance of overhead lines for the project. DFO Operation Statements are provided as an appendix in the Bipole III Aquatics Technical Report.

Stream crossings are considered ESS. Location information and protection measures will be identified in the draft Bipole III EnvPP for the project that accompanies this EIS.

Access to the construction areas of the HVdc transmission line will need temporary access trails. Of the 44 construction access trails outside of the proposed right-of-way, 25 will require stream crossings with a total of 125 crossings. All access trails occur on existing linear disturbances and in some cases existing stream crossing structures are in place. The same DFO Operation Statements and mitigation measures will be applied to these stream crossings as for the HVdc Transmission and ac collector lines. These crossing are temporary and for construction purposes only and as such do not have an on-going project operation component.

Mitigation is organized into DFO operational statements, vegetation removal, erosion and sediment control, stream crossings, concrete works and riparian management. The operational statement for Overhead Line Construction (DFO 2007a) includes mitigation measures that will be adhered to for Bipole III transmission line construction:

- Where possible, installation of lines over water courses and poorly drained habitats such as bogs and fens will be conducted under frozen conditions or aerially;
- Where possible, transmission line approaches and crossings will be perpendicular to the watercourse and will avoid unstable features such as meander bends, braided streams and active floodplains; and
- All structures (temporary and permanent), will be placed above the ordinary high water mark (HWM).

Vegetation Removal

- Removal of riparian vegetation will be limited to select plants within the right-of-way required to accommodate overhead lines, and uprooting of plants will be minimized;
- Clearing limits and sensitive areas will be clearly marked prior to vegetation removal;
- Clearing will be conducted under favourable weather conditions. Construction activities will be postponed under adverse weather (i.e., storm events) to minimize potential sediment introduction into the aquatic environment; and
- Slash/debris piles will be adequately stabilized and stored well above the (HWM).

Erosion and Sediment Control

- Disturbed riparian areas will be re-vegetated following completion of works;
- Appropriate erosion and sediment control measures will be implemented to mitigate sediment introduction into watercourses;
- In addition for the eight sites identified as High sensitivity to disturbance , site-specific sediment and erosion control plans will be developed; and
- Erosion and sedimentation control measures will be routinely inspected to ensure effectiveness.

Equipment Crossing of Streams

Existing stream crossings will be used whenever possible for getting construction equipment to the far side of a stream. Where an existing crossing does not exist or is not practical for use, a temporary stream crossing may be used. DFO's operational statements for Temporary Stream Crossings (DFO 2007b) and, if appropriate conditions exist, Ice Bridges and Snow Fills (DFO 2007c) should be adhered to, including the following:

- Temporary stream crossings will be constructed only where existing crossings do not exist or are not practical for use;
- Temporary stream crossings consist of bridges, dry streambed fords or a one-time ford in flowing waters;
- Whenever possible, existing trails, roads and cut lines will be used as access routes;
- Crossings will be constructed on a straight section of the watercourse, perpendicular to the channel;
- Clean materials will be used in the construction of temporary crossings and all materials will be removed upon project completion or prior to freshet; whichever occurs first;
- One-time fording of flowing streams and temporary bridge construction will only occur where the channel width is less than five m (from HWM to HWM);
- Fording in flowing waters will occur within appropriate fisheries timing windows, as outlined in DFO's Manitoba In-water Construction Timing Windows for the Protection of Fish and Fish Habitat (DFO 2007d);
- Fording will occur under low flow and favourable weather conditions and will avoid known fish spawning areas;
- Where necessary, measures to protect the streambed and banks will be in place prior to fording (e.g., pads, swamp mats). Protection measures will not impede fish passage, or constrict flows; and
- If fording will likely result in erosion and degradation of the streambed and banks, a temporary bridge will be constructed.

Concrete Works

- Any uncured or partly cured concrete will be kept isolated from water courses; and

- Concrete wash water or water that has contacted uncured or partly cured concrete will be isolated from watercourses until it has reached a neutral pH.

Riparian Management Areas – Right-of-Way Buffer Zone

Potential effects of transmission line construction and maintenance on nearby water bodies where stream crossings are not occurring, will be mitigated by the establishment of Riparian Management Areas, and will include a Reserve Zone (RZ) where no vegetation clearing will occur and a Machine Free Zone (MFZ) as follows:

- Flow regime:
    - Perennial water bodies – 30 m RZ; and
    - Ephemeral/intermittent water bodies – 7 m MFZ.
- Fish habitat:
    - Important fish habitat – 30 m RZ;
    - Marginal fish habitat – 15 m RZ; and
    - No fish habitat – 7 m MFZ.

Following implementation of the above listed mitigation measures, potential residual effects to surface water quality and fish habitat from construction of the overhead lines will include some loss of riparian vegetation, temporary elevation in TSS, and temporary disturbance to stream banks and bed. These residual effects will be negative in direction, small in magnitude, restricted to the Local Study Area, of short-term duration, and reversible. Therefore the potential residual effects are considered not significant.

Operation

Vegetation removal near watercourses can result in increased erosion leading to sedimentation of streams, as described in Construction Effects. In addition to contributing to bank stability and erosion protection, riparian vegetation contributes nutrients to streams and lakes through litter and terrestrial insect drop as described in Construction Effects. Vegetation management mitigation is listed below to protect riparian areas and maintain their function.

Vegetation Management

During the operation of the project, riparian vegetation management within the right-of-way will adhere to DFO's Maintenance of Riparian Vegetation in Existing Rights-of-way (DFO 2007e) operational statment including the following measures:

- In riparian areas, vegetation will be maintained in a way that leaves root systems intact;
- Riparian vegetation maintenance within 30 m of the HWM will affect a maximum of 1/3 of woody vegetation (e.g., trees and shrubs) within the right-of-way;
- Riparian vegetation maintenance will be conducted by the method that minimizes stream bank disturbance and if rutting or erosion is likely, appropriate bank protection measures will be implemented prior to machinery use;
- All waste materials (slash) will be stabilized well above the HWM to mitigate entry into the watercourse; and
- Application of herbicides will adhere to appropriate best management practices and all chemical applications will be conducted by a certified applicator.

Potential residual effects on surface water quality and fish habitat from HVdc transmission line and ac collector lines operation will include some loss of riparian vegetation at stream crossings, and the temporary disturbance to stream banks and bed, during periodic maintenance activities. These residual effects are characterized as negative in direction, small in magnitude, restricted to the local study area, and of medium-term duration. Therefore the potential residual effects are considered negligible and not significant.

Keewatinoow Converter Station and Area

Construction

The Keewatinoow Converter Station site is located south of Goose Creek and overlaps the saturated headwater area of an unnamed tributary of the Nelson River. Goose Creek is located as close as 35 m to the converter station footprint area. Other project components in the area include two construction workcamps, a construction power station, concrete batch plant, aggregate borrow pits, and an un-sited wastewater treatment lagoon that will be the subject of separate environmental licensing under The (*Manitoba) Environment Act*.

No new permanent stream crossings are required for the project. Access to construction sites will be of the existing Conawapa service road. The potential effects to the aquatic environment from project development in the Keewatinoow area include:

- Converter station siting over an existing un-named ephemeral stream;
- Workcamp proximity to several streams – Creeks Fourteen and Fifteen; and
- Concrete batch plant water discharge.

An unnamed creek lies within the site of the Keewatinoow Converter Station north of Gillam, MB along the Conawapa access road.

The proposed converter station site includes saturated land that is drained to a ditch and through a culvert on Provincial Route (PR) 290. This area is the headwaters of a small unnamed creek. Habitat at the converter station site consists of boreal wetland with an undefined channel and abundant vegetation. The creek drains to the Nelson River, approximately 800 m from the converter station site. The area that was assessed is considered an ephemeral stream with no apparent channel connectivity to the Nelson River. A standard fish habitat assessment was conducted at the site on August 30, 2010, including sampling for fish, and a second fish sampling effort was conducted June 1, 2011. No fish were caught during the site visits.

This creek is rated as Marginal Fish Habitat and does not support fish directly (Bipole III Aquatic Environment Technical Report). The creek provides indirect fish habitat in the form of water, nutrients and food (lower trophic levels) to the Nelson River. Considering the small size of this unnamed creek and the large size of the Nelson River, the relative contributions of water, food and nutrients to the Nelson River are negligible.

The potential effects of the construction of the Keewatinoow Converter Station on the unnamed creek in relation to fish habitat were assessed following the Practitioners Guide to the Risk Management Framework for DFO Habitat Management Staff (DFO 2010). Construction of the converter station is expected to result in the infilling of 622 m of the total 1,500 m long creek channel.

The unnamed creek at the converter station does not support fish and serves as indirect fish habitat only. Therefore the fish and fish habitat sensitivity was rated as Low. Infilling approximately 622 m of the upper reaches of the creek was rated as High for scale of negative effect (Table 8.2-5). Approximately 40% of the channel length of the small unnamed creek would be affected leading to high ratings irrespective of the value or sensitivity of the fish habitat.

The construction of the Keewatinoow Converter Station will negatively affect a large proportion of the total creek channel. However due to the nature of the habitat and lack of fish presence (i.e. boreal wetland and no fish), the risk of habitat effects is considered very Low according to the Risk Assessment Matrix. The combined rating of low for habitat sensitivity and high for scale of negative effect still fits within the matrix for a combined rating of Low and as such does not require Federal Fisheries authorization for habitat alteration disturbance or destruction (HADD) (DFO 2010). Mitigation measures will be applied for the prevention of erosion and sediment entering the remaining portion of the un-named creek.

Clearing of vegetation for workcamp construction may encroach on the riparian zones of adjacent water courses resulting in a loss of riparian vegetation and potential for erosion and sedimentation effects to the water courses. This potential effect has been considered and appropriate mitigation specified below to reduce or eliminate these effects. Riparian buffer zones will be established around construction and workcamp sites as the main mitigation.

Wash water from the concrete batch plant will be collected in settling ponds at the Keewatinoow station site to allow suspended solids to settle out. Water will be reused as needed as wash water, but there may be a requirement to discharge small amounts of water from the settling ponds on occasion during wet conditions. Concrete batch plant wastewater is generally elevated in pH which is the consideration when releasing to surface waters. Depending on the volume, discharge will be onto the ground primarily or into Goose Creek if required. Mitigation measures to prevent aquatic effect from discharge are indicated in the mitigation measures below.

Mitigation measures are organized into erosion and sediment control, riparian vegetation, instream works and concrete wash water.

Erosion and Sediment Control

The potential for erosion or transfer of sediments into streams or riparian areas adjacent to the construction sites will be mitigated using the following measures:

- Erosion and sedimentation control measures will be in place before construction commences and will be maintained throughout the construction phase;
- During spring runoff erosion and sediment control measures will be in place to ensure sediment laden water does not leave the Keewatinoow site or enter nearby streams;
- Sediment fencing should be used and installed correctly where there is the potential for erosion of exposed soils to enter adjacent water bodies or wetlands. Silt fencing must be maintained and damaged fence repaired immediately;

- Surface erosion control measures such as hydroseeding, organic mulches, wood fibre, peat moss, wood chips/bark, brush matting, or the application of water may also be used at the discretion of the construction contractor;
- To reduce dust caused by wind and construction traffic and potential deposition in aquatic environments, water or other wind erosion control methods will be applied to exposed soil during construction when necessary;
- Erosion prone areas, such as steep slopes, erodible soils, wet areas, and areas adjacent to watercourses, will be monitored to ensure erosion is minimized;
- Erosion control measures will be used, as required, in the ditches to reduce surface erosion and the washing or blowing away of seed;
- Surface runoff will be directed into well-vegetated areas or settling basins and to existing drainage systems when possible;
- Contractors will provide sufficient erosion control materials on-site (such as sediment fencing, stakes, and geotextile fabric) to facilitate timely response to erosion and sedimentation issues that arise during construction activities; and
- The application of soil erosion control measures will be implemented when there is evidence of potential soil erosion (e.g., erosion of topsoil berms or piles, etc.) and immediately after grading is completed to stabilize the soil.

Riparian Vegetation

- Potential effects of construction on nearby water bodies in the Keewatinoow area will be mitigated by creating development and construction setbacks from riparian areas. Riparian Management Areas will be established for nearby streams, and will include a Reserve Zone (RZ) where no vegetation clearing will occur. These include:
  - Goose Creek – 30 m RZ;
  - Nelson River – 30 m RZ;
  - Creek Fifteen – 30 m RZ;
  - Creek Fourteen – 15 m RZ; and
  - Unnamed Tributary – 15 m RZ.

Instream Works

- Instream work will be conducted during favourable weather conditions. Construction will be postponed under adverse weather (i.e., storm events), to minimize potential sediment introduction into the aquatic environment;

- All instream construction activities will be conducted in isolation from flowing water using a temporary diversion if necessary;
- Existing local drainage will be maintained subsequent to un-named creek in-filling;
- Flow to downstream areas will be maintained at all times while diversions are in place;
- Turbid water generated from the isolated work site will be pumped away from the watercourse to a vegetated area, filter fabric dam or other acceptable area that will provide filtration and/or settling time prior to entering watercourses; and
- Any drainage diversions will be removed following completion of works. The site will be restored and all disturbed surfaces stabilized (i.e. re-vegetated).

Concrete Wash Water

In the event that wash water from settling ponds is discharged, either overland or directly to Goose Creek, the discharge water will be treated to meet the following criteria:

- Wash water will be treated to meet the Manitoba Water Quality Standard for municipal wastewater effluents of 30 mg/L TSS prior to discharge; and
- Wash water will be treated, as required, to meet the Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOG) for the protection of aquatic life for pH 6.5-9.0, prior to discharge.

Potential residual effects from construction of the Keewatinoow Converter Station and associated workcamps and batch plant, will include the infilling of an unnamed non-fish bearing tributary, and some loss of riparian vegetation. These residual effects are characterized as negative in direction, large in magnitude, restricted to the Project Site/Footprint, of medium-term duration and reversible. Therefore the potential residual effects are considered not significant.

Borrow Sites and Excavated Material Placement Areas

There are no plans to conduct any instream work for the excavation of aggregate materials for construction. However the borrow sites as mapped overlap existing streams or waterbodies. These sites were evaluated for fish habitat quality as part of the assessment.

Three sites overlap Swift Creek, and two sites overlap unnamed creeks. In addition, one site is near Goose Creek, and another is near two unnamed creeks. Two borrow sites overlap Important Fish Habitat within Swift Creek, and have groundwater sites near them. The third site overlaps Marginal Fish Habitat within Swift Creek, and did not have any identified groundwater sites near it.

Two sites overlap intermittent unnamed tributaries of the Nelson River. These sites contained Marginal Fish Habitat, and did not have any identified groundwater sites near them. One site was located near Goose Creek, which contains Important Fish Habitat. A detailed description of the borrow site locations and fish habitat can be found in the Bipole III Aquatic Environment Technical Report.

The six excavated material placement areas do not overlap any water courses but do lie adjacent to a number of small streams and ponds.

Because groundwater contributes to stream flow, potential effects to surface water quality and fish habitat from borrow pit activities include effects to groundwater. This includes changes to groundwater discharge patterns to stream, changes on groundwater quality, and dewatered water tables. In addition, accidental fuel spills in borrow pit areas, which serve as groundwater recharge areas, could contaminate streams.

Clearing of vegetation for borrow site development and placement areas may encroach on the riparian zones of adjacent water courses resulting in a loss of riparian vegetation and potential erosion and sedimentation effects to the water courses. Run-off of sediment-laden water from excavated material placement areas may enter adjacent water courses resulting in sedimentation effects to those water courses.

Mitigation measures will include the following:

- Borrow pits and excavated material placement areas will be located away from streams and waterbodies to avoid potential effects of borrow pit activity on fish and fish habitat;
- Excavations will not be undertaken below the water table; and
- Spill containment equipment will be put in place in borrow areas for large fuel containing stationary equipment (e.g., crushing equipment). For mobile equipment a re-fueling area will be designated away from depressional or excavated areas. Appropriate measures will be put in place for safe fuel handling and spill containment. Oil or other machinery lubricants will not be dumped in borrow areas.
- Riparian Management Areas (RMAs) will be established surrounding all water bodies, as follows:
  - Important fish habitat – 30 m RZ; and
  - Marginal fish habitat – 15 m RZ.
- Drainage control measures will be used around excavated material placement areas to prevent sediment-laden runoff from reaching any adjacent streams.

Following the implementation of mitigation, potential residual effects on surface water quality and fish habitat are expected to include minor increases of TSS in adjacent streams during rain or runoff event. These residual effects are characterized as negative in direction, small in magnitude, restricted to the Local Study Area, of short-term duration, limited to the construction period and reversible. Therefore the potential residual effects are not significant.

Operation

The operation of the Keewatinoow Converter Station will have limited potential to affect the aquatic environmental component. The operation of a wastewater facility for the station will be the subject of a separate environmental application. Other than the operation of a wastewater facility, the main operational activity of potential concern would be the use of herbicides for vegetation management on the site. The following mitigation is provided for that issue.

- Vegetation control including the application of herbicides during station operation will adhere to appropriate best management practices that prevent any off-site movement of chemicals and to appropriate application by certified applicators.

No residual negative adverse effects on fish habitat or water quality are expected from the operation of the Keewatinoow Converter Station.

Riel Converter Station

There are no water courses within the Riel Converter Station site. A channelized drain, South Bibeau Drain lies 40 m to the west of the Riel Converter Station site. The drain is classified as indirect fish habitat and does not directly support fish. Therefore no construction or operation related effects to the aquatic environment are expected.

Northern Ground Electrodes and Line

Construction

One ground electrode will be required for each of the Keewatinoow and Riel Converter Stations. The ground electrode for the Keewatinoow Converter Station will be located approximately 10 km south of the converter station site on the west side of the Conawapa access road. Currently a shallow land ring electrode design is being proposed. The electrode will be a buried metallic rod approximately five cm in diameter. The rod is buried in a ring with a diameter of approximately 800 m and will require a site area of approximately four km^2, together with an access road for construction and ongoing maintenance. There will also be a low voltage overhead line connection between the ground electrode site and the converter station. The low voltage line will likely be supported on guyed H-frame wood poles and routed along an unused right-of-way originally cleared to provide construction power to the Conawapa site.

The construction of the northern ground electrode and line poses a low risk to fish habitat. One watercourse lies within the northern ground electrode site and is a small tributary of the Nelson River that is classed as Marginal fish habitat and is not expected to support fish within the site. Construction will include installation of the ground electrode beneath this water course requiring the excavation of the channel during construction. The northern ground electrode line right-of-way crosses five water courses, all of which are tributaries of the Nelson River. These include important fish habitat at Swift and Goose creeks and Marginal fish habitat in three unnamed tributaries.

The iron ring electrode is embedded in a coke matrix to increase conductivity. The coke consists primarily of carbon but also may contain small amounts of PAHs. The metallic rod along with the coke is located approximately three to four metres under the ground. Coke leachate from ground electrodes could potentially enter surface waters through introduction to groundwater and subsequent discharge through springs. No acute effects to aquatic organisms are expected from coke; however, overall it is considered to have a low potential to cause adverse effects on the aquatic environment (US EPA 2008).

The potential of coke leachate to enter surface water depends on groundwater and surface water movements at the preferred ground electrode sites. Based on borehole logs near northern ground electrode site NES6, groundwater appears to be between 6 and 10 m below ground and overlain by clay at the site. Therefore, there is no upward movement of water to transfer leachate to the un-named stream on the site. The soil within the site is described as well-drained, and consequently coke leachate if any would be draining down and not up into surface water.

Mitigation for construction of the ground electrode and line will follow that prescribed for the HVdc transmission line and ac collector lines.

In addition, mitigation for construction of the ground electrode crossing of the unnamed creek will include the following:

- DFO’s Operational Statement for Isolated or Dry Open-Cut Stream Crossings is applicable for the installation of the ground electrode and will be implemented and adhered to;
- No instream construction activities will be conducted between April 15 and July 15 as outlined in DFO’s Manitoba In-water Construction Timing Windows for the Protection of Fish and Fish Habitat;

- Instream work will be conducted during favourable weather conditions and construction will be postponed under adverse weather (i.e., storm events), to minimize potential sediment introduction into the aquatic environment;
- All instream construction activities will be conducted in isolation from flowing water using a temporary diversion;
- Temporary diversions will be constructed and operated using the best management practices outlined in Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat;
- Flow to downstream areas will be maintained at all times while diversions are in place;
- Turbid water generated from the isolated work site will be pumped away from the watercourse to a vegetated area, filter fabric dam or other acceptable area that will provide filtration and/or settling time prior to entering watercourses; and
- Diversions will be removed following completion of works and the site will be restored and all disturbed surfaces stabilized (i.e. re-vegetated).

Handling of coke bedding material:

- Coke will be rinsed or leached (aged) before use, to remove any metals loosely bound to its surface;
- To prevent an accidental spill of coke into the aquatic environment, coke materials will be stored greater than 100 m from the ordinary high water mark; and
- Coke will be adequately contained and will be protected from wind and rain to prevent entry of fine particulates into streams through runoff or dust deposition.

Following implementation of the above-listed mitigation measures, residual effects to surface water quality and fish habitat from construction of the northern ground electrode and line will include the loss of riparian vegetation, temporary elevation in TSS, and temporary disturbance to stream banks and bed. Residual effects are characterized as negative in direction, small in magnitude, restricted to the Local Study Area, of short-term duration, restricted to the construction period and reversible. Therefore the residual effects are considered not significant.

Operation

Potential effects of ground electrode operation relate to Electric and Magnetic Field (EMF) and vegetation management. The operation of the ground electrode can create some electric and magnetic fields. Modeling analyses of ground potential rise from ground electrodes along nearby water courses concluded that electrical fields would not reach levels required to elicit effects in fish (Bipole III Environmental and Health Assessment of the DC Electrical Environment Technical Report). Furthermore, fish bearing water courses do not occur within the site and therefore no effects on fish are expected from electrode operation.

Vegetation removal and improper maintenance practices at overhead line crossings of watercourses can result in increased erosion leading to sedimentation of streams. Proper use of herbicides as indicated above for the Keewatinoow converter will mitigate this concern.

Potential residual effects on surface water quality and fish habitat from operation of the electrode line will include some loss of riparian vegetation at stream crossings, and temporary disturbance to stream banks and beds, during periodic maintenance activities. These residual effects are characterized as negative in direction, small in magnitude, restricted to the local study area, and of medium-term duration. Therefore the potential residual effects are considered negligible and not significant.

Southern Ground Electrode

The ground electrode installation for the southern converter station is the same as for northern site except for the diameter of the ring and there are no watercourses that lie within the southern ground electrode site. Mitigation measures for handling of coke bedding material will apply to this site along with any required measures for erosion or sediment control. No residual effects are anticipated.

8.2.4.5 Summary of Residual Environmental Effects and Significance

Residual environmental effects are discussed for surface water quality and fish habitat together as the two VECs are interconnected. Potential negative residual effects are associated with most Project components, but none are significant as presented in Table 8.2-5 and discussed below.

The construction and operation of overhead transmission lines pose a low risk to surface water quality and fish habitat as indicated in DFO's operational statement for Overhead Line Construction. The two main potential effects from construction and operation of overhead transmission lines are loss of riparian habitat and instream sedimentation. With appropriate mitigation measures implemented for construction and operation, the residual effects are considered not significant. Construction access trails, required to access the HVdc transmission line right-of-way, will follow existing linear disturbed areas and with adherence to DFO's operation statements for Temporary Stream Crossings and Ice Bridges and Snow Fills, the residual effects from stream crossings on the construction access trails are considered not significant.

Development of the Keewatinoow Converter Station site will require the infilling of a portion of a small unnamed creek. The creek is considered Marginal fish habitat and the wetland-type habitat does not support fish directly. Infilling would result in the displacement of water from the site to similar habitat adjacent to the site that drains to the area downstream. The potential for increased local and downstream suspended and streambed sediment burdens caused by construction can be effectively mitigated through proper control measures and therefore the residual effects are considered not significant.

The Construction Camp footprint does not overlap any water courses and, with appropriate riparian buffers, there will be no significant residual effects.

There are no water courses within the Riel Converter Station site and therefore construction and operation of the Riel Converter Station will have no significant residual effects on the aquatic environment.

The construction of the ground electrodes poses a low risk to fish habitat. There is no water course at the southern site; however, two roadside ditches are located directly south and north of the site and Cooks Creek is located west of the site. These will be protected during construction; erosion and sedimentation controls will be implemented as necessary. Construction of the northern ground electrode will include isolated or dry open-cut stream crossing construction. Potential effects from construction include riparian clearing, erosion and sedimentation, improper streambed restoration, and alteration of stream flow. These effects will all be mitigated through the implementation of DFO's Operation Statement for Isolated or Dry Open-Cut Stream Crossings (DFO 2007f).

Coke leachate is not predicted to enter surface water at either of the ground electrode sites. If leachate did enter a water body, it is not expected to have a measureable effect on the aquatic environment. Similarly coke physically entering a watercourse through a spill is considered to have a low potential to cause adverse effects on the aquatic environment. Therefore the residual effect of the placement and presence of coke on the aquatic environment is considered not significant.

Potential borrow pit areas include 14 sites, six of which are situated near water bodies. Borrow pit activities may have a negative effect on fish and fish habitat through erosion and sedimentation to streams, as well as pollution of and changes to groundwater flow. These effects can be negated through appropriate mitigation measures, therefore resulting in no significant residual effects.

Table 8.2-5: Residual Environmental Effects Summary – Aquatic Environment

VEC	Project Component	Phase	Residual Effect	Assessment[1]
Surface Water Quality and Fish Habitat	HVdc Transmission Line and ac Collector Lines (including construction access trails)	Construction	Loss of riparian vegetation, stream bank damage, increase in TSS	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Short-Term Overall – Not Significant
		Operation		Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term Overall – Not Significant
	Keewatinoow Converter Station	Construction	Infill, loss of riparian vegetation, stream bank alteration, increase in TSS	Direction – Negative Magnitude - Large Geographic Extent - Project Site/Footprint Duration – Medium-Term Overall – Not Significant
	Borrow Areas, Excavated Material Placement Areas	Construction	Loss of riparian vegetation, stream bank alteration, increase in TSS	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Short-Term Overall – Not Significant
	Northern Ground Electrode and Lines	Construction	Loss of riparian vegetation, temp. stream bank damage & increase in TSS	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Short-Term Overall – Not Significant
		Operation	Loss of riparian vegetation, temp stream bank damage & increase in TSS	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term Overall – Not Significant

Note:

1. Expected residual effects (i.e., effects after mitigation) of the Project on each VEC are assessed using the regulatory significance evaluation approach and methods defined in Chapter 4, Section 4.2.10. Where feasible, regulatory significance is assessed for each non-negligible expected residual effect based on its expected direction, magnitude, geographic extent and duration (as each term is defined in Section 4.2.10); if an adverse residual effect is evaluated to be potentially significant, other factors are also considered (frequency, reversibility, ecological importance and societal importance). Scientific uncertainty is noted where it may materially affect the assessment.

8.2.4.6 Follow-up

Construction monitoring will be used to evaluate the effectiveness of mitigative measures developed for this project. Temporary and permanent facilities installed to maintain natural cross-flow drainage across the construction sites will be inspected on a regular basis to check that drainage is not being inhibited by the construction activities. Water quality monitoring will be implemented at crossing sites where there is potential for sediment introduction into surface waters (e.g., stream bed disturbance during stream isolations).

All disturbed bed and bank sites will be restored comparable to pre-disturbance conditions. Reclamation efforts will be monitored as required by proponent personnel. Once reclamation success is deemed acceptable, temporary erosion control structures will be removed.

8.2.5 Terrestrial Ecosystems and Vegetation

8.2.5.1 Overview

Terrestrial ecosystems are a complex interacting system that includes all land plants, animals, and their environment within a particular area, while vegetation is defined as the general cover of plants growing on the landscape (Cauboue *et al.* 1996). The purpose of the inventories and data summaries completed for the Project is to provide information for the identification of potential effects on VECs as well as terrestrial ecosystems and vegetation for the Project.

Potential Effects and Key Topics for terrestrial ecosystems and vegetation have been identified with potential effects (i.e., predicted change in the environment) and general mitigation measures (i.e., measures to avoid and minimize adverse environmental effects).

8.2.5.2 Potential Effects and Key Topics

There is a wide range of potential effects and key yopics relevant to terrestrial ecosystems and vegetation. Overall, no measureable residual effects are expected from the Project in most potential topic areas given the mitigation measures that will be adopted. The following key topics are addressed below, as background to the assessment of Project effects on specific VECs:

- Modification of vegetation adjacent to the disturbance zone;

- Fragmentation;
- Vegetation diversity;
- Invasive and non-native plants;
- Access;
- Wildfire risks;
- Dust;
- Herbicides; and
- Non-VEC plants and communities.

A brief summary of each supporting topic as well as the mechanism of effect, and general mitigation measures is provided below.

Modification of Vegetation Composition and Structure Adjacent to the Disturbance Zone

The removal of vegetation and the creation of new forest edges along a disturbance zone as a result of construction activities for the transmission lines and other associated project components may result in changes to the nearby forest vegetation. Increased solar radiation exposure and a change in the microclimate along these edges may cause changes in plant community understory composition and structure. Species that prefer shaded and moist conditions may decrease in abundance while species that prefer dry conditions may increase. A reduction in growth or viability of plant species adjacent to transmission right-of-way has been found in other studies.

Another potential effect to native vegetation adjacent to the disturbance zone is windfall. Windfall or blow-down is a factor influencing newly created edges of forest stands. Windfall usually occurs during the first few years after clearing due to trees being susceptible from increased exposure. As a result of windfall, tree canopy cover may decrease, altering forest edge habitat. Increased solar radiation exposure to the vegetation below may affect species composition and possibly community structure.

The potential effects on vegetation adjacent to a disturbance area can be mitigated by implementing the following mitigation measures:

- Construction activities will be carried out during the winter months to minimize removal of shrub and understory species; and
- Grubbing will be minimized within the right-of-way to reduce root damage except at foundation sites.

Fragmentation

Fragmentation is defined as the discontinuity in the spatial distribution of resources and conditions present in an area that affects occupancy, reproduction or species survival, resulting from a given set of mechanisms (Franklin *et al.* 2002) such as disturbance. Construction of the proposed Bipole III HVdc transmission line and other Project components will result in fragmentation of vegetation communities. A 66 m right-of-way will be cleared of trees and shrub vegetation, while wetland vegetation such as sparsely treed bogs will be less affected from fragmentation as a result of less overstory removal. The Bipole III transmission line right-of-way will intercept a total of 480 km of forest which is 35% of the entire route. Consequences of fragmentation include the potential isolation of vegetation communities and a reduction in species diversity and suitable habitat. Other effects include the vulnerability of plant species to extreme weather events (i.e. windfall) and competition from edge species. Continued fragmentation could result from ongoing suppression of vegetation or additional clearing activities in the area.

Mitigation measures were not identified, as fragmentation effects are non-mitigable for the transmission lines, Keewatinoow converter station, construction camp, borrow sites and access roads/trails as a result of vegetation clearing. The issue is addressed in the assessment of Project effects on the VECs for vegetation that are reviewed in subsequent sections.

Vegetation Diversity

Diversity is defined as the richness of species within an area (Cauboue *et al.*1996). The diversity of native vegetation will be temporarily reduced as a result of the removal of vegetation stratums during construction activities along the transmission line right-of-way. Many communities assessed along the preliminary preferred route consist of multiple vegetation stratums, including a tree canopy, tall shrub, low shrub and ground vegetation. Depending on the type of vegetation (e.g., trembling aspen stand), several species can exist at each stratum. Other Project components such as the Keewatinoow converter station, construction power station, construction camp and borrow sites will have complete removal of vegetation and therefore are non-mitigable.

The potential effects on vegetation diversity can be mitigated by implementing the following mitigation measures:

- Construction activities will be carried out during the winter months when effects to plant species are minimized;
- Grubbing will be minimized within the right-of-way to reduce root damage except at foundation sites; and

- Native plant species will be used for revegetation of disturbed areas with increased erosion potential or in areas where vegetation has been completely removed, and will focus on the development of stable plant communities rather than the establishment of a few species (Ecological Land Surveys Ltd. 1999).

Invasive and Non-native Plants

Invasive plants are species that out-compete native species when introduced outside of their natural environment, while non-native plants are species growing outside the range of their natural distribution. The abundance of non-native or introduced plant species may increase as a result of construction, maintenance and site decommissioning activities along the transmission line right-of-way and other Project components. Construction-related ground disturbance could increase the potential for weed introduction (Bonnyville Power Administration 2010) and construction materials used for station development such as gravel and fill could also provide a source for introduced species.

Construction equipment and vehicles can introduce non-native plants such as purple loosestrife (Public Service Commission of Wisconsin 2009), which is an aggressive herbaceous wetland perennial (Kershaw 2003). During the field assessments in 2010, 27 non-native species were observed throughout the Project Study Area; five of these were invasive plants.

Non-native species are problematic for one or a number of the following reasons: introduced plants are capable of growing under a wide range of climatic and soil conditions; they produce abundant seeds that are easily disseminated and seeds that are long lived or can remain dormant through the winter season; they can continue to persist even after the removal of vegetative portions of the plant, and they often have vigorous growth and produce seeds under conditions adverse for other plants (Frankton 1961), and can therefore outcompete native species.

The potential effect of introduction of invasive or non-native plants into cleared areas can be limited by implementing the following mitigation measures:

- Construction, maintenance and decommissioning activities will be carried out during the winter months;
- All equipment will be washed and inspected prior to working in new sites to reduce the spread of introduced species;
- Construction materials (i.e., gravel) will be taken from clean sources and ground cover materials will be weed free prior to use; and

- The access management plan to be developed for the project, will consider means to limit the introduction of non-native plants during clearing and construction of the proposed transmission lines.

Access

Clearing and construction of transmission line rights-of-way as well as the creation of new access roads/trails for the Project can allow increased access by non-community members to sensitive areas that have been identified by local Aboriginal communities and can result in the potential loss of important vegetation resources found at these sites. Although non-Aboriginal people also have long-established traditional uses related to botanical resources, several locations along the preferred route have been identified that support plants that are used by Aboriginal people, including areas for berry picking, medicine gathering, and harvesting plants and trees for cultural purposes. The harvesting and profiting from non-timber resources by non-community members is a concern for Aboriginal people (National Aboriginal Forestry Association 1999).

General mitigation measures for protecting vegetation resources used by Aboriginal people include the following:

- The access management plan(s) to be developed for the Project, will consider means to limit access to areas deemed important for plant harvesting by an Aboriginal community.

Wildfire Risks

Wildfires have the potential to develop from the accumulation of slash during construction and maintenance activities for the Project. If underlying growth or slash from construction and maintenance is left to accumulate within the right-of-way, sufficient fuel can develop that may promote fires in forested areas (International Finance Corporation 2007). There also is the potential for new rights-of-way and access roads/trails to create additional local access, which can result in the potential increase in human-related fire occurrences. A positive effect of transmission line rights-of-way is the creation of natural firebreaks which can slow or help stop the spread of wildfire as well as provide ground access for firefighting to remote areas.

General mitigation measures to reduce the risk of wildfires include the following:

- The removal of slash and other tree maintenance activities will be scheduled to avoid the forest fire season, and burning should occur in the winter months;
- Slash will be cut, piled, burned or disposed of as specified in the Manitoba Conservation work permits;

- Where practical, slash piles will be located on sites with mineral soils;
- Slash piles will be placed away from the right-of-way edges to reduce the potential for scorching of standing vegetation; and
- All fires must be completely extinguished after burning of slash and burn piles will be monitored to confirm that hotspots are not present.

Dust

Access road use during construction, maintenance and site decommissioning for the transmission lines and other Project components, can create dust that can have a potential negative effect by causing stress on adjacent vegetation communities. A covering of dust on leaf surfaces can potentially increase solar heat absorption and decrease transpiration rates resulting in a reduction of carbon uptake (Succarieh 1992). Vegetation adjacent to access roads where dust levels are high may be susceptible to changes in photosynthetic rate and decreases in growth.

General mitigation measures for reduction of any dust on vegetation include the following:

- Construction, maintenance and decommissioning activities fro many areas will be carried out during the winter months; and
- Water or approved dust suppression agents that will not negatively affect surrounding vegetation will be used for dust abatement (Manitoba Hydro 2006) where and when necessary.

Herbicides

Herbicide use during maintenance of transmission line rights-of-way not only inhibits the growth of undesirable species but also can negatively affect desirable species by causing undue stress and possible mortality of vegetation that may be considered important for reasons such as wildlife, traditional uses, or have botanical value. Studies have shown that herbicides have an effect on non-target plant species (Luken *et al*. 1994) as well as early successional vegetation (Bell *et al*. 1997). Carvell (1975) observed that herbicide sprayed rights-of-way differed from communities on unsprayed areas, where herbicide sprayed communities are generally less dense and poorer in number of perennials, particularly the showy wild flowers.

General mitigation measures for herbicides include the following:

- Clearing of the transmission line right-of-way and other sites, will employ a non-herbicide method such as hand cutting, mechanical cutting or winter shearing;

- If herbicides are required to control vegetation growth, all applicable permits and provincial regulations (*The Noxious Weed Act)* will be followed;
- On private lands, prior to any vegetation management work, landowners or appropriate authorities will be contacted to obtain the necessary permission;
- On Crown Lands the necessary work permit(s) will be obtained, as required under The *Manitoba Forest Act;* and
- Species of concern will be monitored and identified/marked and the use of herbicides restricted in these areas.

Non-VEC plants and Plant Communities

Non-VEC plants and communities include native forest vegetation, riparian areas and wetlands, and environmentally sensitive areas. More detailed information on the existing environment and main effects can be found in Chapter 6 and the Bipole III Terrestrial Ecosystems and Vegetation Technical Report.

Broad forest cover types identified for the Project includes coniferous, deciduous and mixedwood. It is estimated that approximately 3,355 ha of upland forest vegetation occurs along the transmission line RoW and approximately 738 ha for the other project components. Main effects include the loss of forest vegetation as a result of construction activities for the transmission lines and other project components.

There are 317 watercourse crossings on the preferred route and although most are predominantly small ephemeral streams; some have also been classified as being moderate and large creeks and rivers. Approximately 957 ha of riparian habitat occurs along the transmission line right-of-way and 310 ha for all other project components. The main effect is the disruption of riparian habitat, which can lead to the degradation of its banks and result in further changes to the riparian zone and species it can support. Removal of vegetation adjacent to a waterway can increase erosion and subsequently increase the amount of sedimentation.

Bog, fen and marsh wetlands were identified along the transmission line right-of-way and cover approximately 1,456 ha. Only bog and fen wetlands were identified for other Project components. Main effects include the potential disruption, alteration or loss of wetlands from Project activities for the transmission line right-of-way and other project components. Project activities may also affect species of concern that may be present in these areas, where activities can cause soil compaction or change water flow which may affect plant populations.

Environmentally sensitive areas for terrestrial ecosystems and vegetation identified along the transmission line right-of-way include dry upland prairies, patterned fen wetlands and salt marshes/flats (Bipole III Environmental Protection Plan). Approximately 10 ha of dry upland prairies, 535 ha of patterned fen wetlands and 6 ha of salt marshes/flats occur within the transmission line right-of-way. Main effects to these environmentally sensitive sites include the potential site disturbance or loss of plants from construction, maintenance and decommissioning activities. No residual effects were identified for patterned fens or salt marshes/flats, since they will be avoided and/or buffered to prevent any project disturbance on these sensitive plant communities.

The potential effects of the project on non-VEC plants and plant communities can be limited by implementing the following mitigation measures:

- Clearing and construction activities will be carried out during the winter months to minimize the effect on understory species and to minimize surface damage, rutting and erosion;
- Where activities, do not occur during winter months, soil and vegetation disturbance will be minimized;
- Where transmission structures will be sited in areas of increased erosion potential, planting or seeding these areas with native species will occur;
- Existing access roads and trails will be used to the extent possible;
- Where disturbance has occurred in areas of increased erosion potential vegetation will be re-established using native species appropriate for the site (i.e., prairie habitat);
- Tree removal will be confined within the limits of the right-of-way, with the exception of danger trees located outside the right-of-way that can affect transmission lines (Manitoba Hydro 2006);
- Tree removal will be confined within the limits of other project component sites;
- Trees will be felled into the right-of-way and other project component sites so as not to damage existing vegetation along right-of-way or other project component boundaries;
- A minimum vegetation (i.e., trees and shrubs) buffer width of 30 m of the high water mark will be maintained for waterbodies such as lakes, ponds and streams;
- Where a buffer zone will be disrupted, clearing, construction, maintenance and decommissioning activities will occur during the winter months and activities will be minimized within the buffer zone;

- Where riparian areas are disrupted during clearing, construction, maintenance or decommissioning activities, a revegetation plan will be developed to re-establish vegetation where required;
- In wetlands, clearing, construction, maintenance and decommissioning activities will be carried out during the winter months;
- Where construction activities do not occur over winter months, construction mats will be considered for use where wetlands may be affected (Minnesota Department of Commerce *et al.* 2010);
- Where transmission structures will be sited in areas of increased erosion potential, planting or seeding these areas with native species will occur (Minnesota Department of Commerce *et al.* 2010); and
- During construction, measures will be implemented to manage storm water runoff to reduce the potential for erosion (Minnesota Department of Commerce *et al.* 2010).

8.2.5.3 Valued Environmental Components

VECs for terrestrial ecosystems and vegetation were chosen based on field studies, literature review, ATK, stakeholder input and professional judgement. Plant species/communities important to Aboriginal peoples were identified through an ATK process and are reviewed the Resource Use section of the socio-economic assessment in this Chapter.

The two VECs determined and reviewed for terrestrial ecosystems and vegetation for the Project:

- Plant species and communities of conservation concern; and
- Native grasslands/prairie areas.

Species of conservation concern are important because these plants exist in low numbers, and play a role in helping to preserve species diversity. Their distribution is often restricted, and some species are protected. Plant species and communities of conservation concern were identified as a VEC and utilized in the assessment due to the low abundance of these species and the need to protect them either provincially, federally or as a result of their being listed by the Manitoba Conservation Data Centre as very rare to uncommon.

Historically, grassland ecosystems existed over large areas, but only few undisturbed natural areas occur today and need to remain intact as these areas provide important plant and wildlife habitat. Native grasslands are also important sites as there is the potential for federal and provincial species of concern to exist in these areas. Thirteen plant species that are listed as protected have the potential to occur in the southern portion of the study area and may potentially be affected by construction activities. Native grassland and prairie areas were identified as a VEC and utilized in the assessment because these areas are known to support species of conservation concern because this ecosystem is among the most threatened in North America. A loss in the amount of native grasslands could result in a reduction of species found in these areas.

8.2.5.4 Environmental Effects Assessment and Mitigation

The following is an assessment of the potential environmental effects of the Project on the selected VECs of the terrestrial ecosystem and vegetation environment. Mitigation measures are described that reduce or prevent environmental effects. The existing environment for terrestrial ecosystem and vegetation in the regional study area is described in Chapter 6. ESSs were also identified and mapped to focus development and application of mitigation measures to specific areas of concern for some species or habitats. ESSs are recorded in the draft EnvPP accompanying the Bipole III EIS.

Effects are assessed on preferred Project components after site selection. Avoidance of areas or potential effects was a major focus of route selection. Over sixty alternative routing segments were rated for the potential level of effect on each environmental component. Segments were chosen that had the least potential effects on the various components where possible in consideration of 28 evaluated criteria. The route and site selection process is described in Chapter 7.

HVdc Transmission and ac Collector Lines

Plant Species and Communities of Conservation Concern

Construction

Fifteen locations for plant species of conservation concern were previously known to occur along the transmission right-of-way, two in the area of the alternate southern ground electrode site, and one along the northern collector right-of-way (MBCDC records). Field assessments identified species of concern at the construction power station, alternative northern and southern ground electrode sites and 26 other locations within the Local Study Area. Nine species of conservation concern, listed by the MBCDC, were observed along the preferred route right-of-way (exact locations unknown) during surveys conducted for Swan Lake First Nation (Reeves 2011). Additional information on plants species of conservation concern can be found in

Chapter 6 Environmental Setting (Section 6.2.5) and the Bipole III Terrestrial Ecosystems and Vegetation Technical Report.

There is potential for the loss of plants of conservation concern from construction and site decommissioning activities along the HCdc transmission lines and ac collector lines. Construction activities that can negatively affect plant species of conservation concern include the use of heavy equipment (crushing) and clearing and grubbing (removal of roots) of vegetation. Although no species of conservation concern were identified on the final preferred route for the transmission line during the field assessment in 2010, fifteen previously known locations of plants of conservation concern listed by the MBCDC occur along the transmission line right-of-way. These are polygon (i.e., general area on a map) records where no exact locations have been identified. Thirteen plant species that are listed as protected have the potential to occur in native grassland/prairie areas in the southern portion of the Project Study Area and may potentially be affected by construction activities. The environmental effect identified is the potential loss of plants of conservation concern and the habitats these occupy as a result of construction and site decommissioning activities along the HVdc transmission line and ac collector lines.

Mitigation measures to reduce the negative effect to plant species of conservation concern include the following:

- Construction and site decommissioning activities will be carried out during the winter months when effects to plant species are minimized;
- Where activities do not occur over winter months, disturbance to the shrub and herb layers will be minimized where species of conservation concern have been observed;
- Existing access roads and trails will be used to the extent possible; and
- Locations of species of conservation concern will be clearly marked with flagging tape prior to construction and site decommissioning activities.

Based on the mitigation measures to be provided there are no anticipated residual effects of construction on plant and plant communities of conservation concern.

Operation

Plants and plant communities of conservation concern can potentially be lost as a result of maintenance activities within the HVdc transmission line and ac collector line rights-of-way. If ground maintenance activities for the transmission lines do not occur in the winter, there is a potential that the use of heavy equipment can crush ground vegetation resulting in a potential loss of plant species of conservation concern. Another potential effect of maintenance activities is the use of herbicides within the rights-of-way, which not only inhibits the growth of undesirable species, but can also negatively affect desirable species causing undue stress and possible mortality of species of conservation concern.

Mitigation measures identified to minimize potential effects to plant and plant communities of conservation concern include the following:

- Routine maintenance activities will be carried out during the winter months when effects to plant species are minimized;
- Where maintenance activities do not occur over winter months, disturbances to the shrub and herb layers will be minimized where species of conservation concern have been observed;
- Existing access roads and trails will be used to the extent possible;
- Locations of species of conservation concern will be clearly marked with flagging tape prior to maintenance activities; and
- In areas where species of conservation concern have been identified, a non-herbicide method will be used, such as hand cutting, mechanical cutting or winter shearing.

Based on the mitigation measures to be provided there are no anticipated residual effects of operation on plant and plant communities of conservation concern.

Native Grasslands/Prairie Areas

Construction

Dry upland prairies, a type of native grassland found along the HVdc transmission line, exemplify the best variety of native prairie that occurs in the study area. These areas were also designated as an ESS for the Project. These areas are known to support species of conservation concern listed by the MBCDC and Dalea villosa, a protected species by the federal *Species at Risk Act* (SARA) and *Manitoba Endangered Species Act* (MBESA). Within the transmission line right-of-way only the Lake Manitoba Plain Ecoregion includes dry upland prairies and these sites occupy an area of approximately 9 ha. Areas of sparse to open tree cover were also identified in dry upland prairie areas during field studies and may also be adversely affected by Project activities.

There is potential for native grassland/prairie areas located in the southern portion of the Project within the HVdc transmission line right-of-way to be disrupted by construction (i.e. heavy equipment use and grubbing activities) and site decommissioning activities. While native grasslands are considered important as a result of the decline of this ecosystem, they are also considered important as there is the potential for federally and provincially protected species of concern to exist in these areas (see above).

Approximately 755 ha of the grassland cover type (considered agricultural pastureland) have the potential to be affected by construction and site decommissioning, while less than 10 ha of dry upland prairie which are part of grasslands and have been identified as environmentally sensitive sites may be affected. Another potential effect of the loss of native grassland/prairie areas is the loss of other species of conservation concern, such as those listed by the MBCDC as very rare to uncommon, within the HVdc transmission line right-of-way from construction activities.

Sparse treed areas, that in some locations span the entire width of the HVdc transmission line right-of-way, were found in dry upland prairie areas during field assessments. Construction activities can result in the clearing of these treed areas, and as a result, a residual effect has been identified. Mitigation measures identified to reduce potential effects for construction activities for the transmission line include the following:

- Construction and site decommissioning activities will be carried out during the winter months to minimize surface damage, rutting and erosion;
- Where activities do not occur during winter months, soil and vegetation disturbance will be minimized in the dry upland prairie areas;
- Where disturbance has occurred in areas prone to increased erosion, vegetation will be re-established using native species appropriate for the site;
- Trees will be removed by low ground disturbance methods;
- Where trees do not pose a threat to the operations of the transmission line, clearing will be reduced in these areas; and
- Existing access roads and trails will be used to the extent possible.

Based on the mitigation measures to be provided the residual effect is considered negative, small magnitude, confined to the Project Site/Footprint, of medium-term duration, one-time frequency, and reversible upon decommissioning, and therefore is not considered significant.

Operation

Native grasslands may potentially be disrupted during HVdc maintenance activities within the transmission line right-of-way. If ground maintenance activities are not carried out during winter months, there is the potential for heavy equipment to disturb and potentially damage grassland communities. Also, because of the sensitive nature of grassland sites (decline of these areas and potential occurrence of species of concern) herbicides used for maintenance can potentially affect desirable species as well as undesirable species.

Mitigation measures identified to reduce potential effects to grassland/prairie areas include the following:

- Routine maintenance activities will be carried out during the winter months to minimize surface damage, rutting and erosion;
- Where maintenance activities do not occur during winter months, soil and vegetation disturbance will be minimized in the dry upland prairie areas;
- Where disturbance has occurred, vegetation will be re-established using native species appropriate for the site;
- Existing access roads and trails will be used to the extent possible; and
- Species of concern will be identified/marked and monitored, and the use of herbicides will be restricted in these areas.

Based on the mitigation measures provided there are no anticipated residual effects.

Keewatinoow Converter Station and Area

The following section summarizes the assessment of the Keewatinoow converter station, construction power station, construction camp, borrow sites (including the excavated material placement sites and access roads/trails.

Plant Species and Communities of Conservation Concern

The potential effect identified for plants and plant communities of conservation concern is the loss of plants from one species (snow willow) that will occur during construction activities. The snow willow is a species of conservation concern and ranked S3 (uncommon) by the MBCDC. These plants were observed during the field assessments at the construction power station. No effects are anticipated for plant species of conservation concern for site decommissioning activities. The loss of some snow willow plants at the construction power station from construction activities is considered non-mitigable due to the complete removal of all vegetation cover from the site and therefore was identified as a residual effect. This species was observed at nine other locations in the vicinity of the construction power station during the field assessments and is not in danger of increasing its conservation status under MCDC criteria with the removal of some plants for the Keewatinoow area project activity.

The loss of some plants from one species of conservation concern is small magnitude, confined to the Project Site/Footprint, of long-term duration, one-time frequency, and irreversible/ permanent even after decommissioning, and therefore is not considered significant.

Native Grasslands/Prairie Areas

There are no environmental or residual effects for native grassland/prairie areas from construction or site decommissioning activities for the Keewatinoow converter station, construction power station, construction camp, borrow sites or access roads/trails.

No environmental or residual effects are anticipated to the VECs from operation activities for the Keewatinoow converter station, construction power station, construction camp, and borrow sites.

Riel Converter Station

Construction

No environmental or residual effects are anticipated to the VECs from construction and site decommissioning activities for the Riel converter station.

Operation

No environmental or residual effects are anticipated to the VECs from operation activities for the Riel converter station.

Ground Electrodes and Lines

Plants and Plant Communities of Conservation Concern

No environmental or residual effects are anticipated to this VEC from construction, operation, and site decommissioning activities for the ground electrode sites and lines.

Native Grasslands/Prairie Areas

No environmental or residual effects are anticipated to this VEC from construction, operation and site decommissioning activities for the ground electrode sites and lines.

8.2.5.5 Summary of Residual Environmental Effects and Significance

Residual effects, which are resultant changes in the environment after the application of mitigation measures, were rated using significance criteria (e.g., direction, frequency, magnitude, geographic extent) and taking into account all Project components and activities (Table 8.2-6). It was determined that the following residual effects for the VECs will occur after implementation of mitigation measures: loss of plants (from one species) of conservation concern, and removal of trees that may occur in dry upland prairie sites. A brief characterization and rationale of each residual effect can be found below.

Plant Specieis and Communities of Conservation Concern

Loss of plants of conservation concern specifically snow willow from construction activities for the construction power station site was identified as an effect. Plant species of conservation concern were identified as a VEC because they exist in low numbers, play a role in helping to preserve species diversity and may be protected either provincially or federally, or listed by the Manitoba Conservation Data Centre as very rare to uncommon. Due to the complete removal of vegetation at the construction power station, the loss of plants of conservation concern is considered non-mitigable. This residual effect is considered not significant based on the significance evaluation criteria and that recognizing that snow willow is ranked S3 other locations for this plant were found in the vicinity of the northern Project components and Local Study Area of the HVdc transmission line.

Native Grassland/Prairie Areas

Removal of trees that may occur in dry upland prairie sites, by construction activities for the HVdc transmission line, was identified as a residual effect. Grasslands and prairie areas, of which dry upland prairie sites are a part, have been identified as a VEC due to the importance of these habitats for species of conservation concern and because this type of ecosystem is among one of the most threatened in North America. During field assessments, areas of sparse tree cover that span the width of the HVdc transmission line right-of-way were observed in dry upland prairie sites and may be completely removed during construction activities, resulting in a potential residual effect. Mitigation can potentially serve to restrict the location, extent, method, and timing of Project activities but the removal of trees will occur and therefore was identified as a residual effect. This residual effect is considered not significant based on the significance evaluation criteria and recognizing that trees were commonly observed in this ecosystem and dry upland prairie sites are not protected areas.

Table 8.2-6: Residual Environmental Effects Summary – Terrestrial Ecosystems and Vegetation

VEC	Project Component	Project Phase	Residual Effects	Assessment[1]
Plant Species & communities of conservation concern	Keewatinoow converter station (construction power station)	Construction	Loss of plants (one species – snow willow)	Direction – Negative Magnitude – Small Geographic Extent – Project Site/ Footprint Duration – Long-Term Overall – Not Significant
Native grasslands/ praire areas	HVdc Transmission	Construction	Removal of trees that may occur in dry upland prairie sites	Direction – Negative Magnitude – Small Geographic Extent – Project Site/ Footprint Duration – Medium-Term Overall – Not Significant

Note:

1. Expected residual effects (i.e., effects after mitigation) of the Project on each VEC are assessed using the regulatory significance evaluation approach and methods defined in Chapter 4, Section 4.2.10. Where feasible, regulatory significance is assessed for each non-negligible expected residual effect based on its expected direction, magnitude, geographic extent and duration (as each term is defined in Section 4.2.10); if an adverse residual effect is evaluated to be potentially significant, other factors are also considered (frequency, reversibility, ecological importance and societal importance). Scientific uncertainty is noted where it may materially affect the assessment.

8.2.5.6 Follow-up

In order to confirm that mitigation measures are implemented effectively, monitoring will be conducted for Project components and project activities. Monitoring will involve verifying the predictions made in the assessment, determining the effectiveness of measures implemented to mitigate adverse environmental effects, and detecting any unforeseen environmental effects. Monitoring will be carried out on environmentally sensitive areas, including species of conservation concern and botanical resource areas identified through the ATK process, as well as riparian areas, and non-native species. Further information regarding monitoring can be found in the Bipole III Terrestrial Ecosystems and Vegetation Technical Report.

Revegetation and access management plans are recommended to be developed for the Project which includes measures that would be implemented to reduce potential environmental effects. Revegetation plans would be used in decommissioned areas after construction where vegetation has been completely removed (e.g., construction camp) and in areas susceptible to erosion (e.g., slopes). Access management plans would help to reduce the introduction of non-native species, the risk of fire, and access by other people to vegetation resources used by Aboriginal people as identified through the ATK process. These measures would be assessed as part of the monitoring plan to determine if they were effective in mitigating potential environmental effects. Follow-up activities that can occur include post Project audits or inspections to determine if the monitoring plan was effective and if modifications to the identified mitigation measures are required for implementation for future projects.

8.2.6 Mammals and Habitat

8.2.6.1 Overview

Mammals play an important role within the functioning ecosystems found throughout the various ecoregions contained within the Project Study Area. There are complex relationships among and between species and their abundance and diversity is linked to a number of natural and human influences. Species diversity and abundance can be partially predicted through assessing habitat conditions, which are based on several factors including vegetation type, successional stage, soil, and fire history. Existing human activity also influences species' distribution, abundance and diversity. Mammals provide ecological, socio-economic, cultural and subsistence services in all regions of the Project Study Area through First Nations use as well as providing recreational and tourism opportunities. Many species of mammals are hunted for recreational purposes and the commercial use of mammals through outfitting and trapping is prevalent. Most importantly, mammals and their habitat play a vital role in First Nations communities by contributing to community cultural values and subsistence practices.

The following environmental effects assessment is focused on VEC mammal species described below that are found in the Project Study Area.

Mammal Groups

For the purpose of this assessment mammals have been organized into ungulates, furbearers and small mammals. Further details on descriptions of mammals and potential effects can be found in the Bipole III Mammals Technical Report.

Ungulates

For the purpose of this report, ungulate VEC mammal species include coastal and barren ground caribou (*Rangifer tarandus groenlandicus*), boreal woodland caribou (*Rangifer* *tarandus caribou*), moose (*Alces alces*) and elk (*Cervus elphas*). See Chapter 6 (Existing Environment) for details regarding these species' ecology and distribution in Manitoba.

In this assessment particular attention was given to boreal woodland caribou due to their federal and provincial status as a threatened species and their distribution across the northern portion of the Project Study Area. There are three separate boreal woodland caribou ranges that are traversed by the Bipole III HVdc transmission line and are potentially affected by the Project. Specific issues involving these three boreal woodland caribou ranges relative to the Project Study Area are discussed in this chapter, while a more in-depth review of the current status of caribou in the Project Study Area can be found in Chapter 6 (Existing Environment) and the Bipole III Caribou Technical Report.

Furbearers

For the purpose of this report, furbearer VEC mammal species include beaver (*Castor canadensis*), American marten (*Martes americana*) and wolverine (*Gulo gulo*). See Chapter 6 (Existing Environment) for details regarding these species' ecology and distribution in Manitoba.

In addition, Grey wolf (*Canis lupis*), were also considered in the environmental assessment process as a VEC linkage species due to their potential effects on VEC ungulates due to potential increased predation effects caused by linear development.

Small Mammals

While small mammals (bats, mice, voles, shrews, squirrels, chipmunks, rabbits, etc.) were assessed and evaluated, decisions resulting from VEC selection processes (See Bipole III Mammals Technical Report 2011) resulted in ungulates and furbearers being selected as VEC species.

8.2.6.2 Key Topics and Potential Environmental Effects

Supporting topics in this environmental assessment were identified through various avenues of research, public consultation, First Nation consultation, meetings with management agencies, resource users and resource stakeholders; review of peer-reviewed published information; intensive wildlife surveying, habitat analysis, habitat modeling and professional experience.

Based on the results of these investigations, the following important wildlife topics were identified for VEC and VEC linkage species within the Project Area.

Mortality

- Increased mortality due to overharvesting via increased access (trapping, hunting, poaching);
- Increased mortality from improved predator mobility via linear corridors; and
- Decreased reproductive capacity (fecundity) due to disturbance or displacement.

Habitat Alteration

- Potential loss or change of Habitat;
- Potential loss of functional habitat via reduction of forage due to disturbance and edge effects; and
- Potential loss of important or unique habitat components (mineral licks, calving areas, dens, reproductive habitat).

Sensory Disturbance

- Displacement (resulting in avoidance of the area).

While these topics and effects are discussed in this chapter, a full detailed description of these issues and effects can be found in the Bipole III Mammals Technical Report (2011).

Mortality

Increased Mortality Due to Overharvesting

One of the primary potential negative effects associated with rights-of-way is the potential for increased harvest of ungulates and furbearers as a result of enhanced or new access. Roads, trails and transmission line rights-of-way can contribute to increased access to wildlife, impacting local and regional populations (Jalkotzy *et al.*, 1997; Richard and Doucet 2003). An increase in hunting and poaching of ungulate species, specifically moose (Richard and Doucet 2003) and elk (Bergman 2006; Chranowski 2009) is also associated with an increase in human access along a linear corridor (Richard and Doucet, 2003; Jalkotzy *et al.*1997). If hunting occurs along a transmission line right-of-way, game species will generally begin to avoid this area (Jalkotzy *et al.*, 1997). In Manitoba, the effects of access and the indirect impacts on ungulates from over hunting are well documented and there are a number of Game Hunting Areas (GHAs) currently closed to moose hunting, partially due to access effects (Manitoba Conservation 2011). These trends can be reversed through specific management and mitigation activities as Crichton *et al* (2004) documented significant increases in moose numbers in areas where effective road and hunting closures were established in eastern Manitoba.

Trappers often use rights-of-way and access roads to access previously remote area. However, this may only impact the Local Study Area and immediate surroundings (Jalkotzy *et al*. 1997). As habitat becomes more limited via habitat removal and fragmentation and trapping access increases, species such as American marten may become more vulnerable to population declines (Webb and Boyce 2009).

Increased Mortality Due to Increased Predation

Linear corridor development, such as transmission line right-of-ways, trails and access roads, in remote regions is generally stated to allow for increased access into formally remote habitat (Jalkotzy 1997). These corridors increase the movement of wolves into moose, caribou and elk habitats, allowing wolves to travel more quickly, and also potentially influence their travel routes, their distribution and increase wolf-prey contacts and interactions (Thomas 1995; James and Stuart-Smith 2000; Courbin *et al*. 2009). Habitat alteration such as creation of trails, roads and rights-of-way can provide predators with increased access to previously secure habitat for prey species, decrease search times for prey, make prey escape more difficult, improve wolf predation efficiency and decrease wolf search rate (Thomas 1995; James and Stuart-Smith 2000). It has also been previously found that the amount of human activity along linear corridors can influence the use of these features by wolves. Linear corridors with less human use, such as remote transmission rights-of-way, may be more attractive to wolves (Stein 2000). Based on this literature, there is potential for increased ungulate mortality along and near the various components. These potential effects are anticipated to arise primarily during the operation phase of the Project.

Decreased Reproductive Capacity

Decreased reproductive capacity is generally not a concern with mammal VECs due to their population status and distribution. Boreal woodland caribou are the exception to this as the Bipole III HVdc transmission line will bisect known calving habitat in the Wabowden area and is discussed below in Section 8.2.6.3. Boreal woodland caribou habitat is comprised of all components that fulfill the necessary year round life requisites required for reproduction (rutting, calving and calf rearing) and foraging (physiological health) while providing refuge from predators (Environment Canada 2008). Females with calves have been found to be less tolerant of disturbances and more likely to avoid disturbances than other individual caribou in the herd (Weir *et al*. 2007). Additionally, caribou in the Project Study Area show considerable fidelity to previously used calving areas in this area (Bipole III Caribou Technical Report). Disturbance may also displace calving females into less secure habitats containing predators. Since caribou calves are vulnerable to predation (Mech *et al*. 1995), loss of previously used, safer calving sites increases risk of calf mortality. This combined with the low fecundity and productivity expressed by boreal woodland caribou, they are sensitive to slight increases in mortality from predators (Thomas 1995).

Habitat Alteration

Direct Loss of Habitat

The loss of individuals or decline in a species population is strongly associated with habitat loss (Fahrig 1997; Bender *et al.* 1998). Direct losses of habitat via habitat removal may affect mammal species, but the effect will vary based on species' distribution and habitat availability. Habitat loss is normally associated with the construction phase of a project, via clearing of an area for various project components However, long term habitat alteration will persist due to maintenance of the HVdc right-of-way. For some species, such as beaver, habitat loss is not a limiting factor; as populations have increased dramatically in most regions of the province. Similarly, species such as wolverine have large home ranges (50-400 km^2 for females and 230-1580 km^2 for males) (COSEWIC, 2003) but are considered more dependent on the abundance and distribution of prey species and, occasionally, carrion remains (COSEWIC 2003). Thus effects of habitat change are related to large scale habitat influences such as forest fire and cumulative anthropogenic caused disturbance (forestry and access).

Other species, such as American marten are habitat specialists (see Section 8.2.6.4), and removal of habitat may result in a population decline with reduced availability of preferred habitat (Frahig 2003). With respect to boreal woodland caribou, habitat loss has specifically been documented as having a strong effect on caribou viability when disturbances occur in critical winter or calving habitat (Wedeles and Dame 1995). Vors (2007) has documented boreal woodland caribou range recession, due in part to habitat loss and alteration as a result of landscape scale habitat change from forestry and other anthropogenic disturbance in Ontario. Criteria used to determine the persistence of boreal woodland caribou is a function of population trend, size and the amount of range disturbance (Environment Canada 2008). Decline of boreal woodland caribou populations is usually the result of a complex set of cumulative effects which result in changes to existing ecological interactions between prey species, alternate prey and predators (Environment Canada 2008).

While habitat loss can occur through the clearing of habitat for transmission line rights-of-way, early successional habitat created through vegetation maintenance along the right-of-way during the operation phase can benefit other ungulate species such as moose, deer and elk (Jalkotzy *et al.* 1997) as rights-of-way provide an enhanced source of high quality palatable forage in proximity to thermal and security cover. rights-of-way represent a small percentage of an ungulates' home range and the amount of habitat loss is expected to be negligible.

Habitat Fragmentation and Functional Habitat Loss

Habitat fragmentation is most often defined as a process in which a large area of habitat is converted into a number of smaller patches, isolated from one other by a matrix of habitats unlike the original (Wilcove *et al.* 1986). This is typically the result of tree and vegetation removal through linear development, including roads and transmission lines, combined with the long term control of treed vegetation. Landscape human disturbance such as forestry can have short to medium term fragmentation effects through increased edge, reduced forest interior habitat, and increased isolation of forest patches (Sanders *et al.* 1991; Dyer *et al.* 2001). Fragmentation generally results in the production of a series of remnant vegetation patches surrounded by a system of different vegetation types and land use (Sanders *et al.* 1991). Habitat fragmentation may affect species such as American marten, which generally prefer continuous mature forest (Whitmer *et al.* 1998).

Functional loss of high quality habitat can also occur along linear development. Schindler (2007) found that the potential functional loss (avoidance) of high quality boreal woodland caribou habitat from all-weather roads was approximately one kilometre. However, overall use of high quality range was not affected. Human encroachment via development has also been cited as contributing to functional habitat loss or degradation of habitat (Jalkotzy *et al.* 1997; Dyer *et al.* 2001). These effects are particularly of concern where fragmentation occurs near core caribou habitat (wintering or calving areas). As a result, caribou movement and habitat use may be affected by fragmentation of core habitat. However, the long term effects of fragmentation on caribou movement and persistence are still largely unknown and require study.

Loss of Important or Unique Habitat

For the purpose of this EIS, ESS for mammals were defined as site specific features or unique habitats that are particularly important in the maintenance of species' life functions, and where these features may be highly susceptible to transmission line construction and operation activities. These include dens, mineral licks and important habitats. Black bear, for example, are important both culturally and economically. Studies have illustrated the effects of human activity on bear denning sites (Mannville 1983; Peek *et al.* 1987; Mattson 1990; Goodrich and Berger 1994; Wiig*et al.* 1996; Linnell *et al.* 2000). Den disturbance and abandonment can result in cub mortality (Linnell *et al.* 2000). In addition to bear denning sites, wolverine and wolf denning sites are sensitive to disturbances and the likelihood of wolf den relocation is directly related to the duration and intensity of human disturbance (Argue *et al.* 2008). Similarly, human disturbance, both on foot and through the use of snowmobiles, is not implicated in wolverine den abandonment, but has been implicated in the movement of kits from maternal dens and rendezvous sites (Magoun and Copeland 1998).

Mineral licks are an important habitat feature for mineral supplementation and are vital in ungulate ecology. Licks are used by all ungulates including caribou, moose, deer, and elk (Klaus and Schmid, 1998; Rea *et al*. 2004, Couturier and Barrette 1988; Heimer 1988; Rea *et al*. 2004). Abandonment resulting from sensory disturbance near mineral licks is associated with direct impacts from land development activities (Weeks and Kirkpatrick, 1976; Reger 1987; Bechtold 1996; Dormaar and Walker 1996).

Based on ATK interviews and specific studies conducted for this Project there are a number of unique sites that have been identified and are outlined in the Bipole III Mammals Technical Report. These include environmentally sensitive sites such as bear dens and mineral licks. Although wolf and wolverine denning sites were not identified during ATK interviews or Project studies, the potential for these sites do exist. These are dealt with in the Draft EnvPP, which identifies specific activities during construction to monitor and avoid such areas should they be discovered at some point during the Project lifespan.

Sensory Disturbance

Displacement

Sensory disturbance due to clearing of a construction site and/or ongoing maintenance/activity may result in mammal avoidance of the immediate vicinity where the disturbance is occurring (Bubenik 1982; Jalkotzy *et al*. 1997). The degree of avoidance will depend on the species (LoBue and Darnell 1959) and the frequency of vehicular traffic and is expected to vary as site preparation activity proceeds along the route. Larger species, particularly ungulates, may be temporarily displaced due to disturbance and ongoing access (Whitten and Cameron 1983; Van Dyke and Klein 1996). Increased public access via linear corridors to mammal habitat has been documented to result in sensory disturbance to mammal populations (Jalkotzy *et al*. 1997). Sources of public access causing sensory disturbance may include snowmobiles, all terrain vehicle, campers, hikers, trappers and hunters, and other resource users (e.g. public picking berry or medicinal herbs) gaining access to wilderness areas previously difficult to access.

8.2.6.3 Valued Environmental Components

Mammal VEC selections were made using a structured process assessing a number of key attributes. These included: evaluation of all mammal species' provincial or federal status and regulatory status, the importance of the species to local cultures and resource users, its ability to function as an umbrella species, its ability to function as an indicator species, its ability to function as a keystone species, the availability of information to construct models of habitat preference for the species, and the relative influence that a transmission line may have on the species population and its habitats.

As described in Chapter 4 (Environmental Assessment Approach), the Project Environmental Assessment investigated Project effects on the following VECs:

- Coastal and barren ground caribou;
- Boreal caribou;
- Moose;
- Elk;
- American marten;
- Beaver; and
- Wolverine.

Grey wolves were also included in the environmental assessment process as a VEC Linkage Species due to their potential effects on VEC species through increased predation impacts potentially associated with linear development.

Due to the status and potential residual effects on caribou, the following provides a detailed background narration on caribou with emphasis on boreal woodland caribou in order to set the context for the environmental assessment in Section 8.2.6.4.

Caribou

Caribou are generally identified by two major sub-species and both are found within the Project Study Area. These include boreal woodland caribou (*Rangifer tarandus caribou*) and migratory barren-ground caribou (*Rangifer tarandus groenlandicus)* (Linnaeus). The coastal or forest/tundra ecotype is genetically similar to the boreal woodland caribou and is generally characterized by its migratory behaviour, use of taiga/tundra transition forest and group calving behaviour in coastal tundra habitats along Hudson Bay. Barren-ground, coastal and boreal woodland caribou have all been identified as VECs for the Project. Boreal woodland caribou were designated as Threatened by Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2002 and were subsequently designated as Threatened under SARA in 2003. In 2006, Manitoba also listed this boreal woodland caribou as Threatened under the Manitoba *Endangered Species Act* and subsequently developed Manitoba's Conservation and Recovery Strategy for Boreal Woodland Caribou which is scheduled to be updated in January 2012. In addition, a draft National Recovery Strategy (Environment Canada 2011a), as well as a Scientific Assessment to Inform the Identification of Critical habitat for Woodland Caribou Boreal Population in Canada (Environment Canada 2001b) has been posted on the

Environment Canada Public Registry in September of 2011. The National Recovery Strategy will continue to be informed by consultations including ATK and responses provided to Environment Canada as a result of the posting process.

Risk assessments[2] have been completed for local caribou populations in both the Manitoba and National strategies based on range delineations illustrated in the 2006 Manitoba strategy. It should be noted that these delineations were based on the best available data in 2006. Since that time there have been a number of major collaborative monitoring activities undertaken to improve the knowledge of boreal woodland caribou distribution within the Project Study Area. The respective risk assessments conducted for the described 2006 local populations were ranked as to their level of conservation risk (Manitoba) and degree of sustainability (national). A number of factors were used including the presence/absence of threats that potentially influence boreal woodland caribou population viability and long term persistence (Manitoba Conservation 2006). Based on the last assessments done in 2006, none of the local caribou populations found in the Project Study Area is currently considered to be at High Risk or unsustainable.

As discussed and given the dated nature of the information used in these assessments, Manitoba Hydro identified potential gaps in data and information in order to effectively identify and mitigate impacts to boreal woodland caribou by avoiding critical habitat and local populations to the extent possible as part of the Site Selection Environmental Assessment (SSEA) process within the Project Study Area.

Status of Caribou Data and Information

In understanding the dated nature of information and the need for current data to conduct the Bipole III SSEA, Manitoba Hydro collaborated with Manitoba Conservation on a number of strategic monitoring and research initiatives to acquire current data to be used in the selection of a Preliminary Preferred Route that would minimize overall impacts on caribou ranges in the Project Study Area by avoiding core use areas and critical habitat. Most importantly, these collaborative monitoring initiatives were guided by an objective evaluation of the potential threats to boreal woodland caribou as a result of transmission line development and operation. The monitoring conducted by Manitoba Hydro is anchored by scientific evidence and was developed and peer reviewed by outside experts prior to execution of project specific monitoring and research. This involved an independent threat assessment using Environment Canada's guidelines for species at risk recovery planning.

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[2] Manitoba – Conservation Risk Assessment; Canada – Integrated Sustainability Assessment.

Manitoba Hydro's boreal woodland caribou threat assessment utilized workshops with external caribou experts to provide an objective assessment of the various potential effects associated with the construction and operation of transmission lines on boreal woodland caribou (Scurrah and Schindler 2011). This threat assessment provided the basis for a draft corporate strategy for boreal woodland caribou monitoring, research and mitigation. Specific issues addressed in the threat assessment and associated draft corporate strategy include; loss of forage (both direct and functional loss due to sensory disturbance), range fragmentation, increased predation, northward encroachment of white-tailed deer, parasites, changes in prey/predator dynamics and increased mortality from hunting. This process provided a critical path for Manitoba Hydro in the implementation of targeted monitoring and research activities aimed at mitigating the potential impacts of Bipole III on caribou through effective routing to avoid caribou range and the identification of site specific mitigation. Some of these studies are also linked to effects monitoring being conducted for the Wuskwatim transmission line project which currently intersects core caribou use areas within the Project Study Area. Initial indications of this effects monitoring to date have illustrated minimal to no effect on boreal woodland caribou range use and occupation.

Boreal Woodland Caribou Ranges

Since 2006, the results of the above described monitoring have provided significant new information allowing for a more accurate characterization of local populations in the Project Study Area. It is anticipated that many of the current range designations and boundaries may change with the development of the revised Manitoba Strategy anticipated in 2012. The results of recent Bipole III specific telemetry studies have provided a significant source of new information previously not available to Manitoba and Canada at the time of their respective recovery strategy development. These new data combined with several decades of historical information and ATK gathered for the Project provided a basis for evaluating alternative routes and assessing residual effects of The Project. Information acquired from other ancillary studies such as aerial distribution surveys conducted for ongoing DNA research and other multi species surveys in the Project Study Area also contributed to the delineation of the Bipole III boreal woodland caribou evaluation ranges (Map 8-1).

From the Bipole III perspective, the main objectives of the targeted collaborative monitoring focused on obtaining data to more accurately describe local population ranges and their response to existing anthropogenic linear development. These data were strategically used in the SSEA process to select a route that minimized intersection with local populations, their calving and calf-rearing areas, core winter use areas, and/or other potential critical habitat. These data combined with historical knowledge and ATK gathered specifically for this project were utilized in evaluating alternate routes and selecting a Preliminary Preferred Route. Based on this new information, 11 potential local populations were identified within or intersecting the Project Study Area. The names and associated provincial and federal status of these are listed in Table 8.2-7. Also listed in this table are potential ranges identified by new data that were used as constraining elements in the evaluation of alternate routes and the selection of the Preliminary Preferred Route.

Of the 11 potential ranges, only three are traversed and include; the Wabowden, Reed Lake and The Bog ranges. The Final Preferred Route (FPR) as selected reduces overall fragmentation across the larger landscape; following, where possible, the existing linear development and disturbed areas, thus mitigating and reducing the majority of potential effects anticipated by the Project.

The Preliminary Preferred Route selection was considered to be the optimal route from a caribou perspective for all three ranges, due to the overall minimization of potential impact on boreal woodland caribou within the Project Study Area.

In the Wabowden area, a deviation in the Preliminary Preferred Route paralleling existing linear features along PTH # 6 was necessary to accommodate competing resource interests in the Wabowden area. These entailed concerns relating to the Thompson Nickel Belt and the potential loss of future exploration capability and subsequent mine development as a result of the electromagnetic shadow created by the HVdc. Accordingly the resulting FPR in Wabowden area was not a preferred alternative from the caribou SSEA perspective.

Table 8.2-7: Summary of Boreal Woodland Caribou Evaluation Ranges in the Project Study Area

	Range Name	Status of Range Delineation	Overlap with Study Area	Overlap with FPR	Provincial Ranking (MB Conservation Risk Assessment Rank)	Federal Ranking (Integrated Risk Assessment)
1	Kississing	MC - 2006 Identified	Yes	No	Medium Risk	Unlikely Self-Sustaining
2	Naosap	MC - 2006 Identified	Yes	No	High Risk	Unlikely Self-Sustaining
3	Reed Lake	MC - 2006 Identified	Yes	Yes	Medium Risk	Likely Self-Sustaining
4	Wapisu	MC - 2006 Identified	Yes	No	Medium Risk	Likely Self-Sustaining
5	William Lake	MC - 2006 Identified	Yes	No	Low Risk	Likely Self-Sustaining
6	Wabowden	MC - 2006 Identified	Yes	Yes	Medium Risk	Likely Self-Sustaining
7	The Bog	MC - 2006 Identified	Yes	Yes	Low Risk	Sustaining - Self Sustaining
8	Wimapedi	Potential range based on new data	Yes	No	NA	NA
9	Wheadon River	Potential range based on new data	Yes	No	NA	NA
10	Harding Lake	Potential range based on new data	Yes	No	NA	NA
11	Swan Pelican	Historical presence - investigated – no evidence of presence	Yes	No	NA	NA

In the north, a small portion of Cape Churchill, Pen Island costal population ranges are intersected by the FPR as well the occasional southern reaches of the Beverly and Qamanirjuaq barren-ground population.

8.2.6.4 Environmental Effects Assessment and Mitigation

Effects assessment methods used in this assessment include the evaluation of available high quality VEC habitat as identified through modeling, mapping of known locations and important areas for VECs, and incorporation of results of various ground and aerial surveys for VEC signs and observations. Other considerations in assessing the potential effects included ATK and TEK provided through First Nation and stakeholder consultation. Effects were also described based on those found in peer-reviewed literature for similar projects and activities (Bipole III Mammals Technical Report).

HVdc Transmission and ac Collector Lines

The following subsections provide a summary of effects and mitigation recommendations for all VEC mammals potentially affected by the HVdc transmission and ac collector lines.

Coastal and Barren Ground Caribou

Construction and Operation

The northern portion of the Project Study Area includes habitat that is occasionally occupied by the coastal and the Beverley-Qamanirijuaq barren-ground caribou. ATK information suggests that Pen Island caribou frequent the study area and that local woodland caribou are also present. The results of Bipole III specific studies indicate the sporadic presence of both Cape Churchill and Pen Island animals in the northern portion of the Project Study Area. Data from satellite collared caribou have illustrated variation in annual range selection with the identification of local caribou exhibiting both sedentary (boreal woodland caribou) and migratory (barren ground and coastal) behaviour. Data also illustrates annual variation in these behaviours with some animals switching from sedentary to migratory. Aerial survey and satellite telemetry data also demonstrated significant annual variation in winter presence throughout the northern portion of the Project Study Area. Aerial surveys conducted in 2009 yielded little caribou sign in the area compared to 2010 when a significant migration of Cape Churchill caribou inundated the Gilliam area. In 2010, mortality to hunting was estimated at approximately 100 caribou (Manitoba Conservation Pers. comm 2011).

Due to the spatial and temporal variability in occurrence of these populations in the narrow northerly portion of the Project Study Area, there would be little useful purpose in choosing a different route, but access control and supervision when the relevant herds are travelling in the area are recommended. Sensory disturbance due to clearing and ongoing access of the right-of-way by construction crews during clearing and construction of the HVdc and converter station may result in short-term avoidance of a relatively small area by these coastal migratory Caribou. However, habitat is not limiting and there are no effects relative to habitat loss. The unpredictable nature of periodic migrations into the Project Study Area will result in little disruption to the overall migration paths of migratory and coastal caribou.

With the establishment of the HVdc right-of-way, there is potential for increased movement of grey wolves following construction. However based on the short period of time that these populations occur in the area, there would be little effect. With increased access as a result of the HVdc, it is possible that there may be increased opportunity for hunting by humans during the periodic migrations of caribou which can include hundreds of animals moving into the area.

In order to address the various potential Project effects the following mitigation measures have been developed:

- Use along the right-of-way will be limited to reduce sensory disturbances and minimize functional habitat loss during caribou migration events which are infrequent and unpredictable.
- Existing satellite collared animals from the Cape Churchill and Pen Island herds will be monitored during construction. Aerial surveys will be conducted to verify numbers and concentrations of animals that may or may not migrate into construction areas. Manitoba Hydro will maintain access control onto the right-of-way and cooperate with Manitoba Conservation in measures that will protect excessive harvest in the area including signage and no hunting areas during construction to protect both workers and migrating caribou. Manitoba Hydro will work cooperatively with Manitoba Conservation on access control through joint access management plan, hunting closures (*Health Safety and Workplace Act*) and hunter education or information initiatives with Manitoba Conservation to reduce the effects of overharvest and wastage.
- Hunting by project personnel will be prohibited and firearms restricted in work camps and associated areas to minimize caribou mortality.

Based on the mitigation measures outlined here, the residual effects expected include potential increased harvest of animals on and along the new right-of-way as a result of improved local access, when and if significant migration events occur. These residual effects for coastal and barren ground caribou are characterized as negative in direction, small in magnitude, Local Study Area in geographic extent, medium term in duration, sporadic/intermittent in frequency, and reversible, and therefore considered not significant.

Boreal Woodland Caribou

Construction and Operation

For boreal woodland caribou, the main Project environmental effects are primarily associated with construction and operation of the HVdc transmission line, and construction access.

The main issues identified through literature and expert review and threat assessments relate to human landscape disturbances that potentially promote and sustain various mechanisms of population decline. It is thought that human development and use of landscapes from activities such as large scale forestry, linear development (including all weather and seasonal access), hydroelectric transmission, and mining activities can collectively contribute to significant changes in the demographic mechanisms that lead to boreal woodland caribou population decline (Thomas 1995; James and Stuart-Smith 2000; Dyer *et al.* 2001; Courbin *et al.* 2009). These mechanistic changes are dependent upon the temporal and spatial nature of the development and the associated disturbance regime that can include short and long term habitat alteration, fragmentation, ecological changes in food web, changes in predator/prey relationships, introduction of pathogens and human disturbance (Environment Canada 2008).

The following ecological and demographic considerations are relevant to the assessment of Project effects:

- **General:** Boreal woodland caribou are typically found in large, un-fragmented tracts of mature coniferous-dominated boreal forest with inherently low ecological diversity and low predator densities (Bradshaw *et al.* 1995; Stuart-Smith *et al.* 1997; Rettie and Messier 2000). In these areas, succulent biomass associated with young regenerating forests is limited, resulting in low prey densities across the larger landscape (Cumming and Beange 1987 and 1993; Siep 1992; Boutin *et al.* 2004). Boreal caribou are neither found in large numbers nor evenly distributed across boreal landscapes. They occur at very low densities across boreal landscapes, congregate during winter in traditional wintering areas, and disperse during the spring, exhibiting solitary behavior during the calving and calf-rearing season which is thought to be a predator avoidance strategy.
- **Predators:** Predators such as grey wolf are mainly associated with more evenly distributed and higher density larger prey species such as moose (*Alces alces*) and white-tailed deer (*Odocoileus virginianus*) (Messier 1985; Messier 1991; Bergerud and Elliott 1998; Zager and Beecham 2006; Bergerud 2007). Moose and deer are typically associated with disturbed forests through anthropogenic activities such as forest harvest and natural disturbance events including fire and insect infestation (Peek *et*

al. 1976; Rempel 1997; Fisher and Wilkinson 2005). Woodland caribou are typically not associated with these early seral forests; their strategy to avoid predators results in their spacing away from the primary prey of wolves and black bear (*Ursus americanus*) (Bergerud *et al.* 1990).

- **Sustainability of a local population:** The sustainability of a local population can be encapsulated by Lambda (λ, the population growth rate); which describes a ratio of recruitment (calf fecundity and survival) against mortality (number of surviving adult females). Predation by wolves is typically the main cause of population decline (Dyer 2001 and 2002; Wittmer 2005 and 2007). Black bears are also known to be a factor in limiting some ungulate populations through predation of calves (Boutin 1992; Ballard 1994).
- **Habitat not typically the limiting factor:** Although important factors in boreal woodland caribou distribution and abundance, habitat supply, quality and availability, are not typically considered as limiting factors in most boreal caribou populations in the boreal forest when predators are present (Seip 1992; Rettie and Messier 2000; Johnson *et al.* 2001). The dynamics of habitat alteration from human development including forestry and hydro transmission development in boreal caribou range can result in increased forage due to the lush and succulent growth that follows tree removal for primary prey species, such as deer, moose, hare and rodents, thus increasing the biomass availability for predators such as wolves and bears (Peek *et al.* 1976; Monthey 1984; Clarke *et al.* 2006; Zwolak 2009). Additionally, it is hypothesized that linear development and the types of anthropogenic activities associated with linear features may lead to a cumulative effect response that could influence Lambda and possibly lead to decline in local or regional populations (Dyer *et al.* 2001; McLoughlin *et al.* 2003).
- **Cumulative effect response to linear development:** Linear development as a cumulative pathway of decline is not clearly understood in the scientific literature and Manitoba Hydro is being proactive in its research and monitoring initiatives to gain insight into related potential effects. These effects include the possibility of changing the natural distribution of primary prey into critical boreal woodland caribou habitat, followed by increased interaction between high level carnivores (in search of primary prey such as moose, etc.) with boreal caribou (James *et al.* 2004). The potential for increased incidental predation on boreal caribou can have significant implications on the sustainability of boreal caribou populations through slight decreases in Lambda, with the primary cause being predation (Schaefer 2003; *Vors et al. 2007*). The response of boreal caribou to separate or "space away" from predators and their primary prey on the landscape is thought to be influenced by habitat alteration and linear development (James 1999; *Dyer et al. 2001*). It is also

hypothesized that linear development and the anthropogenic use of linear features (such as creating snow-packed trails) increases the mobility of predators into previously remote caribou habitat (James 1999). Again, Manitoba Hydro and their collaborative research initiatives have focused on assessing these impacts.

Residual Effects – Overview of Relevant Ranges

Manitoba Hydro's SSEA process provided an opportunity for mitigating the majority of potential effects through the selection of the FPR away from high risk ranges and other local population core winter and summer ranges. In addition, the majority of the HVdc transmission line is routed in proximity to existing linear features (roads, rail lines, and transmission lines), which is expected to reduce the overall effects of additional habitat fragmentation as a result of the Project. Due to social and biophysical values identified in the SSEA, it was not possible to avoid all known ranges within the Project Study Area. As a result three of eleven occurring boreal woodland caribou ranges are potentially impacted by the FPR. These include the Bog Range, the Reed Lake Range and the Wabowden Range. The Bipole III Caribou Technical Report contains details regarding background and analysis regarding these three potentially affected caribou ranges.

The degree and magnitude of potential environmental effects before considering mitigation is variable among the three boreal woodland caribou ranges. This is due to a number of factors, two of which are the differences in the amount of seasonal core use area and the location of that core use area intersected by the FPR within a three mile evaluation corridor[3], also called the Local Study Area. In addition, the degree of existing fragmentation was also assessed for each range in order to quatify disturbance regimes and to qualify the degree to which a new right-of-way may contribute to additional cumulative effects in caribou range. For each range, effects on the local population will likely extend beyond the Local Study Area (i.e., extend to the Project Study Area) due to the mobility of the caribou population and its predators and in consideration of the overall habitat and range requirements for local boreal woodland caribou populations (Environment Canada 2008).

The following sections describe the potential effects for the three boreal woodland caribou ranges that intersect HVdc transmission line.

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[3] A three mile corridor was utilized in the evaluation of the PPR due to the potential sensory effects of the HVdc transmission line on caribou range use and movement.

The Wabowden Range

The Bipole III Caribou Technical Report contains details on the location of core winter areas and known calving habitat. The FPR bisects, as opposed to intersects, core winter use area and known calving areas for the Wabowden range. By contrast, for example, in the case of the Reed Lake range, the FPR is only intersecting the edge of a core winter use area. Bisecting a presently unfragmented core winter use area in the Wabowden range in an otherwise highly fragmented region, increases the uncertainty for specialists in predicting the effects on caribou and the degree to which the herd in question can sustain itself.

- Of all boreal woodland caribou evaluation ranges, the Wabowden Range has the highest degree of existing fragmentation due to anthropogenic disturbance. As a consequence, there presently exists a potential for increased predation in known areas of caribou occurrence during summer and winter.
- Boreal woodland caribou calving areas in the Wabowden area are associated with low land forest areas that have limited potential for resource development such as forestry (Hirai 1998). However, generally speaking, habitats is not a limiting factor in sustaining boreal woodland caribou populations and, therefore, direct loss of habitat due to the right-of-way is not considered to be an issue for the Wabowden range. No other infrastructure components are located in this range requiring the removal or alteration of additional habitat. The habitat that is affected will be permanently removed/altered (for the life of the Project) as vegetation will be maintained at an early successional stage along the 66 m right-of-way.

Some level of sensory disturbance is expected but is anticipated to be minimal based on a preliminary assessment of individual caribou movement and range use from Bipole III and Wuskwatim monitoring. Human use of the right-of-way during winter is expected to be low as snowmobile trails already exist near and along existing linear features away from the FPR. Monitoring human use of the right-of-way will be important in adaptive management and assessing potential effects of the new right-of-way through core winter and summer use areas.

The Reed Lake Range

Direct loss of habitat is not considered to be a factor for the Reed Lake Range as habitat is not limiting in the Project Study Area. This section of the HVdc line parallels the existing Wuskwatim transmission line, is at the extreme eastern edge of the known Reed Lake winter range and does not bisect any major core use area and avoids all known calving areas. The potential effects associated with increased predation and hunting are not anticipated to be a cumulative factor. Long term monitoring of mortality and recruitment and overall range status is being undertaken for the Wuskwatim transmission line and will be continued as part of the anticipated Bipole III environmental monitoring program.

The Bog Range

The HVdc transmission line will largely skirt the edges of the Bog Range core use areas and will parallel an existing transmission line corridor where it bisects, for about four miles, a narrow strip of the range containing core use area and potential calving habitat. The potential effects associated with predation are expected to not be cumulative because the HVdc line will parallel an existing line. There is also a groomed snowmobile trail, maintained by Snoman Inc. (Snowmobilers Association of Manitoba) on the existing transmission right-of-way and thus it is unlikely that the new HVdc line will experience similar snow pack and snowmobile activity.

Summary of Residual Effects on Boreal Woodland Caribou

Sensory disturbance due to clearing of and on-going access to the right-of-way by construction crews as the line is assembled may result in short-term avoidance and displacement for all three ranges. Possible effects of disturbance via construction will likely be focused to the immediate vicinity of construction activity. The degree of avoidance will depend on the frequency of vehicular traffic and is expected to vary as site preparation activity proceeds along the route. Boreal woodland caribou may be temporarily displaced due to disturbance and access if they are present during construction.

The nature of the terrain in all three ranges (i.e., open and sparsely treed bogs) is more accessible today by snowmobile than the more dense coniferous habitats occupied by boreal woodland caribou in other ranges thus already making them more susceptible to illegal hunting and poaching. Increased access increases the risk of poaching of animals during winter in their core use areas.

There is also potential for increased movement of grey wolves along the right-of-way following construction for all three ranges. This movement is facilitated due to the compaction of snow along the right-of-way by machinery and human movement.

In order to address the various potential Project effects that could not be managed by routing, there are a number of mitigation measures that have been identified. Of particular importance are measures that will mitigate against predator movement, while maintaining connected and non fragmented landscapes, particularly in critical core winter use areas and potential calving areas. The use of wildlife corridors and buffers in selected areas can provide for landscape connectivity, facilitating natural and un-restricted movement for wildlife (Barrows *et al.* 2011; Bennet and Mulongov 2006;

Chetkiewcz and Boyce 2009; Tishendor and Fahrig 2000). The use of wildlife corridors and buffers is also recommended in the Forestry Wildlife Guidelines for Manitoba. The maintenance of natural, low tree cover within selected areas in the right-of-way, to maintain landscape function, will discourage human use and predator movement while facilitating the natural movement of boreal woodland caribou within core areas.

The specific mitigation activities that will be implemented to address the potential effects are as follows:

- Timing of construction (winter) will mitigate sensory disturbance on females during calving and calf rearing in calving areas.
- Natural low tree cover in the Wabowden and Bog ranges will be maintained in core winter use areas and known and potential calving areas to maintain natural functional structure to encourage ongoing use by boreal woodland caribou. Boreal woodland caribou in the Wabowden area have demonstrated movement north and south of the FPR. Natural vegetation corridors for wildlife will be developed on the FPR in strategic locations through the maintenance of naturally low vegetations such as black spruce and tamarack. Strategic locations will be determined through the analysis of current telemetric data and in consultation with Manitoba Conservation.
- Maintenance of low tree cover and the development of natural vegetation corridors will also minimize predator flow through these critical habitats and discourage human use of the right-of-way for snowmobile travel and other uses. Emphasis will be placed on the Wabowden range in core use areas; natural vegetation corridors will also be implemented in The Bog range.
- In the Wabowden range, robust and effective access control to the right-of-way from PTH #6 will be applied near core use areas. This will be based on site specific conditions and methods that halt or limit ATV and snowmobile traffic. Methods include gates (during construction) and the spreading of debris, ditching and trenching (post construction). Natural vegetation will be encouraged and where necessary planting of trees will occur to discourage future snowmobile and ATV access into core winter and summer use areas.
- Future maintenance along the right-of-way during operations will involve helicopter access and minimize snow packing in the Wabowden Range. In other areas development of Manitoba Hydro snowpack trails will be limited in core winter areas to minimize potential predator effects into core areas and potential illegal hunting activities.
- Limiting recreational use and travel by ATVs and snowmobiles along the right-of-way in the core winter use areas and known potential calving areas (Bipole III

Caribou Technical Report 2011) will be encouraged to reduce sensory disturbances and minimize functional habitat loss.

- Ancillary access and other project footprints (staging areas) will be located to avoid core use areas and reduce potential disturbance, functional habitat loss, and temporary range fragmentation. Areas temporarily cleared for Project construction will be rehabilitated through the planting of native vegetation to facilitate a quick recovery to natural low growing vegetation that will provide security cover to encourage animal movement across the right-of-way in future.
- Hunting by Project personnel will be prohibited and firearms use restricted in work camps and areas which will minimize mortality.
- Long term monitoring of the boreal caribou ranges intersected by the Project will continue and include population monitoring, and assessment of recruitment and mortality. Data will be gathered through satellite collaring and assessments will be conducted on sensory disturbance and avoidance of the right-of-way and overall range fragmentation.
- Monitoring of wolves will be conducted in all boreal woodland caribou ranges intersecting the Project using aerial surveys and satellite tracking studies to determine use of the right-of-way and increased predation.
- Studies will be initiated on the effects of black bears and the potential effects of the right-of-way on bear activity and predation in calving areas near the right-of-way in the Wabowden range.

Subject to the successful implementation of the mitigation measures outlined above, the residual effects of the HVdc transmission line on boreal woodland caribou are sensory disturbance due to clearing and ongoing access, short-term avoidance and displacement during construction, the risk of an increase in illegal hunting due to additional access, the risk of an increase in the presence of wolves due to additional access, and increased presence of bears due to an increase in succulent biomass.

The residual effects of the HVdc transmission line on boreal woodland caribou in the Wawbowden, Reed Lake and Bog ranges after successful implementation of the mitigation measures outlined above are expected to be negative in direction, small in magnitude, Project Study Area in geographic extent, short term (construction) and medium term (operation) in duration, regular to continuous in frequency, reversible after Project decommissioning, and therefore not significant.

This assessment is subject to scientific uncertainty and concern, particularly with regard to boreal woodland caribou in the Wabowden range, based on the following considerations:

- There is uncertainty regarding the location of this range and the present size of its population, some of which uncertainty may be resolved in 2012 when the province publishes its revised assessments on these topics.
- There is concern that there is a risk of unsustainable losses in the population of the range from the incremental effects of the Project due to the risk of increased predation, increased hunting and increased presence of bears.
- The probability of there being unsustainable effects due to the Project is indeterminable in part because there is currently no known disturbance threshold for boreal woodland caribou sustainability in general, let alone specifically for boreal woodland caribou in the Wabowden range. Further, there has not been an adaptive management strategy implemented to date for this range and, accordingly, there is no basis today to conclude that such strategy would be 100 % effective in maintaining the population(s), with or without the Project.
- Both the provincial and the federal governments will be publishing new recovery strategies for boreal woodland caribou in 2012; specialists are currently reviewing drafts of these strategies and are trying to reach consensus on the subject of disturbance thresholds.

Current intensive monitoring is helping to reduce the uncertainty in predicting effects on the Wabowden range through the gathering of more data on the size of the range and current recruitment and mortality. Ongoing monitoring will be required with respect to all three ranges to provide early warning of potential population effects, in which cases early responsiveness with an adaptive management plan will be required to ensure that residual effects remain insignificant. Adaptive management actions will be particularly important and required in the Wabowden range, and potentially in the Bog and/or Reed Lake ranges, to further mitigate effects if identified through monitoring. Overall monitoring and adaptive management plans in each range will need to be reviewed and updated as required when the new federal and provincial recovery strategies and provincial assessments for each range are released in 2012.

Integrated management solutions involving Manitoba Conservation will also be important in sustaining these local populations through enforcement of regulations protecting boreal woodland caribou from hunting, access management and the regulation of other resource use activities that may increase the cumulative effects.

Moose

Construction

Transmission lines are expected to have little impact on habitat availability for moose. Potential effects to moose habitat were primarily mitigated during the routing and planning process of the Project. As a result, a relatively small amount (1.1 km^2) of moose habitat is anticipated to be removed for the ac collector lines component of the Project, while it is anticipated that the transmission line right-of-way will intersect 253.6 km of moose habitat in the Project Study Area (Map 8-2). In addition, the Henday-Long Spruce, Keewatinoow construction power and northern electrode line 50 m rights-of-way are anticipated to intersect 3.1 km, 1.2 km and 0.1 km of moose habitat, respectively.

The primary potential negative effect associated with rights-of-way is the potential for increased hunting and poaching via increased access to moose populations which could reduce local moose populations (Richard and Doucet 2003). Additionally, moose are anticipated to avoid the Local Study Area (see Chapter 4; Environmental Assessment Approach for study area definitions) during noise and other sensory disturbance-related activities of construction, such as roads use/creation and construction of the right-of-way and transmission lines.

Effects on moose populations are also anticipated to arise from increased predation from wolves as a result of their increased rate of movement along the rights-of-way. Finally, ungulates in western Manitoba are susceptible to parasites and viruses such as chronic wasting disease. New linear corridors will ultimately contribute to increasing ungulate movement capabilities which influence these effects. Clearing and construction activities in this area may occur during non-winter periods potentially resulting in minor displacement or disruption to calving female moose. There are no population effects expected and the impact would be very minimal. Manitoba Hydro will maintain access control onto the Project site and cooperate with Manitoba Conservation in measures that will protect against excessive harvest in the area including signage and no hunting areas during construction to protect both workers and moose. Manitoba Hydro will work cooperatively with Manitoba Conservation to improve access control through joint access management planning, hunting closures (*Health Safety and Workplace Act*) and hunter education or information initiatives to reduce the effects of overharvest and wastage. Hunting by Project personnel will be prohibited and firearms restricted in work camps and use of access roads for the Local Study Area by hunters limited during construction to minimize moose mortality.

Operation

During Bipole III HVdc Transmission Line operations, local moose populations, movements and habitat area are anticipated to be affected by infrequent maintenance activities of the transmission line and right-of-way, including periodic inspections and vegetation maintenance using helicopters, machinery, vehicles, and people. Such activities area may result in moose avoidance of sensory disturbance. It is anticipated that there may be loss of functional habitat associated with sensory disturbances arising from recreational use (e.g., snowmobiles, ATVs) of cleared rights-of-way. Other potential effects may include increased mortality from increased predation, increased transmission of parasites and diseases associated with access and movements of wolves, and other ungulates along the right-of-way.

The majority of potential negative effects of the Project on core moose habitat and populations in the Project Study Area were mitigated during the planning and routing process. Routing avoided isolated high density moose areas. In addition, mitigation measures developed for the protection and management for riparian and aquatic habitats, specifically use of buffers, will aid in the protection of preferred moose habitat. A listing of river and creek crossings and protection measures that are likely to minimize potential effects to riparian habitats can be found in the Bipole III Aquatics Technical Report.

The following mitigation measures will be applied to moose in the Local Study Area in addition to general mitigation measures:

- In the northern areas disturbances from construction activities will occur during winter which will avoid the sensitive parturition period near potential moose calving sites such as bogs and wetlands.
- Pre-construction surveys will be conducted to identify and locate mineral licks, and specific protection prescriptions developed based on site and environmental conditions.
- Hunting by Project personnel will be prohibited and firearms restricted in work camps and right-of-way access by hunters limited during construction to minimize moose mortality.

Summary Residual Effects

The residual effects on moose from Project construction and operation include potential for: overharvest from increased access; sensory disturbance; some functional habitat loss; increased predation; and increased parasites and disease. The residual effects are characterized as negative in direction, small in magnitude, Local Study Area in geographic extent, medium term in duration (operation), regular/continuous in frequency, reversible and therefore considered not significant.

Elk

Construction

Elk populations and habitat in southwestern and western Manitoba may be affected by the Bipole III HVdc transmission line construction. Potential effects from the ac collector line construction and operation are not expected because spatial overlap does not occur with elk distribution in the province. The main effect of the Project during construction is likely to be habitat alteration, although the potential effect on the local elk population is highly likely to be small because few elk are found in the Local Study Area (Map 8-3). Other potential effects may include a small decrease in the local elk population from mortality associated with increased access, movements, hunting and wolf predation along the right-of-way (Bipole III Mammals Technical Report).

The clearing of aspen forest and the construction of transmission lines will alter elk habitat. Forest used by elk for thermal cover, escape cover and foraging is expected to decrease over a portion of the 76.8 km of the line intersecting with elk habitat; however, large tracts of deciduous forest habitat are available elsewhere in the ecoregions where these populations are found (Bipole III Mammals Technical Report). Grassland and shrubland habitats used for foraging by elk should not be adversely affected where soil and low-growing vegetation are left undisturbed by clearing activities. In the clearing of forest, elk will most likely avoid areas where machinery and work crews are present but will not be permanently displaced if other habitat areas are available for short-term use (Edge *et al.* 1985). Sensory disturbances through the clearing of forests (Guangshun *et al.* 2006) and increased predator movements (James and Stuart Smith 2000) could result in some functional habitat loss from the transmission line right-of-way and, over the short-term, extend into the Local Study Area. In addition, local elk movements across or along the right-of-way may be affected in the short-term by obstructions such as woody debris piles produced during forest clearing.

A few direct and indirect sources of elk mortality from the construction of the HVdc transmission line could result in a small decrease in local elk numbers (Bipole III Mammals Technical Report). The transmission line right-of-way is expected to increase hunter access to areas with elk (Allen 1984), and may potentially result in some elk mortality. There is also the potential for wolves to use rights-of-way as movement corridors (James and Stuart Smith 2000) which may increase the rate of predation on elk where these species overlap, and potentially result in a small increase in elk mortality. Finally, although the risk of vehicle collisions is small, injury or mortality to ungulates such as elk could result from accidental collisions with construction vehicle traffic (Cole *et al*. 1997).

Operation

During Bipole III HVdc transmission line operations local elk populations, movements and habitat would be affected by infrequent maintenance activities, including periodic inspections and vegetation maintenance using helicopters, machinery, vehicles, and people. Although hunting mortality is anticipated to be the main effect of the Project, it is highly likely to be small as few elk occupy habitat in the Local Study Area (Bipole III Mammals Technical Report). Other potential effects may include mortality from increased predation, increased transmission of parasites and diseases associated with access and movements of wolves, deer, moose and elk along the right-of-way. There also may be some loss of functional habitat associated with sensory disturbances arising from recreational use (e.g., snowmobiles, ATVs) of cleared right-of-way.

The majority of negative effects on elk habitat and populations in the Project Study Area were mitigated during the planning and routing process by avoiding core ranges in the Riding Mountain, Duck Mountain and Spruce Woods regions of Manitoba (Bipole III Mammals Technical Report).

Summary Residual Effects

The residual effects on elk from Project construction and operation include potential for: overharvest from increased access; some functional habitat loss; fragmentation; sensory disturbance; increased transmission of disease and parasites; and increased predation. The residual effects are characterized as negative in direction, small in magnitude, Local Study Area in geographic extent, medium term in duration (operation), regular/continuous in frequency, reversible, and therefore considered not significant.

American Marten

Construction

American marten habitat occurs regularly along the transmission line right-of-way. This species prefers mature conifer forest (Chapin *et al*. 1997) and due to this specific habitat preference, may experience stronger effects via habitat removal conducted during the Project lifespan than species with more general habitat requirements. With the exception of dispersing juveniles, marten will likely be affected by habitat loss at a local level due to moderate home range sizes.

Despite the higher presence of marten in the more northern ecoregions, analysis of the Local Study Area shows that highest impact of this Project will be on marten habitat in the more southern marten populations, specifically in the Hayes River Upland and Mid-Boreal Upland Ecoregions. It is anticipated that 2.2 km^2 of a total of 436.7 km^2 of marten habitat in the Local Study Area will be removed for the ac collector lines, while it is anticipated that the HVdc transmission line right-of-way will intersect 92.9 km of marten habitat in the Local Study Area (Map 8-4). It is anticipated that the Henday-Long Spruce right-of-way will intersect 1.6 km of marten habitat.

Construction is expected to have a negative effect on marten populations. Sensory disturbance due to clearing of and ongoing access along of the right-of-way by construction crews as the line is constructed may result in short-term avoidance of a relatively small area by marten (Bipole III Mammals Technical Report).

Mitigation measures for Project effects on American marten are limited and consist primarily of routing the proposed Project away from marten habitat. As a result, potential negative effects of the Project on core coniferous marten habitat and populations were primarily mitigated for during the planning and routing process.

Operation

Operation of the transmission lines is expected to have a negligible impact on marten populations. No additional habitat will be lost during operations; however, fragmentation may remain an issue. Depending upon the degree of overlap of American marten home ranges with the transmission line, the Project will likely have a minimal, long-term effect on a small number of individuals.

American marten are commonly trapped in the Project Study Area (Bipole III Resource Use Technical Report). Trapping mortality is expected to potentially be the largest effect on marten populations within the Project Study Area due to increased access. Marten populations tend to be cyclic and existing trapping regulations provide for conservation and management of this species. Access created by the right-of-way may provide increased opportunities for trappers in areas that were previously remote.

Mitigation measures for Project effects on American marten are limited and consist primarily of routing the proposed Project away from large contiguous and intact forest which is high quality marten habitat. As a result, potential negative effects of the Project on core coniferous marten habitat and populations were primarily mitigated for during the planning and routing process. The following mitigation measures will address the majority of residual effects on American marten.

- Clearing of the right-of-way during winter months to lessen disturbance of female marten and their young.

Summary Residual Effects

The residual effect on American marten from Project construction and operation is mainly short term displacement during construction; functional habitat loss; fragmentation; sensory disturbance; and increased mortality due to trapping. The residual effects are characterized as negative in direction, moderate in magnitude, Local Study Area in geographic extent, medium term in duration (operation), regular/continuous in frequency, reversible, and therefore considered not significant.

Beaver

Construction

Beaver populations and habitat may be affected by Bipole III HVdc transmission line and ac collector line construction. The clearing of forested stands and construction of transmission lines will alter beaver habitat by reducing available material used in building lodges. These losses will only occur in the portion of the 79.7 km^2 area to be altered through ac collector line construction where suitable riparian habitat and beavers are currently present (Map 8-5). Stream crossings and wetland areas used as habitat by beaver should not be adversely affected through HVdc transmission line and ac collector line construction as beaver are relatively adaptable to changes in the physical environment (Hood and Bayley 2008). In the clearing of forested areas beaver will likely avoid areas where machinery and work crews are present but would not be permanently displaced after construction is completed. Additionally, the removal of woody vegetation may affect the ability of beavers to build lodges in proximity to stream crossings (Curtis and Jensen 2004).

Direct and indirect sources of beaver mortality from the construction of the HVdc transmission line and ac collector lines are not expected (Bipole III Mammals Technical Report). As the rights-of-way are cleared and the transmission line constructed in winter, increased predator access and predation (James and Stuart Smith 2000) are negligible, as most beaver are found inside frozen lodges or under the ice. Although trapper access could increase during the clearing and construction along the transmission line rights-of-way, trapper effort is more likely to decrease in areas where heavy machinery and vehicles are operating (Bipole III Mammals Technical Report). As an overall result, local-level beaver mortality is highly unlikely to be affected during the construction period.

Operation

Beaver populations and habitat may be affected through the operation and maintenance of the Bipole III HVdc transmission and ac collector lines. Operation and maintenance of transmission and collector lines and right-of-way through mechanized clearing may lead to some temporary avoidance of these areas by beaver. The continued presence of rights-of-way could also serve to increase trapper access to beaver locations and lead to some increases in mortality.

Mitigation measures developed for the protection and management of riparian and aquatic habitats, specifically use of buffers, will aid in the protection of beaver habitat. A listing of river and creek crossings and protection measures that are likely to minimize potential effects to riparian habitats can be found in the Bipole III Aquatic Technical Report. In addition, provincial harvest management strategies that regulate trapping activities will continue to play an important role in maintaining beaver populations in the Local Study Area.

Summary Residual Effects

The residual effect on beaver from Project construction and operation is mainly decreased local beaver population and some sensory disturbance. The residual effects are characterized as negative in direction, small in magnitude, Project Site/Footprint area in geographic extent, medium term in duration (operation), sporadic/intermittent in frequency, reversible, and therefore considered not significant.

Wolverine

Construction

Based on aerial tracking, areas containing high wolverine densities were not located within the Project Study Area; thus the effects of the Project on wolverine populations are anticipated to be minimal.

Wolverines have large area requirements and naturally low abundance (Dalerum *et al.* 2008). In Manitoba, wolverines occupy the province north of 53 latitude and recent increases in the extent of the provincial range have been noted (Bipole III Mammals Technical Report). Given their large home ranges, wolverines are expected to avoid disturbance during development where wolverine populations exist/overlap with the Project Study Area and use other parts of their home ranges during this avoidance. Wolverines are also expected to avoid areas with major transportation routes and disturbance, such as highways and construction sites. Though no denning sites have been found within the Project Study Area to date, effects of the Project may include denning site disturbance during the construction phase. Clearing in wolverine range will occur during winter when dens are non-active.

Operation

Based on the results of field studies and aerial track surveys, areas containing high wolverine densities were avoided during the routing of the HVdc transmission line; thus the effects of the Project on wolverine populations within the Project Study Area are anticipated to be minimal.

It is anticipated that with increases in trapper access to previously remote areas via transmission line rights-of-way and associated access roads, trapping and mortality of wolverines may increase in some areas, but this will have a negligible effect on wolverine populations.

The majority of negative effects of the Project on wolverine in the Project Study Area were mitigated for during the planning and routing process whereever possible. While the anticipated effects on wolverine populations are expected to be minimal, mitigation measures, such as the provincial harvest management strategies that regulate trapping activities, are recommended for wolverine ranges which overlap with the Project Study Area. These management strategies play an important role in monitoring changes and reducing effects to wolverine population numbers and status.

Summary Residual Effects

The residual effects on wolverine from Project construction include potential for: sensory disturbance. The residual effects are characterized as negative in direction, small in magnitude, Project Site/Footprint assessment area in geographic extent, short term in duration, infrequent in frequency, reversible, and therefore considered not significant.

The residual effects for wolverine during Project operation include potential for overharvest through trapping and increased access and are characterized as negative in direction, small in magnitude, Local Study Area in geographic extent, medium term in duration, regular/continuous in frequency, reversible and therefore considered not significant.

In addition the residual effects on wolverine from Project operation include potential for sensory disturbance. The residual effects are characterized as negative in direction, small in magnitude, Project Site/Footprint assessment area in geographic extent, medium term in duration, infrequent in frequency, reversible, and therefore considered not significant.

Sites Access Roads

Site access roads can be considered in two categories – existing site access roads that will be employed for the Project, and new site access roads that will have to be cleared and constructed for the Project. The following subsections provide a summary of effects and mitigation recommendations for all VEC mammals potentially affected by existing and new site access roads created and used for the Project.

Moose

Construction

Based on the mapping provided in the Bipole III Mammals Technical Report (2011), a small amount of moose habitat is anticipated to overlap existing access roads and new site access roads being constructed for the Project. As a result, a small amount of moose habitat is anticipated to be removed for this Project component. In addition to the possible effects of a small amount of habitat removal, moose are anticipated to avoid the Local Study Area during noise related construction activities, such as site access road use.

It is anticipated that with increases in access roads there will be the potential for increased hunting and poaching via increased access to moose populations, which may serve to ultimately reduce local moose populations.

The majority of negative effects of the Project on core moose habitat and populations in the Local study area were mitigated during the planning and routing process.

Clearing and construction activities in this area may occur during non-winter periods potentially resulting in minor displacement or disruption to calving and female moose. There are no population effects expected and the impact would be very minimal. Manitoba Hydro will control access to the Project site and cooperate with Manitoba Conservation in measures that will protect against excessive harvest in the area including signage and no hunting areas during construction to protect both workers and moose. Manitoba Hydro will work cooperatively with Manitoba Conservation to control access through joint access management planning, hunting closures (*Health Safety and Workplace Act*) and hunter education or information initiatives to reduce the effects of overharvest and wastage. Hunting by Project personnel will be prohibited and firearms restricted in work camps. Hunter use of access roads in the Local Study Area will be controlled during construction to minimize moose mortality.

The residual effects are characterized as negative in direction, small in magnitude, Local Study Area in geographic extent, short term in duration, regular/continuous in frequency, reversible, and therefore considered not significant.

Operation

During the operation phase of the Project local moose populations, movements and habitat area are anticipated to be affected within the Local Study Area by maintenance and operation activities along access roads, but to a minimal extent. Such activities may result in moose avoidance of sensory disturbance.

The primary potential effect associated with access roads is the potential for increased hunting and poaching in the Local Study Area via increased access which could reduce local moose numbers. In addition, with increased public access to remote areas via access roads, trails and the rights-of-way, it is expected that the number of vehicle collisions/moose mortality could increase and detour species away from active areas (Jalkotzy 1997). However, it is unlikely that moose/vehicle collisions will impact local populations. Effects on moose populations are anticipated to arise from increased predation from wolves as a result of their increased rate of movement along the linear features and access roads.

The following mitigation measures will be applied to moose in the Local Study Area in addition to general mitigation measures: In the northern areas disturbances from construction activities will occur during winter which will avoid the sensitive parturition period near potential moose calving sites such as bogs and wetlands. Pre-construction surveys will be completed to identify and locate mineral licks. Specific prescriptions will be developed based on site and environmental conditions. Hunting by Project personnel will be prohibited and firearms restricted in work camps and access to Project site by hunters during construction limited to minimize moose mortality.

The residual effects on moose from Project operation include potential for: over harvesting due to increased access and increased predation. The residual effects are characterized as negative in direction, small in magnitude, Local Study Area in geographic extent, medium term in duration, regular/continuous in frequency, reversible, and therefore considered not significant.

Elk

As elk range associated with the Project Study Area is located in southwestern and western Manitoba, site access roads are not anticipated to directly or indirectly affect elk populations or habitat (Bipole III Mammals Technical Report).

American Marten

Construction

Based on the mapping provided in the Bipole III Mammals Technical Report, a small amount of marten habitat is anticipated to overlap existing sites access roads set to be used for the Project. As a result, net habitat loss is anticipated for marten due to this Project component. Sensory disturbance due to ongoing access of the Local study area by construction crews may result in short-term avoidance of a relatively small area by marten.

The following mitigation measures are recommended for marten in the Local Project Area:

- Long-term storage of cleared vegetation that may impede marten movement and increase the risk of forest fires will be avoided; and
- Recreational, public and vehicle access will be limited along the Local Study Area to reduce sensory disturbances and minimize functional habitat loss.

The residual effects on American marten from Project construction include potential for sensory disturbance. The residual effects are characterized as negative in direction, moderate in magnitude, Local Study Area in geographic extent, short-term in duration, regular/continuous in frequency, reversible, and therefore considered not significant.

Operation

During the operation phase of the Project, site access roads are anticipated to have a negligible effect on marten populations. No habitat will be lost during the operation phase; however, fragmentation may remain an issue.

American marten are commonly trapped in the Project Study Area (Bipole III Resource Use Technical Report); as a result trapping mortality is expected to have an effect on marten populations within the Local study area due to increased access roads.

The following mitigation measures will address the majority of residual effects on American marten. The rights-of-way will be cleared during winter months to lessen disturbance of female marten and their young.

The residual effects on American marten from Project operation include potential for: overharvesting due to increased access and habitat fragmentation. The residual effects are characterized as negative in direction, moderate in magnitude, Local Study Area in geographic extent, medium term in duration, regular/continuous in frequency, reversible, and therefore considered not significant.

Beaver

Construction

Based on the mapping provided in the Bipole III Mammals Technical Report (2011) a small amount of beaver habitat is anticipated to overlap existing sites access roads set to be used for the Bipole III Transmission Project. As a result, not habitat loss is anticipated for beaver due to this project component. Sensory disturbance due to ongoing access of the Local study area by construction crews may result in short-term avoidance of a relatively small area by beaver. During the construction of Project components, beaver may avoid access roads where heavy machinery, vehicle movements, people, noise and clearing of forests is occurring. Direct and indirect sources of beaver mortality via access roads are not expected (Bipole III Mammals Technical Report). Although trapper access could increase during the clearing and construction of the Local Study Area, trapper effort is more likely to decrease in areas where heavy machinery and vehicles are operating (Bipole III Mammals Technical Report). As an overall result, local-level beaver mortality is highly unlikely to be affected via access roads.

The majority of potential negative effects of the Project on riparian and aquatic (beaver) habitats in the Project Area were primarily mitigated for during the planning and routing process.

The residual effects on beaver from Project construction include potential for: sensory disturbance. The residual effects are characterized as negative in direction, small in magnitude, Project site/footprint assessment area in geographic extent, short term in duration, once in frequency, reversible, and therefore considered not significant.

Operation

Populations of beaver are widely distributed and are very abundant within preferred habitats in the Local Study Area (Bipole III Mammals Technical Report). During the operation phase of the Bipole III Transmission Project, site access roads are anticipated to have a negligible effect on beaver populations.

New access in the Local Study Area could lead to a small increase in trapping opportunities and this may result in limited and localized beaver mortality related to trapping. No measureable population-level decline is anticipated for beaver populations as a result of this Project. The majority of potential negative effects of the Project on riparian and aquatic (beaver) habitats in the Local Study Area were primarily mitigated for during the planning and routing process. Access management and provincial harvest management strategies that regulate trapping activities will continue to play an important role in maintaining beaver populations in the Local Study Area.

Mitigation measures developed for the protection and management for riparian and aquatic habitats, specifically use of buffers, will aid in the protection of beaver habitat. A listing of river and creek crossings and protection measures that are likely to minimize potential effects to riparian habitats can be found in the Bipole III Aquatics Technical Report. In addition, provincial harvest management strategies that regulate trapping activities will continue to play an important role in maintaining beaver populations in the Local Study Area.

The residual effects on beaver from Project operation include potential for overharvesting due to increased access. The residual effects are characterized as negative in direction, small in magnitude, Project Site/Footprint assessment area in geographic extent, medium term in duration, sporadic/intermittent in frequency, reversible, and therefore considered not significant.

Wolverine

Construction

Based on aerial tracking, areas containing high wolverine densities were not located within the Local Study Area; thus the effects of the Project on wolverine populations within the Local Study Area are anticipated to be minimal. Given their large home ranges, wolverines are expected to avoid disturbance during development where wolverine populations exist/overlap with the Local study area and used other extents of their home ranges during disturbance.

Though no denning sites have been found within the Project Area to date, effects of the Project may include denning site disturbance during the construction phase of the Project. Clearing in wolverine range will occur during winter when dens are non active.

The residual effects on wolverine from Project construction include potential for: sensory disturbance. The residual effects are characterized as negative in direction, small in magnitude, Local Study Area in geographic extent, short term in duration, regular/continuous in frequency, reversible, and therefore considered not significant.

Operation

Based on aerial tracking, areas containing high wolverine densities were not located within the Local Study Area; thus the effects of the Project on wolverine populations within the Local study area are anticipated to be minimal. The following mitigation measures are recommended for wolverine ranges which overlap with the Local Study Area: provincial harvest management strategies that regulate trapping activities will continue to play an important role in monitoring changes and reducing effects to wolverine population numbers and status. Manitoba Hydro will maintain access control to the Project site and cooperate with Manitoba Conservation in measures that will protect excessive harvest in the area including signage and no hunting areas during construction to protect both workers and wolverine.

The residual effects on wolverine from Project operation include potential for: sensory disturbance. The residual effects are characterized as negative in direction, small in magnitude, Local Study Area in geographic extent, medium term in duration, regular/continuous in frequency, reversible, and therefore considered not significant.

Keewatinoow Converter Station and Area

Moose

Construction

The Keewatinoow Converter Station is expected to have little impact on habitat ability for moose. Moose habitat was primarily mitigated for during the routing and planning process of the Project. As a result, a relatively small amount (2.6 km^2) of moose habitat is anticipated to be removed for this component of the Project (Bipole III Mammals Technical Report 2011). In addition to habitat removal, moose are anticipated to avoid the Local Study Area during noise related activities of construction, such as roads use/creation and construction. It is anticipated that with increases in construction sites and associated access roads that there will be the potential for increased hunting and poaching via increased access to moose populations, which may serve to ultimately reduce local moose populations.

The majority of negative effects of the Project on core moose habitat and populations in the Local study area were mitigated for during the planning and routing process. While this reduce reduces the number of potential negative effects of the Project on moose, the following mitigation measures are recommended for moose in the Local Project Area.

- Clearing and construction activities in this area may occur during non-winter periods potentially resulting in minor displacement or disruption to calving and female moose. There are no population effects expected and the impact would be very minimal.
- Manitoba Hydro will maintain access control onto the Project site and cooperate with Manitoba Conservation in measures that will protect excessive harvest in the area including signage and no hunting areas during construction to protect both workers and moose.
- Manitoba Hydro will work cooperatively on with Manitoba Conservation on access control through joint access management plan, hunting closures (*Health Safety and Workplace Act*) and hunter education or information initiatives to reduce the effects of overharvest and wastage.
- Hunting by Project personnel will be prohibited and firearms restricted in work camps.
- Access by hunters during construction will be limited on access roads for the Local study area to minimize moose mortality.

The residual effects on moose from Project construction include potential for: functional habitat loss; sensory disturbance; and overharvest from increased access. The residual effects are characterized as negative in direction, small in magnitude, Project Site/Footprint assessment area in geographic extent, short term in duration, infrequent in frequency, reversible, and therefore considered not significant.

Operation

During Keewatinoow Converter Station operations, local moose populations, movements and habitat area anticipated to be affected by maintenance and operation activities affecting the Local Study Area. Such activities area may result in moose avoidance of sensory disturbance. It is anticipated that there may be loss of functional habitat associated with sensory disturbances to use of cleared Local Study Area.

The primary potential effect associated with the Local Study Area and associated access roads is the potential for increased hunting and poaching via increased access to local moose areas which could reduce local moose numbers. In addition, with increased public access to remote area via increases access roads, trails and rights-of way, it is expected that the number of vehicle collisions/moose mortality could increase and detour species away from active areas (Jalkotzy 1997). However, it is unlikely that moose/vehicle collisions will impact local populations. Effects on moose populations are anticipated to arise from increased predation by wolves as a result of their increased rate of movement along the linear features and access roads.

The following mitigation measures are recommended for moose in the Local Study Area:

- In northern areas, disturbances from construction activities will occur during winter which will avoid the sensitive parturition period near potential moose calving sites such as bogs and wetlands.
- Clearing and construction activities in this area that occurs during non-winter periods may result in minor displacement or disruption to calving and female moose. There are no population effects expected and the impact would be very minimal.
- Manitoba Hydro will maintain access control onto the Project site and cooperate with Manitoba Conservation in measures that will protect excessive harvest in the area including signage and no hunting areas during construction to protect both workers and moose.
- Manitoba Hydro will work cooperatively on with Manitoba Conservation include access control through joint access management plan, hunting closures (*Health Safety and Workplace Act*) and hunter education or information initiatives to reduce the effects of overharvest and wastage.

- Hunting by Project personnel will be prohibited and firearms restricted in work camps.
- Access by hunters during construction will be limited on access roads for the Local study area to minimize moose mortality.
- Preconstruction surveys will be conducted to identify and locate mineral licks. Specific prescriptions will be developed to protect them based on site and environmental conditions.

The residual effects on moose from Project operation include potential for: sensory disturbance; functional habitat loss; overharvesting due to increased access; and increased predation. The residual effects are characterized as negative in direction, small in magnitude, Project Site/Footprint assessment area in geographic extent, medium term in duration, infrequent in frequency, reversible, and therefore considered not significant.

Elk

An elk range associated with the Project Study Area is located in southwestern and western Manitoba The construction or operation of the Keewatinoow Converter Station is not anticipated to directly or indirectly affect elk populations or habitat (Bipole III Mammals Technical Report).

American Marten

Construction

American marten habitat occurs in the vicinity of the Keewatinoow Converter Station. This species prefers mature conifer forest (Chapin *et al*. 1997) and due to this specific habitat preference, may experience greater effects via habitat removal conducted during the Project lifespan than species with more general habitat requirements. With the exception of dispersing juveniles, marten will likely be affected by habitat loss at a local level due to moderate home range sizes. Overall, it is anticipated that less than 0.1 km^2 of marten habitat in the Local study area will be removed for Keewatinoow Converter Station (Bipole III Mammals Technical Report). Construction is expected to have a negligible effect on marten populations. Sensory disturbance due to clearing and ongoing access of the Local Study Area by construction crews may result in short-term avoidance of a relatively small area by marten.

The following mitigation measure is recommended for marten in the Local Study Area:

- Manitoba Hydro will maintain access control for the Project site and cooperate with Manitoba Conservation in measures that will protect excessive harvest in the area including signage and no hunting areas during construction to protect both workers and marten.

The residual effects on American marten from Project construction include potential for: functional habitat loss and sensory disturbance. The residual effects are characterized as negative in direction, moderate in magnitude, Project Site/Footprint assessment area in geographic extent, short term in duration, infrequent in frequency, reversible, and therefore considered not significant.

Operation

Operation of the Project is expected to have a negligible impact on marten populations. No additional habitat will be lost during operations; however, fragmentation may remain an issue. Depending upon the degree of overlap of American marten home ranges with the Local Study Area, it will likely have a small, long-term effect on a small number of individuals.

American marten are commonly trapped in the Project Study Area (Bipole III Resource Use Technical Report); as a result trapping mortality is expected effect on marten populations within the Local Study Area due to increased access.

The following mitigation measures are recommended for marten in the Local Study Area:

- Construction will occur during winter within Project site to lessen disturbance of female marten and their young.
- Manitoba Hydro will maintain access control onto the Project site and cooperate with Manitoba Conservation in measures that will protect excessive harvest in the area including signage and no hunting areas during construction to protect both workers and marten.

The residual effects on American marten from Project operation include potential for: habitat fragmentation and overharvesting due to increased access. The residual effects are characterized as negative in direction, moderate in magnitude, Project Site/Footprint assessment area in geographic extent, medium term in duration, infrequent in frequency, reversible, and therefore considered not significant.

Beaver

Construction

Beaver populations and habitat may be affected by Keewatinoow Converter Station construction. During the construction of these Project components, beaver may avoid areas where heavy machinery, vehicle movements, people, noise and clearing of forests is occurring. Alternately, the removal of woody vegetation may affect the ability of beavers to build lodges in proximity to stream crossings (Curtis and Jensen 2004). Beaver mortality is not expected from increased predation, accidents or trapping during the construction period.

The clearing of forested stands and construction of transmission lines will alter beaver habitat through reducing available material used in building lodges. A small amount (0.1 km^2) of beaver habitat is anticipated to be removed for this component of the Project (Bipole III Mammals Technical Report). Stream crossings and wetland areas used as habitat by beaver should not be adversely affected through Keewatinoow Converter Station construction as beaver are relatively adaptable to changes in the physical environment (Hood and Bayley 2008). In the clearing of forested areas beaver will likely avoid areas where machinery and work crews are present but would not be permanently displaced after construction is completed.

Direct and indirect sources of beaver mortality from the construction of the Keewatinoow Converter Station are not expected (Bipole III Mammals Technical Report). If it is to be constructed in winter, increased predator access and predation are negligible at this time of year, as most beaver are found inside frozen lodges or under the ice. Although trapper access could increase during the clearing and construction of the Local Study Area, trapper effort is more likely to decrease in areas where heavy machinery and vehicles are operating (Bipole III Mammals Technical Report). As an overall result, local-level beaver mortality is highly unlikely to be affected during the construction period.

The majority of potential negative effects of the Project on riparian and aquatic (beaver) habitats in the Project Area were primarily mitigated for during the planning and routing process.

The residual effects on beaver from Project construction include potential for: sensory disturbance and functional habitat loss. The residual effects are characterized as negative in direction, small in magnitude, Project Site/Footprint assessment area in geographic extent, short term in duration, once in frequency, reversible, and therefore considered not significant.

Operation

Populations of beaver are widely distributed and are very abundant within preferred habitats in the Local Study Area (Bipole III Mammals Technical Report). Despite this small amount of habitat loss, maintenance activities may result in keeping habitat along the Local Study Area at an early successional stage, and become a food source for beavers located in undisturbed ponds near the Local Study Area.

New access in the Local Study Area could lead to a small increase in trapping opportunities and this may result in limited and localized beaver mortality related to trapping. No measureable population-level decline is anticipated for beaver populations as a result of this Project. The majority of potential negative effects of the Project on riparian and aquatic (beaver) habitats in the Local Study Area were primarily mitigated for during the planning and routing process. Mitigation measures developed for the protection and management for riparian and aquatic habitats, specifically use of buffers, will aid in the protection of beaver habitat. A listing of river and creek crossings and protection measures that are likely to minimize potential effects to riparian habitats can be found in the Bipole III Aquatic Technical Report. In addition, provincial harvest management strategies that regulate trapping activities will continue to play an important role in maintaining beaver populations in the Local Study Area.

The residual effects on beaver from Project operation include potential for a small increase in trapping. The residual effects are characterized as negative in direction, small in magnitude, Project Site/Footprint assessment area in geographic extent, medium term in duration, sporadic/intermittent in frequency, reversible, and therefore considered not significant.

Wolverine

Construction

Based on aerial tracking, areas containing high wolverine densities were not located within the Local Study Area; thus the effects of the Project on wolverine populations within the Local Study Area are anticipated to be minimal. Given their large home ranges, wolverines are expected to avoid disturbance during development where wolverine populations exist/overlap with the Local Study Area and used other extents of their home ranges during this avoidance. Wolverines are also expected to avoid areas with major transportation routes and disturbance, such as highways and construction sites. Though no denning siites have been found within the Project Area to date, effects of the Project may include denning site disturbance during the construction phase of the Project. Clearing in wolverine range will occur during winter when dens are non–active.

The majority of negative effects of the Project on wolverine in the Local Study Area were mitigated for during the planning and routing process where-ever possible. While the anticipated effects on wolverine populations are expected to be minimal, the following mitigation measures are recommended for wolverine ranges which overlap with the Local Study Area:

- Clearing in wolverine range will occur during winter when dens are non-active.

The residual effects on wolverine from Project construction include potential for sensory disturbance and functional habitat loss. The residual effects are characterized as negative in direction, small in magnitude, Project Site/Footprint assessment area in geographic extent, short term in duration, once in frequency, reversible, and therefore considered not significant.

Operation

Based on aerial tracking, areas containing high wolverine densities were not located within the Local Study Area; thus the effects of the Project on wolverine populations within the Local Study Area are anticipated to be minimal. The following mitigation measures are recommended for wolverine ranges which overlap with the Local Study Area:

- Provincial harvest management strategies that regulate trapping activities to play an important role in monitoring changes and reducing effects to wolverine population numbers and status.
- Manitoba Hydro will maintain access control onto the Project site and cooperate with Manitoba Conservation in measures that will protect excessive harvest in the area including signage and no hunting areas during construction to protect both workers and wolverine.

The residual effects on wolverine from Project operation include potential for small amounts of sensory disturbance and harvesting. The residual effects are characterized as negative in direction, small in magnitude, Project Site/Footprint assessment area in geographic extent, medium term in duration, infrequent in frequency, reversible, and therefore considered not significant.

Borrow and Excavation Sites

The following subsections provide a summary of effects and mitigation recommendations for all VEC mammals potentially affected by Borrow and Excavation Sites in the Keewatinoow area. Based on the nature and function of borrow sites, no effects are expected to arise via borrow and excavation sites during the operation phase of the Bipole III Transmission Project.

Moose

Based on the mapping provided in the Bipole III Mammals Technical Report a small amount of moose habitat is anticipated to overlap with Bipole III Transmission Project borrow and excavation sites. In addition to the possible effects of a small amount of habitat removal, moose are anticipated to avoid the Local Study Area during noise related activities of construction, such as road use and excavation.

It is possible that with the creation of borrow and excavation sites there may be increased hunting and poaching via increased access to moose populations, which may serve to ultimately reduce local moose populations. The following mitigation measures are recommended for moose in the Local Study Area.

- Clearing and construction activities in this area may occur during non-winter periods potentially resulting in minor displacement or disruption to calving and female moose. There are no population effects expected and the impact would be very minimal.
- Manitoba Hydro will maintain access control onto the Project site and cooperate with Manitoba Conservation in measures that will protect excessive harvest in the area including signage and no hunting areas during construction to protect both workers and moose.
- Manitoba Hydro will work cooperatively with Manitoba Conservation on access control through joint access management planning, hunting closures (*Health Safety and Workplace Act*) and hunter education or information initiatives to reduce the effects of overharvest and wastage.
- Hunting by Project personnel will be prohibited, firearms restricted in work camps and use of access roads for the Local Study Area by hunters limited during construction to minimize moose mortality.

The residual effects on moose from Project construction include potential for sensory disturbance and overharvesting due to increased access. The residual effects are characterized as negative in direction, small in magnitude, Project Site/Footprint assessment area in geographic extent, short term in duration, infrequent in frequency, reversible, and therefore considered not significant.

Elk

As elk range associated with the Project Study Area is located in southwestern and western Manitoba, borrow and excavation sites are not anticipated to directly or indirectly affect elk populations or habitat (Bipole III Mammals Technical Report).

American Marten

Based on the mapping provided in the Bipole III Mammals Technical Report a small amount of marten habitat is anticipated to overlap with Project borrow and excavation sites. As a result of activity at these sites, sensory disturbance due to clearing of the Local Study Area by construction crews may result in short-term avoidance of a relatively small area by marten.

The following mitigation measures are recommended for marten in the Local Study Area:

- Manitoba Hydro will maintain access control onto the Project site and cooperate with Manitoba Conservation in measures that will protect excessive harvest in the area including signage and no hunting areas during construction to protect both workers and marten.

Based on the above mitigation measures, there are no residual effects anticipated for marten.

Beaver

Based on the mapping provided in the Bipole III Mammals Technical Reports a small amount of beaver habitat is anticipated to overlap with Bipole III Transmission Project borrow and excavation sites. In the clearing of forested areas for this small project component, beaver will likely avoid areas where machinery and work crews are present but would not be permanently displaced after construction is completed.

The majority of potential negative effects of the Project on riparian and aquatic (beaver) habitats in the Local study area were primarily mitigated for during the planning and routing process.

Based on the above mitigation measures, there are no residual effects anticipated for beaver.

Wolverine

Based on aerial tracking, areas containing high wolverine densities were not located within the Local Study Area; thus the effects of the Project on wolverine populations within the Local Study Area are anticipated to be minimal. Given their large home ranges, wolverines are expected to avoid disturbance during development where wolverine populations exist/overlap with the Local study area and used other extents of their home ranges during disturbance.

Though no denning sites have been found within the Project Area to date, effects of the Project may include denning site disturbance during the construction phase. Clearing in wolverine range will occur during winter when dens are non-active. Specific mitigation measures will be applied during the construction phase if wolverine denning sites are discovered.

The following mitigation measure is recommended for wolverine ranges which overlap with the Local Study Area:

- Clearing in wolverine range will occur during winter when dens are non-active.

The residual effects on wolverine from Project construction include potential for sensory disturbance. The residual effects are characterized as negative in direction, small in magnitude, Project Site/Footprint assessment area in geographic extent, short term in duration, infrequent in frequency, reversible, and therefore considered not significant.

Riel Converter Station

Based on analysis documented in the Bipole III Mammals Technical Report no effects are expected on VEC mammal species from construction or operation of the Riel Converter Station.

Ground Electrodes and Lines

Based on their geographical extents, the assessments were broken into northern and southern categories. However, based on analysis documented in the Bipole III Mammals Technical Report no construction or operation effects are expected on VEC mammal species via the southern ground electrodes and lines and so the following sections are summations for possible effects on VEC and VEC linkage species and related mitigation recommendations for the northern ground electrodes and line construction and operation . The following subsections provide a summary of effects and mitigation recommendations for all VEC mammals potentially affected by the Northern Ground Electrodes and Lines construction and operation.

Moose

Construction

The northern ground electrodes and lines are expected to have little impact on habitat availability for moose. A relatively small amount (2.6 km^2) of moose habitat is anticipated to be removed for this component of the Project (Bipole III Mammals Technical Report, 2011). In addition to habitat removal, moose are anticipated to avoid the Local Study Area during noise related activities of construction, such as roads use/creation and construction. It is anticipated that with increases in construction sites and associated access roads that there will be the potential for increased hunting and poaching via increased access to moose populations, which may serve to ultimately reduce local moose populations. The following mitigation measures are recommended for moose in the Local Study Area:

- Clearing and construction activities in this area may occur during non-winter periods potentially resulting in minor displacement or disruption to calving and female moose. There are no population effects expected and the impact would be very minimal. Manitoba Hydro will maintain access control onto the Project site and cooperate with Manitoba Conservation in measures that will protect excessive harvest in the area including signage and no hunting areas during construction to protect both workers and moose.

- Manitoba Hydro will work cooperatively with Manitoba Conservation on access control through joint access management planning, hunting closures (*Health Safety and Workplace Act*) and hunter education or information initiatives with Manitoba Conservation to reduce the effects of overharvest and wastage.
- Hunting by Project personnel will be prohibited, firearms restricted in work camps and use of access roads for the Local Study Area by hunters during construction to minimize moose mortality.

The residual effects on moose from Project construction include potential for overharvesting due to increased access. The residual effects are characterized as negative in direction, small in magnitude, Project Site/Footprint assessment area in geographic extent, short term in duration, infrequent in frequency, reversible, and therefore considered not significant.

Operation

Local moose may become temporarily displaced due to disturbance occurring via Manitoba Hydro staff using vehicles to access the Local Study Area for maintenance activities. The nature of ground electrode operation suggests that there will be little activity following construction. No mitigation is required for operation of ground electrodes.

Elk

As elk range associated with the Project Study Area is located in southwestern and western Manitoba, the construction or operation of the Northern ground electrode is not anticipated to directly or indirectly affect elk populations or habitat (Bipole III Mammals Technical Report).

American Marten

Construction

American marten habitat occurs in the vicinity of the electrode site. Overall, it is anticipated that less than 0.1 km^2 of marten habitat in the Local Study Area will be removed for electrode development. Construction is expected to have a negligible effect on marten populations. Sensory disturbance due to clearing of the Local study area by construction crews may result in short-term avoidance of a relatively small area by marten. The following mitigation measures are recommended for marten in the Local Study Area: Manitoba Hydro will maintain access control onto the Project site and cooperate with Manitoba Conservation in measures that will protect excessive harvest in the area including signage and no hunting areas during construction to protect both workers and marten.

Operation

Based on analysis documented in the Bipole III Mammals Technical Report, no effects on marten populations are expected through operation of the northern ground electrodes and lines (Bipole III Mammals Technical Report).

Based on the above mitigation measures, there are no residual effects anticipated for marten.

Beaver

Construction

The clearing of forested stands and construction of transmission lines will alter beaver habitat through reducing available material used in building lodges. A small amount (0.1 km^2) of beaver habitat is anticipated to be removed for this component of the Project (Bipole III Mammals Technical Report). In the clearing of forested areas beaver will likely avoid areas where machinery and work crews are present but would not be permanently displaced after construction is completed.

The majority of potential negative effects of the Project on riparian and aquatic (beaver) habitats in the Local study area were primarily mitigated for during the planning and routing process.

Based on the above mitigation measures, there are no residual effects anticipated for beaver.

Operation

Beaver habitat loss is not associated with the operation of ground electrodes and lines (Bipole III Mammals Technical Report). Mitigation efforts are not required for beaver as the area affected by the ground electrodes and lines is small, and beaver mortality is not anticipated as a Project effect. As a result, no residual effects are anticipated for beaver for this component of the Project.

Wolverine

Construction

Based on aerial tracking, areas containing high wolverine densities were not located within the Local Study Area; thus the effects of the Project on wolverine populations within the Local Study Area are anticipated to be minimal. Given their large home ranges, wolverines are expected to avoid disturbance during development where wolverine populations exist/overlap with the Local Study Area and used other extents of their home ranges during disturbance.

Though no denning sites have been found within the Project Area to date, effects of the Project may include denning site disturbance during the construction phase of the Project. Clearing in wolverine range will occur during winter when dens are non-active.

The following mitigation measures are recommended for wolverine ranges that overlap with the Local Study Area: clearing in wolverine range will occur during winter when dens are non-active.

The residual effects on wolverine from Project construction include potential for sensory disturbance. The residual effects are characterized as negative in direction, small in magnitude, Project Site/Footprint assessment area in geographic extent, short term in duration, infrequent in frequency, reversible, and therefore considered not significant.

Operation

Wolverine travelling through the area may become temporarily displaced due to disturbance occurring via Manitoba Hydro staff using vehicles to access the Local Study Area for maintenance activities. The nature of ground electrode operation suggests that there will be little activity following construction. No mitigation is required for operation of ground electrodes. As a result, no residual effects are anticipated for wolverine for this component of the Project.

8.2.6.5 Summary of Residual Environmental Effects and Significance

For the purpose of this EIS, a residual environmental effect is defined as the resultant change in the environment after the application of mitigation measures (Hegmann *et al.* 1999). Once constructed and in operation, the residual effects associated with the Project will be less than those associated with construction and will typically become neutral in nature and related to less invasive activities associated with ongoing maintenance activities. Potential changes in the distribution and abundance of species due to the development of the Project and ongoing maintenance may include the following:

- Loss or alteration of habitat associated with the placement of permanent structures such as the transmission line, converter stations, substations, etc.;

- Loss or alteration of habitat associated with facilitating the development of permanent structures associated with Bipole III development i.e. roads, work camps, etc.;
- Displacement of species through mechanized processes deterring species use of particular areas during initial Bipole III construction and ongoing maintenance;
- Increased predator and human movements across the landscape as a result of the maintenance of the cleared Bipole III rights-of-way creating accessible linear features; and
- Additional fragmentation/reduction of connectivity in potentially high use habitat areas.

The effects of the Project on mammal species should be considered in the context of species resilience to the presence of additional large-scale landscape features. As the Project will extend over a considerable geographic area, it is expected a small percentage of the various habitat types within the areas of influence will be lost or altered. Based on the detailed analysis of impacted habitat types (Bipole III Mammals Technical Report), there are no rare or significant habitat complexes critical to the persistence of the Project Mammal VECs on the landscape. Mammal populations may increase or decrease and may undergo periods of movement and migration through varying naturally occurring factors including forest fires, predator-prey cycles, and intra-species competition for home-range areas/mating rights.

While most mammal species will be affected by the Project, these effects are typically minimal in scope. In the case of boreal woodland caribou, the FPR does intersect three boreal woodland caribou ranges. Boreal woodland caribou (listed at Medium Risk in two ranges and Low Risk in the third range) will be negatively affected by the HVdc transmission line. A number of core winter use and summer calving and calf rearing areas in the Wabowden range are being traversed and in most areas the potential effects from construction in these areas is expected to be low. However the potential of long term residual impacts are not certain and will require ongoing monitoring and adaptive management which is described in the Bipole III Caribou Technical Report.

The following is a summary of the residual effects for the mammal VECs (see Table 8.2-8).

Coastal and Barren Ground Caribou

Residual effects associated with the construction and operation of the HVdc line are expected after proposed mitigation to be not significant. However there is potential for periodic major migrations of caribou into the Project Study Area which could result in significant mortality events from excessive hunting. There are no significant residual effects expected on migratory or coastal caribou populations. Given the small area required for the construction and operation of the converter station and northern ground electrode, there are no expected residual effects.

Boreal Woodland Caribou

Residual effects of the HVdc transmission line on boreal woodland caribou in the Wawbowden, Reed Lake and Bog ranges after successful implementation of the proposed mitigation measures are expected to be not significant. The expected residual effects relate primarily to potential increase in predation rates, especially in areas where the HVdc line bisects or intersects known core winter use areas and known calving areas. Compared to the Wabowden range, the Reed Lake and the Bog range are less susceptible to predicted effects due to the location of the HVdc line in relation to core winter and summer use areas. There is scientific uncertainty regarding the residual effects resulting from the Project's linear development and how this contributes to the overall cumulative effects from other disturbance within ranges, and there is concern regarding a risk of unsustainable losses in the population (particularly in the Wabowden range) from the incremental effects of the Project due to the risk of increased predation, increased hunting and increased presence of bears. The nature of effects will be monitored and adaptive management (including integrated management solutions) applied as required in the Wabowden range (and potentially in the Bog range).

Beaver, Marten and Wolverine

Overall, the Project is expected to have minimal to no residual effects on beaver, marten and Wolverine in the Project Study Area.

Moose and Elk

Residual effects associated with moose and elk are not significant. There will be short term displacement during construction of the HVdc transmission line (moose and elk), Keewatinoow Converter Station and the northern ground electrode (moose). Given the small area required for construction and operation of the converter station and northern ground electrode, there are no expected residual effects. Habitat availability will not be affected for these species; however increased mortality may result from improved hunter access in some northern areas. The majority of effects were managed and mitigated through routing that avoided important moose and elk areas.

Table 8.2-8: Residual Environmental Effects Summary – Mammals

VEC	Project Component	Phase	Residual Effects	Assessment[1]
Costal and Barren Ground Caribou	HVdc Transmission Line and ac Collector Lines and Keewatinoow Area	Construction & Operation	Overharvesting	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term (Op) **Overall – Not Significant**
Boreal Woodland Caribou (Wabowden, Reed Lake and Bog Ranges)	HVdc Transmission Line	Construction & Operation	Sensory disturbance, avoidance and displacement, hunting and poaching, predation	Direction – Negative Magnitude – Small Geographic Extent – Project Study Area Duration – Medium-Term (Op) **Overall – Not Significant** (Uncertainty Noted[2]) - (Require Adaptive Management)
American Marten	HVdc Transmission Line and ac Collector Lines, Site Access Roads	Construction & Operation	Displacement, functional habitat loss, fragmentation, sensory disturb., trapping, overharvesting	Direction – Negative Magnitude – Moderate Geographic Extent – Local Study Area Duration – Medium-Term (Op) **Overall – Not Significant**
	Keewatinoow Converter Station	Construction & Operation	Functional habitat loss, sensory disturbance, fragmentation, overharvesting	Direction – Negative Magnitude – Moderate Geographic Extent - Project Site/Footprint Duration – Medium-Term (Op) **Overall – Not Significant**
Beaver	HVdc Transmission Line and ac Collector Lines, Site Access Roads	Construction & Operation	Decreased population, sensory disturbance, overharvesting	Direction – Negative Magnitude – Small Geographic Extent - Project Site/Footprint Duration – Medium-Term (Op) **Overall – Not Significant**

VEC	Project Component	Phase	Residual Effects	Assessment[1]
	Keewatinoow Converter Station	Construction & Operation	Functional habitat loss, sensory disturbance, small increase in trapping	Direction – Negative Magnitude – Small Geographic Extent - Project Site/Footprint Duration – Medium-Term (Op) **Overall – Not Significant**
Wolverine	HVdc Transmission Line and ac Collector Lines, Site Access Roads	Construction & Operation	Sensory disturbance	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term (Op) **Overall – Not Significant**
	Keewatinoow Converter Station, Borrow & Excavation Sites	Construction (both) & Operation (station only)	Functional habitat loss, sensory disturbance, harvesting	Direction – Negative Magnitude – Small Geographic Extent - Project Site/Footprint Duration – Medium-Term (Op) **Overall – Not Significant**
	Ground Electrodes and Lines	Construction	Sensory disturbance	Direction – Negative Magnitude – Small Geographic Extent - Project Site/Footprint Duration – Short-Term **Overall – Not Significant**
Moose	HVdc Transmission Line and ac Collector Lines, Site Access Roads,	Construction & Operation	Overharvest, sensory disturb., functional habitat loss, predation, parasites and disease	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term (Op) **Overall – Not Significant**
	Keewatinoow Converter Station, Borrow Sites, Ground Electrode & Lines	Construction (all) & Operation (station only)	Functional habitat loss, sensory disturb. overharvest, predation	Direction – Negative Magnitude – Small Geographic Extent - Project Site/Footprint Duration – Medium-Term (Op) **Overall – Not Significant**
Elk	HVdc Transmission	Construction & Operation	Overharvest, sensory disturb.,	Direction – Negative Magnitude – Small

VEC	Project Component	Phase	Residual Effects	Assessment[1]
	Line and ac Collector Lines		functional habitat loss, predation, parasites/disease, fragmentation	Geographic Extent – Local Study Area Duration – Medium-Term (Op) **Overall – Not Significant**

Note:

1. Expected residual effects (i.e., effects after mitigation) of the Project on each VEC are assessed using the regulatory significance evaluation approach and methods defined in Chapter 4, Section 4.2.10. Where feasible, regulatory significance is assessed for each non-negligible expected residual effect based on its expected direction, magnitude, geographic extent and duration (as each term is defined in Section 4.2.10); if an adverse residual effect is evaluated to be potentially significant, other factors are also considered (frequency, reversibility, ecological importance and societal importance). Scientific uncertainty is noted where it may materially affect the assessment.
2. Uncertainty noted (with requirement for monitoring and adaptive management) specifically regarding potential residual effects on caribou in the Wabowden range; monitoring required in all three ranges with the potential for adaptive management if required.

8.2.6.6 Follow up and Monitoring

The purpose of follow-up monitoring is to verify the accuracy of environmental assessments and determine the effectiveness of mitigation measures (Hegmann *et al* 1999). Given that there are several effects anticipated to occur with mammals in the Project Study Area, the following summarizes the monitoring measures that are to be taken.

Monitoring of caribou populations will be on-going. Collaborative research and monitoring is being undertaken between Manitoba Hydro, Manitoba Conservation and the University of Manitoba. Monitoring and research include on-going collaring of caribou and wolves and specific research assessing caribou persistence in relation to linear development. Monitoring of caribou populations will be on- going, with the purpose of assessing the effects of linear features on caribou populations and caribou use of habitat. Monitoring and analysis of caribou recruitment and mortality in relation to various disturbance/range regimes is being undertaken.

8.2.7 Birds and Habitat

8.2.7.1 Overview

Manitoba Hydro is committed to responsible environmental stewardship, which aims to minimize the environmental effects of the Project components on bird species (Manitoba Hydro 2011). This requires a substantial effort as, of the approximately 400 bird species found in Manitoba, 371 have been identified as having ranges within the

Project Study Area with 218 being seasonal breeders; some of which have precise breeding habitat requirements. Fourteen of these 218 species are listed under *The Endangered Species Act* of Manitoba (MESA) or the federal *Species at Risk Act* (SARA). By conducting a detailed effects assessment with numerous VECs, Manitoba Hydro is committed to developing the Project without precipitating any further risks on listed bird species and to mitigating any potential Project effects on migratory and resident bird species when possible.

Potential effects are expected when bird ranges overlap spatially and temporally with the Project. Most species are migratory in Manitoba, generally migrating northward in spring, nesting in suitable habitats in spring and summer, and migrating south in fall to over-winter in the southern United States and in Central and South America. In Manitoba, few bird species are year-round residents (Carey *et al.* 2003).

Clearing, construction, operation, and maintenance of the Bipole III HVdc transmission line, ac collector lines, converter stations, and ground electrodes and lines are expected to affect birds and bird communities in several ways. Effects can be positive, negative, or neutral, depending upon the affected species. Supporting topics include increased mortality, habitat alteration and fragmentation, sensory disturbance, and disruption of movements. Chapter 6 (Existing Environment) and the Bipole III Birds Technical Report (Section 6.0) contain more detailed descriptions of the bird communities and effects assessment.

8.2.7.2 Potential Effects and Key Topics

The completed effects assessment identifies potential effects of four Project components on bird species during the operation and construction phases: HVdc transmission and ac collector lines, Keewatinoow converter station, Riel converter station, and ground electrodes and lines. Proposed mitigation measures were derived based on previous research and environmental assessments as well as the need to reduce environmental effects unique to Bipole III. The Potential Effects and Key Topics of Project-related effects on bird are as follows:

Mortality

- Due to collisions with vehicles or machinery, and collisions with transmission wires;
- Of waterfowl, other waterbirds, and upland game birds due to hunting;
- Mortality or nest loss due to construction or maintenance during the spring nesting season; and
- Increased susceptibility to brood (nest) parasitism and/or terrestrial predators.

Habitat Alteration

- Loss or alteration on Project rights-of-way and component footprints.

Sensory Disturbance

- And/or habitat avoidance due to clearing or maintenance activities; and
- Disruption of daily movements due to the physical presence of humans, machinery, or Project structures.

Mortality

Increases in bird mortality can occur in a variety of forms including collisions with transmission wires and vehicles, electrocutions, increased predation and hunting, and brood parasitism. Bird-wire strikes are one of the most common causes of non-hunter related mortality for birds, particularly birds with short wings and large body masses (Avery *et al.* 1980; Malcolm 1982; Rusz *et al.* 1986; Faanes 1987; Morkill and Anderson 1991; Brown and Drewien 1995; Bevanger 1998; Training Unlimited Inc. 2000). Other factors that may influence a bird's likelihood of colliding with a transmission wire include visibility (e.g., weather conditions, time of day; Brown and Drewien 1995), age of the bird (i.e., younger birds are more prone to collisions), location of the wire (e.g., wires crossing migration corridors can cause more collisions), and surrounding environment (Bevanger 1995; Brown and Drewien 1995; Bevanger 1998). While there is a possibility for any bird species to collide with a vehicle, the likelihood of such an event is considered to be remote while travelling on a transmission line right-of-way. However, vehicle collisions have been identified by agencies such as COSEWIC as being a contributing factor in the decline of certain species at risk populations. Mortality from electrocutions typically affects only birds with large wingspans and tail lengths and birds that demonstrate perching behaviour (Avery *et al.* 1980; Bevanger 1998; Janss 2000). Electrocutions are primarily related to smaller distribution lines (Avery *et al.* 1980; Bevanger 1998; Janss 2000). The wires and structures configuration of the Bipole III HVdc transmission line and the ac collector line will prevent electrocutions from occurring.

Clearing and maintenance associated with the right-of-way and other Project components may result in the destruction of some nests, consequently decreasing nest success or increasing mortality rates of hatchlings. With the exception of a few irregular-nesting species such as gray jay that nest in late winter, the risk of nest disturbance from maintenance and clearing is reduced and nearly eliminated by limiting these activities to winter months.

The introduction of new transmission lines on the landscape could contribute to increased predation on some bird species located near the right-of-way. Artificial perching and roosting structures such as transmission towers are used by some raptors in habitats with few natural perches; these perches provide an elevated viewpoint to aid in locating prey (Boeker and Nickerson 1975; Knight and Kawashima 1993). Raptors often utilize transmission towers even in habitats containing natural perch sites as the great height of transmission towers offer the highest vantage point (Lammers and Collopy 2007). In addition, nests located near the forest edge are under greater predatory pressures from small mammals such as chipmunks and red squirrels that may not utilize the central portion of transmission line rights-of-way (Chasko and Gates 1982).

In addition to increased predation as the right-of-way is cleared and access trails are created, opportunities for harvest of upland game birds and waterfowl may increase. In some cases, access could be limited by physical (e.g., terrain, water) and social (e.g., private land) barriers. Provincial harvest management strategies and regulations are an important consideration in ensuring sustainable upland game bird and waterfowl population goals are met.

Clearing of the right-of-way may contribute to an increase in brood parasitism by brown-headed cowbirds, which lay eggs in the nests of other bird species. Rates of brood parasitism have been shown to increase significantly in habitat edges associated with fragmented habitats compared to interior habitats containing forested buffers between nests and human disturbed landscapes (Tewksbury *et al.* 2006). However, there is little change in the rate of brood parasitism when habitats with a large degree of human disturbance are further fragmented, while landscapes with little to no previous human disturbance show significant increases (Tewksbury *et al.* 2006). Decreased nest success by host bird species would be limited to the existing range of the brown-headed cowbird in Manitoba (Bipole III Birds Technical Report). Brown-headed cowbird parasitism rates can be high in southern Manitoba in areas such as Delta Marsh (Sealy 1992), but less is known about northern environments.

Habitat Alteration

The loss of individuals and a decline in a species' population is strongly associated with habitat loss (Schmiegelow and Mönkkönen 2002). The vulnerability of bird species to habitat loss is dependent on their degree of habitat specialization; birds with broad-ranging habitat requirements are less likely to be affected (Hockey and Curtis 2008). Conversely, species that are highly specialized for small, rare habitat features are extremely vulnerable to any habitat loss (Hockey and Curtis 2008).

Fragmentation of habitat involves the removal of existing habitat that results in smaller isolated patches of remaining habitat where there was previously continuous habitat (Bender *et al.* 1998). Stable species abundance in fragmented landscapes may mask changes in bird communities due to replacement of locally extirpated species by immigration of species that favour fragmented habitats (Schmiegelow *et al*. 1997). Population declines observed in some birds may be attributed to their habitat requirements, as species that favour interior habitat will experience declines as the habitat becomes fragmented into smaller and smaller patches (Bender *et al*. 1998). This high degree of habitat specialization increases bird species' susceptibility to habitat loss and fragmentation. Increasing fragmentation of a landscape may not lead to declines in bird populations when remaining patches of habitat are large enough to provide suitable breeding habitat to allow for stable populations (Schmiegelow *et al*. 1997).

Decreased nesting success of breeding birds in small habitat fragments has resulted in some species' inability to reproduce at levels that would maintain population (Burke and Nol 2000). In highly fragmented landscapes the decline in nesting success has been observed in bird species that usually favour edge habitat (Robinson *et al*. 1995). Species that require larger and unfragmented core habitats are most vulnerable to decline (Burke and Nol 2000). Nest failures have primarily been attributed to nest predation and in large part to brown-headed cowbird parasitism, and to predation by small mammals (Conway 1999; Burke and Nol 2000; Hobson and Bayne 2000).

The effects of fragmentation on bird groups may be somewhat mitigated by allowing vegetation regrowth to occur; however vegetation management will generally maintain the right-of-way at an early stage of succession, which may be of limited use to species favouring interior forest habitat. The habitat on the right-of-way is expected to benefit edge-favouring species, and potentially grassland and shrubland birds.

The effects of habitat alteration due to clearing and maintenance activities, as well as construction activities in the north, would be mitigated in part, by limiting these activities to winter months. Year-round construction disturbances in the north are associated with point source disturbances at the converter station, borrow areas, and excavated material disposal areas. In the south, year-round construction activities could result in some nest abandonment and loss of habitat effectiveness.

Sensory Disturbance

Birds found along transmission lines affected by sensory disturbance may result in nest or territory abandonment, particularly those birds that rely on songs and calls for communication and territory establishment and defence (Bayne *et al*. 2008; Francis *et al*. 2009). Additionally, noise disturbance may result in increased and decreased predation rates, as noise interferes with the ability of some birds to pick up on audio cues to the presence of a predator (e.g., warning calls from other birds) while interfering with the ability of predators to pick up on audio cues regarding the presence of prey species (Slabbekoorn and Ripmeester 2007).

Bird response to gaps in habitat varies significantly among bird groups and species, habitat type, and the size of the gap (Rail 1997). Habitat specialists, such as boreal forest birds, are less likely to cross moderate to large sized gaps than are habitat generalists (Rail 1997). Even small gaps in forest cover have the potential to temporarily halt the movement of some species through an area. The tendency of birds to cross gaps in woodland habitat increases with the presence of high shrub cover in the original habitat and in the gap (Bélisle and St. Clair 2001). Body size of bird species is also associated with the distance of gaps crossed, with larger birds frequently traversing greater distances than smaller birds (Grubb and Doherty 1999).

The physical presence of humans, towers, and machinery could affect seasonal and daily movements of some species or individuals as they alter their pathways to avoid disturbance. Limited movement can prevent individuals from accessing resources and can hamper their ability to avoid predators (AltaLink Management Ltd. 2006). Daily movements could be altered on a local scale. Wider rights-of-way such as those associated with portions of the ac collector lines could potentially have a larger effect on barriers to movement, than the narrower right-of-way of the HVdc transmission line.

Most transmission line projects likely have little effect on seasonal movements such as the spring and fall migrations of larger bird species, as most fly significantly higher than the height of transmission lines and any related construction activities on the ground (Gauthreaux 1972). The effects of disruption of movements due to clearing and maintenance activities, as well as construction activities in the north, are mitigated by limiting these activities to winter months. In the south, construction activities may occur year-round and consequently exacerbated effects on daily movements resulting from noise, machinery and people could still occur.

The effects of sensory disturbance due to clearing and maintenance activities, as well as construction activities in the north, would be mitigated in part, by limiting these activities to winter months. Year-round construction disturbances in the north are associated with point source disturbances at the converter station, borrow areas, and excavated material disposal areas. In the south, year-round construction activities could result in some nest abandonment and loss of habitat effectiveness due to sensory disturbances.

8.2.7.3 Valued Environmental Components

VECs focused on federal and provincially listed species at risk, waterfowl and other waterbirds, colonial waterbirds, upland game birds, birds of prey, and woodpeckers. Selection was made following evaluation of each species' provincial or federal status or regulations, its importance to local cultures, its ability to function as an umbrella species, its ability to function as an indicator species, its ability to function as a keystone species, the availability of information to construct models of habitat preferences for the species, and in part, the relative influence that a transmission line may have on the species population and habitats. In terms of specifics, the following species have additional specific attributes as indicators of community health: mallards are an indicator of wetland bird associations; sandhill cranes are an indicator of global sparsely treed black spruce or tamarack peatlands and other wetland bird associations; yellow rails are an indicator of sedge-dominated wetlands and other wetland bird associations; bald eagles are an indicator of mature northern and western riparian forest; sharp-tailed grouse are an indicator of grassland, shrubland and forest mosaic bird associations; ruffed grouse are an indicator of deciduous and mixed wood forest bird associations; pileated woodpeckers are an indicator of mature mixed wood forest bird associations; olive-sided flycatchers are an indicator of northern and western wetland and early successional (i.e., fire) bird associations; Sprague's pipit are an indicator of southern and western dry native grassland bird associations; golden-winged warblers are an indicator of shrubland and shelterbelt bird associations; and Canada warblers are an indicator of southern and western mature deciduous forest dominated bird associations.

A large number of bird VECs were selected due to the large Project Study Area and resultant diversity of bird species using different habitats. However, due to the nature of the Project (primarily a long transmission line), many of the VECs are susceptible to similar Project effects and/or mitigation measures. Therefore, in order to reduce redundancy the VEC information is summarized by broader environmental group (e.g., waterfowl and waterbirds) and type of effects (e.g., mortality).

Bird VECs are organized into the following groups:

- Waterfowl and waterbirds - mallard, sandhill crane, yellow rail;
- Colonial waterbirds – great blue heron, least bittern;
- Birds of prey – bald eagle, ferruginous hawk, burrowing owl, short-eared owl;
- Upland game birds – sharp-tailed grouse, ruffed grouse;
- Woodpeckers – pileated woodpecker, red-headed woodpecker; and
- Songbirds and other birds – common nighthawk, olive-sided flycatcher, loggerhead shrike, Sprague's pipit, golden-winged warbler, Canada warbler, rusty blackbird.

The Bipole III Birds Technical Report contains additional details.

8.2.7.4 Environmental Effects Assessment and Mitigation

This section describes the effects and mitigation for each VEC for each Project component. During the route selection process three route alternatives with a number of interconnections were assessed in order to determine which alternative would have the fewest effects on bird populations and their habitats (see Chapter 7). This included the selection of a route that avoided wildlife management areas, ecological reserves, provincial parks, provincial forests, Ducks Unlimited hotspots, Important Bird Areas, and areas with high paired density values, where possible. Where it was not possible to avoid these features (e.g., Important Bird Area located near The Pas) routes were selected to minimize potential effects on bird populations, by following pre-existing linear features or developments wherever possible. The final preferred route that was assessed for residual effects had the lowest potential effects on bird populations and their habitats. Investigation of potential environmental effects on bird species due to Project development was done using a combination of field and desktop studies in accordance with previous research and environmental assessments. The existing environment for birds in the regional study area is described in Chapter 6. ESS were also identified and mapped to focus development and application of mitigation measures to specific areas of concern for some species or habitats. ESSs are recorded in the draft EnvPP accompanying the Bipole III EIS.

HVdc Transmission and ac Collector Lines

Waterfowl and Waterbird VECs (Mallard, Sandhill Crane and Yellow Rail)

Construction

Mortality

Mortality of waterfowl and waterbirds could increase slightly during clearing and construction. As clearing will occur after the fall migration on the entire route, no increase in mortality is expected during this stage. Opportunistic harvest of mallards by construction workers and the public during the legal hunting season may increase as local access is enhanced by the HVdc transmission and ac collector line rights-of-way. Legal harvest may not increase if clearing occurs out of season, but opportunities for domestic harvest and illegal harvest may improve, and potentially result in mallard mortality in the Local Study Area. As most access will be controlled along the rights-of-way during clearing and construction for safety reasons, hunting mortality is expected to be limited. Nests in wetlands could inadvertently be damaged or destroyed during spring and summer construction; however construction activities in these habitats would most likely be limited to dry areas where machinery can operate, and consequently, few nests would be affected. Mortality of a few individuals would result in negligibly reduced local populations of waterfowl and waterbirds.

Habitat Alteration

Clearing of the rights-of-way would result in minimal habitat alteration for mallards and sandhill cranes, as the HVdc transmission line route was selected to avoid wetlands and other water bodies where possible. Consequently, only an estimated 1.49% of mallard habitat in the Local Study Area is expected to be altered on the HVdc transmission line right-of-way. An additional 1.10% of mallard habitat is expected to be altered on the ac collector lines. In addition, only an estimated 1.42% of sandhill crane habitat in the Local Study Area is expected to be altered on the HVdc transmission line right-of-way. An additional 11.42% of sandhill crane habitat is expected to be altered on the ac collector lines in that area. Waterfowl and waterbirds can benefit from clearings such as rights-of-way. Small habitat alterations and any potential habitat losses may affect a few individuals in the Project Footprints but are not expected to have a measurable effect on local mallard populations or on breeding and nesting habitat availability.

Yellow rail range extends along the length of the route. No direct effects on yellow rail mortality are anticipated during clearing, as this migratory species will not be the area in winter. On the southern portion of the route, nests could be damaged or destroyed if construction occurs during the spring nesting period. Disguised nests can be found on or near the ground in sedge meadows (Brookhout 1995), which can inadvertently be run over by machinery (COSEWIC 2009a). As construction activities in these habitats will most likely be limited to dry areas where machinery can operate, few nests would be affected. Yellow rails have been known to collide with vehicles (Bookhout 1995). Local increases in traffic associated with construction activities may temporarily increase the risk of yellow rail collisions with vehicles, increasing the occurrences of mortality or injury. These types of collisions will be limited to the southern portion of the route.

Habitat loss and degradation are reported as threats to yellow rails (COSEWIC 2009a). A total of 1.27% of yellow rail habitat on the HVdc transmission line right-of-way, and 0.89% along the ac collector lines rights-of-way, will be affected in the Local Study Area. Small habitat alterations and any potential habitat losses may affect a few individuals at Project footprints but are not expected to have a measurable effect on local populations or on breeding and nesting habitat availability. In some cases, yellow rail nesting habitat may improve slightly where forest is converted to sedge and marsh wetlands.

Sensory Disturbance

While sensory disturbances from clearing and construction could affect breeding, nesting, and daily movements of mallards, the restriction of clearing and northern construction activities to winter negates these potential effects. Similarly, clearing in the south will be limited to the winter months, and potential sensory disturbance effects will not occur. On the southern portion of the route, sensory disturbances and disruption of movements from construction will be limited to daily effects including site abandonment and avoidance by a few individuals, and would most likely occur around heavy construction locations. Limited renesting may occur if mallards and sandhill cranes are disturbed early in the nesting season, and suitable nesting is found elsewhere in the Local Study Area.

Mitigation

The following mitigation measures are proposed to minimize and mitigate effects of the HVdc transmission and ac collector lines on waterfowl and waterbirds during the clearing and construction phase. Additional measures are included for the yellow rail, a species at risk:

- Hunting and harvesting of wildlife by Project staff will be limited while working on Project sites and restrict firearms at construction sites, minimizing the potential effect of harvesting on mallard mortality;
- Project activities during bird breeding and brood rearing months will be restricted from April 1 to July 31, to reduce the risk of nest destruction and sensory disturbance;
- Searches for yellow rail nests will be undertaken prior to spring or summer construction if the timing of construction activity overlaps with sensitive time periods;
- Setback distances will be applied for yellow rail nesting if the timing of construction activity overlaps with sensitive time periods (the recommended setback distance for yellow rail is 350 m and is to be applied to construction zones in southern Manitoba if they intersect with species at risk habitats and active breeding areas); and
- Vegetated buffers will be maintained in riparian areas to minimize the effect of habitat alteration on waterfowl and waterbirds.

Based on the above mitigation measures, residual effects on mallard, sandhill crane and yellow rail during construction are characterized as negative in direction, small magnitude, limited to the Local Study Area, short-term in duration, regular/continuous in frequency, and reversible, and therefore considered not significant.

Operation

Mortality

Improved access to the Project area via the rights-of-way and access roads could lead to a small increase in harvest of mallards and sandhill cranes. Waterfowl and waterbirds account for a large portion of deaths due to collisions with power lines (Faanes 1987;

Brown and Drewien 1995; Training Unlimited Inc. 2000). While individual birds may occasionally collide with wires, otherwise healthy populations should not be affected by such incidents (Bevanger 1998). Potential collision occurrences can be minimized in areas of high incidents with the use of deflectors to increase the visibility of these wires. Provincial harvest management strategies and regulations are important considerations in ensuring sustainable mallard population goals are met. Mortality of a few individuals would result in negligibly reduced local populations of waterfowl and waterbirds.

Collisions with tall structures contribute to yellow rail mortality (Goldade *et al.* 2002). Potential collision occurrences can be minimized in areas of high incidents with the use of deflectors to increase the visibility of these wires. As all sources of mortality are important to species at risk since they can affect local and regional populations, mitigation measures are required to minimize these potential effects. Collisions with transmission towers and lines would most likely occur at wetland sites. If vegetation maintenance activities coincide with the spring nesting season, nests could inadvertently be damaged or destroyed. As this species is migratory, no effects on mortality are anticipated during the winter. Mortality of a few individuals would result in negligibly reduced local populations of yellow rail.

Habitat Alteration

As vegetation management is expected to occur only during the winter in the north no loss of effective habitat or disruption of movements is expected to occur. In the south, vegetation management may occur year round and consequently may affect the breeding, nesting, and daily movements of mallards.

Sensory Disturbance

Sensory disturbances and disruption of movements will be limited to infrequent, temporary effects including site abandonment and avoidance by a few individuals. Finally, there also may be some loss of effective habitat associated with sensory disturbances arising from recreational use (e.g., snowmobiles, ATVs) along the route.

Mitigation

The following mitigation measures are proposed to minimize and mitigate Project-related effects on waterfowl and waterbirds during the operation phase:

- Access trails associated with the rights-of-way will be decommissioned to reduce access to the area by hunters and decrease the local harvest of waterfowl and other waterbirds;

- Shrubby vegetation will be maintained on the rights-of-way where possible to impede transportation via ATV and some foot traffic, to reduce access to the area and to reduce sensory disturbances arising from recreational use;
- Bird diverters will be placed at environmental sensitive sites such as wetlands (see Bipole III Birds Technical Report Section 6.2.3), to reduce the potential for collisions with wires;
- Vegetation management activities will be avoided near wetlands from April 1 to July 31 on the length of the right-of-way, to prevent nest disturbance or abandonment;
- Searches for yellow rail nests will be undertaken prior to spring or summer vegetation management if the timing of maintenance activity overlaps with sensitive time periods and locations; and
- Setback distances (as per Construction section) will be applied if the timing of vegetation management overlaps with sensitive time periods.

Based on the above mitigation measures, residual effects on mallard, sandhill crane and yellow rail during operation are characterized as negative in direction, small magnitude, limited to the Local Study Area, medium-term in duration, sporadic/intermittent in frequency, and reversible, and therefore considered not significant.

Colonial Waterbird VECs (Great Blue Heron and Least Bittern)

Construction

Mortality

Few direct causes of mortality of colonial waterbirds such as great blue heron are anticipated for the clearing and construction phase. As clearing will occur mostly before spring and after the fall migration on the entire route, no increase in mortality is expected during this stage. Nests in wetlands could inadvertently be damaged or destroyed during spring and summer construction; however construction activities in these habitats would most likely be limited to dry areas where machinery can operate, and consequently, few nests would be affected. Mortality of a few individuals would result in negligibly reduced local populations of colonial waterbirds. No direct Project-related effects on least bittern mortality are expected on the northern portion of the route during the clearing and construction phase, as this species' range is limited mainly to south-eastern Manitoba, and potentially, to a few sites west of Lake Manitoba. As this species is migratory, no effects on mortality are anticipated during winter clearing. If construction occurs in wetlands during the nesting period in spring and early summer, least bittern nests in the overlapping construction zone could be damaged or destroyed.

However, construction activities in these habitats would most likely be limited to dry areas where machinery can operate, and consequently, few nests would be affected. Collisions with vehicles are a threat to least bittern populations (COSEWIC 2009b). These collisions are generally infrequent, and the limited spatial and temporal overlap of construction activities with least bittern range in Manitoba will limit the risk of increased mortality. As all sources of mortality are important to species at risk as they can affect local and regional populations, mitigation measures are required to minimize these potential effects. Mortality of a few individuals would result in negligibly reduced local populations of least bittern.

Habitat Alteration

Clearing of the right-of-way will result in minimal habitat alteration for colonial waterbirds, as the HVdc transmission line route was selected to avoid wetlands and other water bodies where possible. An estimated 1.53% of great blue heron habitat in the Local Study Area is expected to be altered on the HVdc transmission line right-of-way. Small habitat alterations and any potential habitat losses may affect a few individuals at Project footprints but are not expected to have a measurable effect on local populations or on breeding and nesting habitat availability.

A total of 1.64% of least bittern habitat in the Local Study Area will be affected on the HVdc transmission line right-of-way. Small habitat alterations and any potential habitat losses may affect a few individuals at Project footprints but are not expected to have a measurable effect on local populations or on breeding and nesting habitat availability. In some cases, least bittern nesting habitat may improve slightly where forest is converted to marsh wetlands.

Sensory Disturbance

While sensory disturbances from clearing and construction could affect breeding, nesting, and daily movements of colonial waterbirds, the restriction of clearing and northern construction activities to winter negates these effects. On the southern portion of the route, sensory disturbances and disruption of movements from construction will be limited to daily effects including site abandonment and avoidance by a few individuals, and would most likely occur around heavy construction locations.

Mitigation

The following mitigation measures are proposed to minimize and mitigate effects of the HVdc transmission and ac collector lines on colonial waterbirds during the clearing and construction phase. Additional measures are developed for least bittern, a species at risk:

- Project activities will be restricted during bird breeding and brood rearing months from April 1 to July 31 to reduce the risk of nest destruction and sensory disturbance;
- Vegetated buffers will be maintained in riparian areas to minimize the effect of habitat alteration on colonial waterbirds;
- Buffers within a 200 m radius of heron colonies will be maintained from April 1 to July 31 to protect from sensory disturbance during the breeding season;
- Buffers within a 100 m radius of heron colonies will be maintained from August 1 to March 31 to protect nest trees and maintain the integrity of nesting sites;
- Searches for least bittern nests will be undertaken prior to spring or summer construction if the timing of construction activity overlaps with sensitive time periods; and
- Setback distances for least bittern will be applied if the timing of construction activity overlaps with sensitive time periods (the recommended setback distance for least bittern is 400 m and is to be applied to construction zones in southern Manitoba if they intersect with species at risk habitats and active breeding areas).

Based on the above mitigation measures, residual effects on great blue heron and least bittern during construction are characterized as negative in direction, small magnitude, limited to the Local Study Area, short-term in duration, regular/continuous in frequency, and reversible, and therefore considered not significant.

Operation

Mortality

Colonial waterbirds such as great blue heron account for a large portion of deaths due to collisions with power lines (Faanes 1987; Brown and Drewien 1995; Training Unlimited Inc. 2000). While individual birds may occasionally collide with wires, otherwise healthy populations should not be affected by such incidents (Bevanger 1998). Potential collision occurrences can be minimized in areas of high incidence with the use of deflectors to increase the visibility of these wires. Mortality of a few individuals would result in negligibly reduced local populations of colonial waterbirds. Collisions with overhead wires are a locally serious threat to least bitterns (COSEWIC 2009b), particularly at wetland sites. Potential collision occurrences can be minimized in areas of high incidents with the use of deflectors to increase the visibility of these wires. If vegetation maintenance activities coincide with the spring nesting season, nests could inadvertently be damaged or destroyed. Effects on mortality will be limited to the extreme southern portion of the transmission line, the extent of least bittern range in Manitoba. As this species is migratory, no effects on mortality are anticipated during the winter. As all sources of mortality are important to species at risk as they can affect local and regional populations, mitigation measures are required to minimize these potential effects. Mortality of a few individuals would result in negligibly reduced local populations of least bittern.

Habitat Alteration

As vegetation management is expected to occur only during the winter in the north no loss of effective habitat or disruption of movement is expected to occur. In the south, vegetation management may occur year round and consequently may affect the breeding, nesting, and daily movements of colonial waterbirds.

Sensory Disturbance

Sensory disturbances and disruption of movements will be limited to infrequent, temporary effects including site abandonment and avoidance by a few individuals. Finally, there also may be occasional, temporary loss of effective habitat associated with sensory disturbances arising from recreational use (e.g., snowmobiles, ATVs) along the route.

Mitigation

The following mitigation measures are proposed to minimize and mitigate effects of the transmission and ac collector lines on colonial waterbirds during the operation phase:

- Bird diverters will be placed at environmental sensitive sites such as wetlands (see Bipole III Birds Technical Report Section 6.2.3) to reduce the potential for collisions with wires;
- Vegetation management will be limited in areas where least bittern could occur from April 1 to July 31to minimize the risk of nest destruction and sensory disturbance during the nesting season (see Bipole III Birds Technical Report for potential habitat and locations);
- Colonies or other groups of birds will be avoided during helicopter use for line maintenance (AltaLink Management Ltd. 2006);

- Shrubby vegetation will be maintained on the rights-of-way where possible to impede transportation via snowmobiles, ATV and some foot traffic, to reduce access to the area and reduce sensory disturbances arising from recreational use;
- Searches for least bittern nests will be undertaken prior to spring or summer vegetation management if the timing of maintenance activity overlaps with sensitive time periods and locations; and
- Setback distances for least bittern (see Construction section) will be applied if the timing of vegetation management overlaps with sensitive time periods.

Based on the above mitigation measures, residual effects on great blue heron and least bittern during operation are characterized as negative in direction, small magnitude, limited to the Local Study Area, medium-term in duration, sporadic/intermittent in frequency, and reversible, and therefore considered not significant.

Birds of Prey VECs (Bald Eagle, Ferruginous Hawk, Burrowing Owl and Short-eared Owl)

Construction

Mortality

Few direct causes of mortality of birds of prey such as bald eagle are expected during the clearing and construction phase. Birds of prey are somewhat susceptible to collisions with vehicles (Harness and Wilson 2001; AltaLink Management Ltd. 2006; Stinson *et al.* 2007). Limited increases in local traffic to and from construction sites, and low vehicle speeds along the right-of-way are expected to result in very few accidental bird of prey injuries or mortalities. Mortality of a few individuals would result in negligibly reduced local populations of birds of prey. No direct effects on ferruginous hawk mortality are anticipated on the northern portion of the route during clearing and construction, as the species' range is limited to southern Manitoba. As this species is migratory, no effects on mortality are anticipated for winter clearing. On the southern portion of the route, ferruginous hawks, like other birds of prey, may be susceptible to collisions with vehicles (e.g., Bechard and Schmutz 1995) due to local traffic increases during spring and summer construction. These collisions are generally infrequent, and the limited spatial and temporal overlap of construction activities with ferruginous hawk range in Manitoba will limit the risk of increased mortality. As all sources of mortality are important to species at risk as they can affect Local and regional populations, mitigation measures are required to minimize these potential effects.

As burrowing owl range is limited to extreme south-western Manitoba, Project-related effects will be geographically limited. Burrowing owls are migratory, and no effects on mortality are anticipated during winter clearing. As burrowing owls nest on the ground in sparsely vegetated areas (DeSmet 2003b), construction on the south-western portion of the route during the spring nesting season could result in inadvertent damage to or destruction of nests. The tendency of burrowing owls to forage near roads makes them susceptible to collisions with vehicles, which contribute to the species' mortality (Haug *et al.* 1993; COSEWIC 2006b). Local increases in traffic associated with construction activities may temporarily increase the risk of burrowing owl collisions with vehicles; however these collisions are generally infrequent, and the limited spatial and temporal overlap of construction activities with burrowing owl range in Manitoba will limit the risk of increased mortality. As all sources of mortality are important to species at risk as they can affect local and regional populations, mitigation measures are required to minimize these potential effects.

Short-eared owl range extends throughout the Project Study Area. As this species is migratory, no effects on mortality are anticipated during winter clearing. Short-eared owls are ground nesters (Holt and Leasure 1993) and their nests and eggs can be destroyed by machinery (COSEWIC 2008a). Many short-eared owls nest in wetlands, and are unlikely to be affected given limited construction activities in this habitat. Some nest in agricultural areas such as haylands, where construction may occur. Collisions with vehicles contribute to short-eared owl mortality (COSEWIC 2008a), and temporary increases in local traffic may affect individuals on the southern portion of the route during spring and summer construction. These collisions are generally infrequent, and the limited temporal overlap of construction activities with short-eared owl range in Manitoba will limit the risk of increased mortality. As all sources of mortality are important to species at risk as they can affect local and regional populations, mitigation measures are required to minimize these potential effects.

Mortality of a few individuals would result in negligibly reduced local populations of ferruginous hawk, burrowing owl, and short-eared owl.

Habitat Alteration

Clearing of the right-of-way will result in the disruption, alteration, and improvement of some raptor nesting and foraging habitat. Specifically, 0.74% of bald eagle habitat in the Local Study Area is expected to be altered on the HVdc transmission line right-of-way with an additional 1.45% affected along the ac collector lines right-of-way. Small habitat alterations and any potential habitat losses may affect a few individuals at Project footprints but are not expected to have a measurable effect on local populations or on breeding and nesting habitat availability.

Although an estimated 1.32% of ferruginous hawk habitat in the Local Study Area could be affected on the HVdc transmission line right-of-way, nesting ferruginous hawks were not found during surveys in the Local Study Area. Habitat carrying capacity for this species is most likely underutilized, particularly in areas where suitable nesting and foraging areas exist (Leary *et al*. 1998). Small habitat alterations and any potential habitat losses may affect a few individuals at Project footprints but are not expected to have a measurable effect on local populations or on breeding and nesting habitat availability, but only if multi-generational stick nests are not disturbed or removed.

Habitat alteration and degradation have been identified as significant contributors to declining burrowing owl populations (COSEWIC 2006b). An estimated 1.33% of burrowing owl habitat in the Local Study Area will be affected on the HVdc transmission line right-of-way. Although habitat will be affected on the right-of-way, burrowing owls have not occupied apparently suitable habitats in eastern Manitoba for many years and are considered to be extirpated from Manitoba with the last breeding pair found in 1999 (COSEWIC 2006b). Consequently, small habitat alterations and losses could affect a few individuals but are not expected to have a measurable effect on the local populations or on breeding and nesting habitat availability, but only if nesting burrows are not disturbed. In some cases, burrowing owl foraging habitat could also increase slightly where forest is converted to grassland.

Habitat alteration or conversion has been identified as contributing to short-eared owl population decline in the Prairie Provinces (COSEWIC 2008a). An estimated 1.36% of short-eared owl habitat on the HVdc transmission line right-of-way, and 0.89% along the ac collector lines rights-of-way, will be affected in the Local Study Area. Small habitat alterations and any potential habitat losses may affect a few individuals at Project footprints but are not expected to have a measurable effect on local populations or on breeding and nesting habitat availability. In some cases, short-eared owl nesting habitat may improve slightly where forest is converted to grasslands and wet shrublands.

Sensory Disturbance

While sensory disturbances from clearing and construction could affect breeding, nesting, and daily movements of birds of prey, the restriction of clearing and northern construction activities to winter reduces these potential effects. In terms of burrowing owls effects will be geographically limited to the species' range and although there is some uncertainty as to how far these effects may extend, they are not anticipated to extend beyond 1 km of the source of effect, and only where heavy machinery and construction noise are the greatest. However, sensory disturbances from construction in summer may result in nest/young abandonment by some individuals and could disrupt daily movements if any burrowing owl burrows are found in the Local Study Area. As some birds of prey are not migratory, clearing and construction activities may result in individual birds temporarily abandoning nearby habitat in the vicinity of the rights-of-way. Sensory disturbances and disruption of movements from clearing and construction will be limited to daily effects including site abandonment and avoidance by a few individuals, and would most likely occur around heavy construction locations. Finally, the newly cleared right-of-way may present improved foraging opportunities for raptors, as small mammals may be attracted to the altered habitat (Johnson *et al*. 1979).

Ferruginous hawks are particularly susceptible to disturbance by human activity, often resulting in nest/young abandonment (De Smet 2003a; Hoffman and Smith 2003). Although there is some uncertainty as to how far these effects may extend, they are not anticipated to extend beyond one km, and only where heavy machinery and construction noise are the greatest. The restriction of clearing activities to winter negates some potential effects; however, sensory disturbances from construction in summer may result in nest/young abandonment by some individuals and could disrupt daily movements if any ferruginous hawk nests are found in the Local Study Area.

Mitigation

The following mitigation measures are proposed to minimize and mitigate effects of the HVdc transmission and ac collector lines on birds of prey during the clearing and construction phase:

- Trees containing large stick nests will be left undisturbed until unoccupied to minimize mortality due to nest destruction during the nesting season, particularly when clearing the south-western portion of the right-of-way to avoid disturbing ferruginous hawk nests;
- Artificial structures will be provided for nesting if unoccupied nests must be removed to reduce the loss of nesting habitat (i.e., but only if the raptor nest is not located adjacent to a sensitive site e.g., sharp-tailed grouse lek or species at risk habitat);
- Buffers within a 200 m radius of eagle and osprey nests will be maintained from April 1 to July 31 to protect from sensory disturbance during the breeding season;
- Buffers will be maintained within a 100 m radius of eagle and osprey nests from August 1 to March 31 to protect nest trees and maintain the integrity of nesting sites;
- Project activities during bird breeding and brood rearing will be restricted from April 1 to July 31 to reduce the risk of nest destruction and sensory disturbance;
- Searches for ferruginous hawk, burrowing owl and short-eared owl nests will be undertaken prior to spring or summer construction if the timing of construction activity overlaps with sensitive time periods;
- Setback distances for species at risk will be applied if the timing of construction activity overlaps with sensitive time periods (the recommended setback distance

ferruginous hawk is 1,000 m, and is 500 m for burrowing owl and short-eared owl is and is to be applied to construction zones in southern Manitoba if they intersect with species at risk habitats and active breeding areas);

- Construction activity will be prohibited within 1,000 m of ferruginous hawk nests for 45 days following hatching of young to minimize disturbance (Environment Canada 2009); and
- Buffers will be maintained within a 100 m radius of large stick nests from August 1 to March 31 to protect nest trees and maintain the integrity of nesting sites.

Based on the above mitigation measures, residual effects on bald eagle, ferruginous hawk, burrowing owl, and short-eared owl during construction are characterized as negative in direction, small magnitude, limited to the Local Study Area, short-term in duration, regular/continuous in frequency, and reversible, and therefore considered not significant.

Operation

Mortality

Electrocution can be a significant source of bird of prey mortality (Lehman *et al.* 2007). As large birds of prey such as bald eagle are susceptible to electrocution (Harness and Wilson 2001; Millsap *et al.* 2004), mortality could increase where they are attracted to the transmission line and structures. With the configuration of the Bipole III HVdc transmission line, electrocutions are highly unlikely to occur. Collisions with wires are a potential source of mortality, and species that fly at high speeds in pursuit of prey, such as northern goshawk, are most prone to collisions (Bevanger 1994). The potential for bird-wire collisions was minimized when the HVdc transmission line route was selected, as raptor migration corridors were avoided where possible. Potential collision occurrences can be minimized in areas of high incidents with the use of deflectors to increase the visibility of these wires. While individual birds may occasionally collide with transmission wires, otherwise healthy populations should not be affected by such incidents. Mortality of a few individuals would result in negligibly reduced local populations of birds of prey.

Ferruginous hawks have been reported to occasionally strike overhead wires (Bechard and Schmutz 1995). Potential collision occurrences can be minimized in areas of high incidents with the use of deflectors to increase the visibility of these wires. Such collisions would be geographically limited, as the species' range is limited to southern Manitoba. The potential for bird-wire collisions was minimized when the HVdc transmission line route was selected, as raptor migration corridors were avoided where possible. No direct effects on ferruginous hawk mortality are anticipated on the northern portion of the route during operation and maintenance. As this species is migratory, no effects on mortality are anticipated during the winter. As all sources of mortality are important to species at risk as they can affect local and regional populations, mitigation measures are required to minimize these potential effects.

Burrowing owl collisions with transmission wires are seemingly uncommon, and do not appear to be a large source of mortality. Potential collision occurrences can be minimized in areas of high incidents with the use of deflectors to increase the visibility of these wires. The potential for bird-wire collisions was minimized when the HVdc transmission line route was selected, as raptor migration corridors were avoided where possible. No direct effects on burrowing owl mortality are anticipated on the northern portion of the route during operation and maintenance. As this species is migratory, no effects on mortality are anticipated during the winter. If vegetation maintenance activities coincide with the spring nesting season, nests could be damaged or destroyed. Effects on mortality will be limited to the south-western portion of the transmission line, the extent of burrowing owl range in Manitoba. As all sources of mortality are important to species at risk as they can affect local and regional populations, mitigation measures are required to minimize these potential effects.

Collisions with transmission wires contribute to short-eared owl mortality (COSEWIC 2008a). The potential for bird-wire collisions was minimized when the HVdc transmission line route was selected, as raptor migration corridors were avoided where possible. Potential collision occurrences can be minimized in areas of high incidents with the use of deflectors to increase the visibility of these wires. As this species is migratory, no effects on mortality are anticipated during the winter. As this species nests on the ground in open areas (Holland and Taylor 2003c), vegetation management during the spring nesting season could damage or destroy nests. As all sources of mortality are important to species at risk as they can affect local and regional populations, mitigation measures are required to minimize these potential effects.

Mortality of a few individuals would result in negligibly reduced local populations of ferruginous hawk, burrowing owl, and short-eared owl.

Habitat Alteration

As vegetation management is expected to occur only during the winter in the north no loss of effective habitat or disruption of movement is expected to occur. In the south, vegetation management may occur year round and consequently may affect the breeding, nesting, and daily movements of birds of prey.

Sensory Disturbance

Sensory disturbances and disruption of movements will be limited to infrequent, temporary effects including site abandonment and avoidance by a few individuals. Finally, there also may be occasional, temporary loss of effective habitat associated with sensory disturbances arising from recreational use (e.g., snowmobiles, ATVs) along the route.

Mitigation

The following mitigation measures are proposed to minimize and mitigate Project-related effects on birds of prey during the operation phase:

- Vegetation management activities will be avoided near large stick nests from April 1 to July 31 to prevent nest disturbance or abandonment during the nesting season (see Bipole III Birds Technical Report for potential habitat and locations);
- Buffers will be maintained within a 50 m radius of active large stick nests when discovered;
- Bird diverters will be placed at ESSs such as the Red River crossing (see Bipole III Birds Technical Report Section 6.2.3) to reduce the potential for collisions with wires;
- Perch deterrents such as porcupine wire or triangles will be installed where raptor perching and nesting are problematic to discourage such activity, reducing the small chance of electrocution and possibly the need for removing nests;
- Artificial nest structures will be installed in adjacent habitats where nests on transmission towers are removed, to reduce loss of nesting habitat (i.e., but only if the raptor nest is not located adjacent to a sensitive site e.g., sharp-tailed grouse lek or species at risk habitat);
- Shrubby vegetation will be maintained on the rights-of-way where possible to impede transportation via snowmobile and ATV and some foot traffic to reduce sensory disturbances arising from recreational use;
- Searches for ferruginous hawk, burrowing owl and short-eared owl nests will be undertaken prior to spring or summer vegetation management if the timing of maintenance activity overlaps with sensitive time periods and locations;
- Setback distances for ferruginous hawk, burrowing owl, and short-eared owl (see Construction section) will be applied if the timing of vegetation management overlaps with sensitive time periods; and

- Maintenance activity will be prohibited within 1,000 m of ferruginous hawk nests for 45 days following hatching of young to minimize disturbance (Environment Canada 2009).

Based on the above mitigation measures, residual effects on bald eagle, ferruginous hawk, burrowing owl, and short-eared owl during operation are characterized as negative in direction, small magnitude, limited to the Local Study Area, medium-term in duration, sporadic/intermittent in frequency, and reversible, and therefore considered not significant.

Upland Game Bird VECs (Sharp-tailed Grouse and Ruffed Grouse)

Construction

Mortality

Upland game bird mortality could increase during clearing and construction. Opportunistic harvest of sharp-tailed grouse and ruffed grouse by construction workers and the public during the legal hunting season may increase as access is created by the HVdc transmission and ac collector line rights-of-way. As the season for these species ends in mid December (Manitoba Conservation 2010c), legal harvest may not increase if clearing occurs out of season, but opportunities for domestic harvest and illegal harvest may improve, and potentially result in sharp-tailed grouse mortality in the Local Study Area. As most access will be controlled along the right-of-way during clearing and construction for safety reasons, hunting mortality is expected to be limited.

Sharp-tailed grouse are also susceptible to collisions with vehicles (Clevenger *et al*. 2003). If construction of transmission line right-of-way is to occur over a lek area, there is the potential for these areas to operate as ecological traps where many individual birds could be killed through animal-vehicle collisions. Sharp-tailed grouse have been demonstrated to have strong site-fidelity to lek areas (Drummer *et al.* 2011) and would be particularly at-risk if construction activities coincide with higher levels of vehicle traffic. Mortality of a few individuals would result in negligibly reduced local populations of upland game birds.

Habitat Alteration

Upland game bird habitat will be altered and disrupted during clearing of the rights-of-way. In some cases, the altered habitat created by the ROWs could improve sharp-tailed grouse and ruffed grouse breeding and nesting opportunities. Additionally, these species would benefit from edge habitat created by the right-of-way. An estimated 1.67% of sharp-tailed grouse habitat is expected to be altered on the HVdc transmission line right-of-way, while less than 0.77% of habitat is expected to be altered along the ac collector lines rights-of-way in the Local Study Area. In addition an estimated 1.51% of ruffed grouse habitat is expected to be altered on the HVdc transmission line right-of-way, while <0.01% of habitat is expected to be altered along the ac collector lines rights-of-way in the Local Study Area. Sufficient habitat is located within the Local Study Area and throughout the landscape to sustain grouse populations. Small habitat alterations and any potential habitat losses may affect a few individuals at Project footprints but are not expected to have a measurable effect on local populations or on breeding and nesting habitat availability.

Sensory Disturbance

As sharp-tailed grouse and ruffed grouse are not migratory, clearing and construction activities may result in individual birds temporarily abandoning nearby habitat in the vicinity of the rights-of-way. On the southern portion of the route, sensory disturbances and disruption of movements from construction will be limited to daily effects including site abandonment and avoidance by a few individuals. In particular, male sharp-tailed grouse are displaced from leks by human presence (Baydack and Hein 1987; Connelly *et al*. 1998). Excessive and continual disturbances in the vicinity of a sharp-tailed grouse lek could result in the potential loss of an entire nesting season for the local population.

Mitigation

The following mitigation measures are proposed to minimize and mitigate effects of the HVdc transmission and ac collector lines on sharp-tailed and ruffed grouse during the clearing and construction phase:

- Project activities during bird breeding and brood rearing months will be restricted from April 1 to July 31 to reduce the risk of nest destruction and sensory disturbance;
- Hunting and harvesting of wildlife by Project staff will be limited while working on Project sites and restrict firearms at construction sites to minimize the effect of harvesting on upland game bird mortality; and
- Setback distances will be applied around sharp-tailed grouse leks if discovered and if the timing of construction activity overlaps with sensitive time periods.

Based on the above mitigation measures, residual effects on sharp-tailed grouse and ruffled grouse during construction are characterized as negative in direction, small magnitude, limited to the Local Study Area, short-term in duration, regular/continuous in frequency, and reversible, and therefore considered not significant.

Operation

Mortality

Improved access to the Project Study Area via the rights-of-way and access roads could lead to a small increase in harvest of sharp-tailed grouse and ruffed grouse. Provincial harvest management strategies and regulations are important considerations in ensuring sustainable sharp-tailed grouse goals are met. Mortality due to predation could increase, as raptors could perch on transmission towers above sharp-tailed grouse leks. Grouse are vulnerable to collisions with transmission wires (Janss 2000; Bevanger and Brøseth 2001). Ground wires tend to increase the susceptibility of some bird species to collisions, as the risk of collisions increases with the number of levels of wires (Bevanger and Brøseth 2001). Potential collision occurrences can be minimized in areas of high incidents with the use of deflectors to increase the visibility of these wires. Mortality of a few individuals would result in negligibly reduced local populations of upland game birds.

Habitat Alteration

As sharp-tailed grouse and ruffed grouse are not migratory, vegetation management may affect breeding, nesting, and daily movements of individuals regardless of the time of year.

Sensory Disturbance

Sensory disturbances and disruption of movements will be limited to infrequent, temporary effects including site abandonment and avoidance by a few individuals. Additionally, there may be occasional, temporary loss of effective habitat associated with sensory disturbances arising from recreational use (e.g., snowmobiles, ATVs) along the route.

Mitigation

The following mitigation measures are proposed to minimize and mitigate effects of the transmission and ac collector lines on sharp-tailed and ruffed grouse during the operation phase:

- Access trails associated with the rights-of-way will be decommissioned to reduce access to the area by hunters and to decrease the local harvest of upland game birds;
- Shrubby vegetation on the rights-of-way will be maintained where possible to impede transportation via snowmobile, ATV and some foot traffic to reduce access to the area by hunters and decrease the local harvest of and sensory disturbance to sharp-tailed and ruffed grouse;

- Bird diverters will be placed at environmental sensitive sites such as sharp-tailed grouse leks (see Bipole III Birds Technical Report Section 6.2.3), to reduce the potential for collisions with wires; and
- Perch deterrents such as porcupine wire or triangles on transmission towers will be installed near sharp-tailed grouse leks to reduce predation on sharp-tailed grouse by raptors.

Based on the above mitigation measures, residual effects on sharp-tailed grouse and ruffed grouse during operation are characterized as negative in direction, small magnitude, limited to the Local Study Area, medium-term in duration, sporadic/intermittent in frequency, and reversible, and therefore considered not significant.

Woodpecker VECs (Pileated Woodpecker and Red-headed Woodpecker)

Construction

Mortality

Few direct causes of woodpecker mortality are expected during the clearing and construction phase. Woodpeckers are prone to collisions with vehicles when foraging on the ground (Bull and Jackson 1995). Limited increases in local traffic to and from construction sites, and low vehicle speeds along the right-of-way are expected to result in very few accidental woodpecker injuries or mortalities. Mortality of a few individuals would result in negligibly reduced local populations of woodpeckers. Red-headed woodpecker range extends throughout southern Manitoba, and no effects are anticipated on the northern portion of the route. As this species is migratory, no effects on mortality are anticipated during winter clearing. Collisions with vehicles during roadside foraging are a source of red-headed woodpecker mortality (COSEWIC 2007c). Local increases in traffic associated with construction activities may temporarily increase the risk of collisions with vehicles. These collisions are generally infrequent, and the limited spatial and temporal overlap of construction activities with red-headed woodpecker range in Manitoba will limit the risk of increased mortality. As all sources of mortality are important to species at risk as they can affect local and regional populations, mitigation measures are required to minimize these potential effects. Mortality of a few individuals would result in negligibly reduced local populations of red-headed woodpecker.

Habitat Alteration

Clearing of the right-of-way will result in minimal habitat alteration for woodpeckers, as the preferred transmission line route was selected to avoid core communities with large tracts of forest where possible. As a result, an estimated 1.61% of pileated woodpecker habitat in the Local Study Area will be altered on the HVdc transmission line right-of-way. As pileated woodpecker habitat alterations are small, these populations are unlikely to be affected by Project. The removal of dead standing trees on or near the rights-of-way during clearing could result in the loss of woodpecker nesting habitat. Small habitat alterations and any potential habitat losses may affect a few individuals at Project footprints but are not expected to have a measurable effect on local populations or on breeding and nesting habitat availability.

The decline in red-headed woodpecker populations has been attributed to the past loss of large tracts of mature deciduous forests (COSEWIC 2007c). The removal of dead trees for nesting and roosting is a more recent limiting factor for red-headed woodpeckers (COSEWIC 2007c). Approximately 1.68% of red-headed woodpecker habitat in the Local Study Area will be affected on the HVdc transmission line right-of-way. The removal of dead or dying trees on or near the right-of-way within red-headed woodpeckers' range could result in the loss of some nesting habitat. Small habitat alterations and any potential habitat losses may affect a few individuals at Project footprints but are not expected to have a measurable effect on local populations or on breeding and nesting habitat availability.

Sensory Disturbance

While sensory disturbances from clearing and construction could affect breeding, nesting, and daily movements of woodpeckers, the restriction of clearing and northern construction activities to winter negates these potential effects on migratory species. As some woodpecker species are not migratory, clearing and construction activities may result in individual birds temporarily abandoning nearby habitat in the vicinity of the rights-of-way. Sensory disturbances and disruption of movements from construction will be limited to daily effects including site abandonment and avoidance by a few individuals, and would most likely occur around heavy construction locations.

Mitigation

The following mitigation measures are proposed to minimize and mitigate effects of the HVdc transmission and ac collector lines on woodpeckers during the clearing and construction phase. Additional measures are provided for red-headed woodpecker, a species at risk.

Project activities during bird breeding and brood rearing months will be restricted from April 1 to July 31 to reduce the risk of nest destruction and sensory disturbance;

- Dead standing trees will be retained where possible;
- To reduce the loss of woodpecker nesting habitat;

- Danger trees near the rights-of-way will be topped, rather than removed, to reduce the loss of adjacent woodpecker nesting habitat;
- Clearing of trees with roost cavities will be limited to daylight hours, and preferably in fall, to minimize disruption of resident woodpeckers and retain shelter and nesting sites;
- Searches for red-headed woodpecker nests will be undertaken prior to spring or summer construction if the timing of construction activity overlaps with sensitive time periods; and
- Setback distances will be applied if the timing of construction activity overlaps with sensitive time periods (the recommended setback distance for red-headed woodpecker is 200 m and is to be applied to construction zones in southern Manitoba if they intersect with species at risk habitats and active breeding areas).

Based on the above mitigation measures, residual effects on pileated woodpecker and red-headed woodpecker during construction are characterized as negative in direction, small magnitude, limited to the Local Study Area, short-term in duration, regular/continuous in frequency, and reversible, and therefore considered not significant.

Operation

Mortality

Few Project-related effects on pileated woodpecker mortality or other woodpecker species are anticipated. The removal of danger trees in the vicinity of the right-of-way in spring could damage or destroy woodpecker nests. Mortality of a few individuals would result in negligibly reduced local populations of woodpeckers.

Few Project-related effects on red-headed woodpecker mortality are anticipated during the operation and maintenance phase. As this species is migratory, no effects on mortality are anticipated during the winter. The removal of dead standing trees in the vicinity of the right-of-way during vegetation management in spring could damage or destroy red-headed woodpecker nests. Effects will be limited to the southern portion of the transmission line, the extent of red-headed woodpecker range in Manitoba. Mortality of a few individuals would result in negligibly reduced local populations of red-headed woodpeckers.

Habitat Alteration

For migratory woodpeckers vegetation management is not expected to result in any loss of effective habitat or disruption of movements as this work is limited to the winter in the north. For woodpeckers found in the south and non-migratory woodpeckers, vegetation management may affect the breeding, nesting, and daily movements of individuals regardless of the time of year.

Sensory Disturbance

Sensory disturbances and disruption of movements will be limited to infrequent, temporary effects including site abandonment and avoidance by a few individuals. There also may be occasional, temporary loss of effective habitat associated with sensory disturbances arising from recreational use (e.g., snowmobiles, ATVs) along the route.

Mitigation

The following mitigation measures are proposed to minimize and mitigate effects of the transmission and ac collector lines on woodpeckers during the operation phase:

- Vegetation management will be limited in areas where red-headed woodpecker could occur from April 1 to July 31 to minimize the risk of nest destruction and sensory disturbance during the nesting season (see Bipole III Birds Technical Report for potential habitat and locations);
- Where feasible, danger trees near the rights-of-way topped, rather than removed, to reduce the potential loss of adjacent woodpecker nesting habitat;
- Removal of danger trees with roost cavities will be limited to daylight hours, to minimize disruption of resident woodpeckers and retain shelter and nesting sites;
- Removal of danger trees near the right-of-way will be prohibited during the spring nesting period to minimize nest destruction and sensory disturbance during the nesting season;
- Shrubby vegetation will be maintained on the rights-of-way where possible to impede transportation via snowmobile and ATV, and some foot traffic, to reduce sensory disturbances arising from recreational use;
- Searches for red-headed woodpecker nests will be undertaken prior to spring or summer vegetation management if the timing of maintenance activity overlaps with sensitive time periods and locations; and
- Setback distances for red-headed woodpeckers (see Construction section) will be applied if the timing of vegetation management overlaps with sensitive time periods.

Based on the above mitigation measures, residual effects on pileated woodpeckers and red-headed woodpeckers during operation are characterized as negative in direction, small magnitude, limited to the Local Study Area, medium-term in duration, sporadic/intermittent in frequency, and reversible, and therefore considered not significant.

Songbirds and Other Bird VECs (Common Nighthawk, Whip-poor-will, Olive-sided Flycatcher, Loggerhead Shrike, Sprague's Pipit, Golden-winged Warbler, Canada Warbler and Rusty Blackbird)

Construction

Mortality

Common nighthawk range extends throughout the Project Study Area. No effects on this migratory species' mortality are anticipated during winter clearing. These birds lay eggs directly on the ground in open areas (Taylor 2003j), and eggs or hatchlings could be destroyed during construction in summer. Common nighthawks frequently roost on bare patches on the ground, and are susceptible to collisions with vehicles (COSEWIC 2007b). Local increases in traffic associated with construction activities may temporarily increase the risk of common nighthawk collisions with vehicles. These collisions are generally infrequent, and the limited temporal overlap of construction activities with common nighthawk range in Manitoba will limit the risk of increased mortality. As all sources of mortality are important to species at risk as they can affect local and regional populations, mitigation measures are required to minimize these potential effects. A common nighthawk was found dead on the roadside during 2010 bird surveys, indicating that collisions with vehicles are possible in the Project Study Area.

Whip-poor-will range extends throughout southern Manitoba, and no effects are anticipated on the northern portion of the route. No effects on this migratory species' mortality are anticipated during winter clearing. Whip-poor-wills tend to rest beside roadways, making them susceptible to collisions with vehicles (Cink 2002; COSEWIC 2009c), and local increases in traffic associated with construction activities may temporarily increase the risk of collisions with vehicles. These collisions are generally infrequent, and the limited spatial and temporal overlap of construction activities with whip-poor-will range in Manitoba will limit the risk of increased mortality. As all sources of mortality are important to species at risk as they can affect local and regional populations, mitigation measures are required to minimize these potential effects.

Olive-sided flycatcher range overlaps most of the Project Study Area. No effects on this migratory species' mortality are anticipated during winter clearing. Olive-sided flycatchers are unlikely to nest on the cleared rights-of-way where shrubs are not yet present, and collisions with vehicles are not reported in the literature reviewed. No Project-related effects are expected during the clearing and construction phase.

Loggerhead shrike range is limited to southern Manitoba. Although this species is unlikely to be encountered as its currently known range is essentially restricted to the area around Winnipeg (COSEWIC 2004), there is minor potential for the western race to occur along the route in pasturelands and shelterbelts. As this species is migratory, no effects on mortality are anticipated during winter clearing. As loggerhead shrikes often forage near roads, collisions with vehicles can be a major source of mortality (DeSmet 2003c; COSEWIC 2004). Local increases in traffic associated with construction activities may temporarily increase the risk of collisions with vehicles. These collisions are generally infrequent, and the limited spatial and temporal overlap of construction activities with loggerhead shrike range in Manitoba will limit the risk of increased mortality. As all sources of mortality are important to species at risk as they can affect local and regional populations, mitigation measures are required to minimize these potential effects.

No direct effects on Sprague's pipit mortality are anticipated on the northern portion of the route during clearing and construction, as the species' range is limited to southern Manitoba. As this species is migratory, no effects on mortality are anticipated for winter clearing. Sprague's pipits nest on the ground in tall grass (Holland *et al.* 2003a), and could nest on the cleared right-of-way in spring; these nests could be destroyed during spring and summer construction.

Golden-winged warbler range is limited to southern Manitoba. No effects on this migratory species' mortality are anticipated during winter clearing. Golden-winged warblers are unlikely to nest on the cleared right-of-way where shrubs are not yet present, and collisions with vehicles are not reported in the literature reviewed. No Project-related effects on mortality are expected during the clearing and construction phase.

Canada warbler range extends throughout southern to central Manitoba. As this species is migratory, no effects on mortality are anticipated during winter clearing. Canada warblers are unlikely to nest on the cleared right-of-way where shrubs are not yet present, and collisions with vehicles are not reported in the literature reviewed. No Project-related effects are expected during the clearing and construction phase.

Rusty blackbird range extends throughout Manitoba. As this species is migratory, no effects on mortality are anticipated during winter clearing. Rusty blackbirds nest mainly in northern treed muskeg habitat (Nero and Taylor 2003), and are unlikely to nest on the cleared right-of-way where regenerating vegetation is not yet present. Collisions with vehicles are not reported in the literature reviewed. No Project-related effects are expected during the clearing and construction phase.

Mortality of a few individuals would result in negligibly reduced local populations of common nighthawk, whip-poor-will, olive-sided flycatcher, loggerhead shrike, Sprague's pipit, golden-winged warbler, Canada warbler, and rusty blackbird.

Habitat Alteration

COSEWIC (2007b) reports that habitat loss or alteration may contribute to the decline of common nighthawk populations in the Prairie Provinces. Approximately 2.39% of common nighthawk habitat on the HVdc transmission line right-of-way, and 6.97% on the ac collector lines rights-of-way, will be affected in the Local Study Area. With the exception of the ac collector line rights-of-way, small habitat alterations and potential losses may affect a few individuals but are not expected to have a measurable effect on the common nighthawk population or to breeding and nesting habitat availability. The effect of habitat alterations along the ac collector lines is considered to be greater in magnitude than the HVdc transmission line right-of-way as greater than 5% of the available habitat is affected. In some cases, common nighthawk nesting habitat may improve slightly where forest is converted to open habitats where nighthawks nest on the ground and often forage in open habitats.

Habitat alteration or conversion is thought to contribute to whip-poor-will population decline in the Prairie Provinces (Cink 2002), but no direct link has been identified (COSEWIC 2009c). Approximately 1.68% of whip-poor-will habitat in the Local Study area will affected on the HVdc transmission line right-of-way. Small habitat alterations and any potential habitat losses may affect a few individuals at Project footprints but are not expected to have a measurable effect on local populations or on breeding and nesting habitat availability. In some cases, whip-poor-will nesting habitat may improve slightly where forest is converted to open habitats where they nest and often forage.

COSEWIC (2007d) indicates that habitat loss and alteration are thought to contribute to declining olive-sided flycatcher populations. A total of 1.55% of olive-sided flycatcher habitat in the Local Study Area will be affected on the HVdc transmission line right-of-way, and 1.94% on the ac collector lines rights-of-way. Small habitat alterations and losses may affect a few individuals where suitable perch trees are removed, but are not expected to have a measurable effect on local populations or to breeding and nesting habitat availability. In some cases, olive-sided flycatcher nesting habitat may improve slightly where forest is converted to open wetland or shrubland.

Habitat loss or degradation has been identified as contributing to declining loggerhead shrike populations (COSEWIC 2004). The reduction of native grassland in the Prairie Provinces and the central Great Plains of the United States has eliminated breeding habitat, and foraging habitat in migration and wintering areas has also been lost (COSEWIC 2004). Although an estimated 2.10% of loggerhead shrike habitat in the

Local Study Area could be affected on the HVdc transmission line right-of-way, no nesting loggerhead shrikes where not found during surveys in the Local Study Area. In some cases, loggerhead shrike nesting habitat may improve slightly where forest is converted to grassland and shrubland.

Clearing of the right-of-way will result in minimal habitat alteration for sensitive grassland birds such as Sprague's pipit, as the transmission line route was selected to avoid large core communities of grasslands where possible. Although approximately 1.37% of Sprague's pipit habitat in the Local Study Area will be affected on the HVdc transmission line right-of-way, nesting Sprague's pipits were not found during surveys in the Local Study Area. Habitat carrying capacity for this species is most likely underutilized (Holland *et al.* 2003). In some cases, Sprague's pipit nesting habitat may improve slightly where forest is converted to grassland, although there is a moderate level of uncertainty as to whether these habitats will be occupied by local populations.

Golden-winged warblers thrive on human-caused disturbances such as right-of-ways (COSWEIC 2006c), and could benefit from the habitat created by clearing the right-of-way in southern and west-central Manitoba, where this species is an uncommon breeder (Edie *et al.* 2003a). An estimated 1.38% of golden-winged warbler habitat in the Local Study Area will be affected on the HVdc transmission line right-of-way.

COSEWIC (2008b) reports that loss and alteration of breeding and wintering habitat are contributing factors in the decline of Canada warbler populations. Clearing of the right-of-way will result in minimal habitat alteration for Canada warblers, as the transmission line route was selected to avoid large core communities of deciduous forest where possible (WRCS 2011). An estimated 1.30% of Canada warbler habitat in the Local Study Area will be will be affected on the HVdc transmission line right-of-way. Small habitat alterations and any potential habitat losses may affect a few individuals in the Project Footprint but are not expected to have a measurable effect on local populations or on breeding and nesting habitat availability. In some cases, Canada warbler nesting habitat may improve slightly where forest is converted to tall shrublands.

COSEWIC (2006a) indicates that alteration of wintering habitat is the most important threat to rusty blackbird populations, and loss of breeding habitat also contributes to this species' decline. The estimated 1.49 % of rusty blackbird habitat in the Local Study Area will be affected on the HVdc transmission line right-of-way, and 1.67% along the ac collector lines rights-of-way. Small habitat alterations and any potential habitat losses may affect a few individuals at Project footprints but are not expected to have a measurable effect on local populations or on breeding and nesting habitat availability. In some cases, rusty blackbird nesting habitat may improve slightly where forest is converted to grassland and shrubland.

Sensory Disturbance

While sensory disturbances from clearing and construction could affect breeding, nesting, and daily movements, the restriction of clearing and northern construction activities to winter negates these potential effects. Similarly, clearing in the south will be limited to the winter months, and potential sensory disturbance effects will not occur. On the southern portion of the route, sensory disturbances and disruption of movements from construction will be limited to daily effects including site abandonment and avoidance by a few individuals, and would most likely occur around heavy construction locations.

Mitigation

The following mitigation measures are proposed to minimize and mitigate effects of the HVdc transmission and ac collector lines during the clearing and construction phase, with additional measures for species at risk:

- Project activities during bird breeding and brood rearing months will be restricted from April 1 to July 31, to reduce the risk of nest destruction and sensory disturbance;
- Searches for nests will be undertaken prior to spring or summer construction if the timing of construction activity overlaps with sensitive time periods;
- Setback distances will be applied if the timing of construction activity overlaps with sensitive time periods (the recommended setback distance is 200 m for common nighthawk and whip-poor-will, 300 m for olive-sided flycatcher and Canada warbler, 400 m for loggerhead shrike, 250 m Sprague's pipit, 300m for golden winged warbler, and 100 m for rusty blackbirds), and is to be applied to construction zones in southern Manitoba if they intersect with species at risk habitats and active breeding areas; and
- Night-time activities will be avoided during the nesting season to minimize disturbance to common nighthawk and whip-poor-will.

Based on the above mitigation measures, residual effects on common nighthawk, whip-poor-will, olive-sided flycatcher, loggerhead shrike, Sprague's pipit, golden-winged warbler, Canada warbler and rusty blackbird during construction are characterized as negative in direction, small magnitude, limited to the Local Study Area, short-term in duration, regular/continuous in frequency, and reversible, and therefore considered not significant.

Operation

Mortality

Predation by terrestrial predators such as raccoon and striped skunk is a source of common nighthawk mortality (COSEWIC 2007b), and could increase due to improved predator mobility on the cleared right-of-way. As common nighthawks lay eggs on the ground in clearings (Taylor 2003j), eggs or hatchlings could be damaged or destroyed during vegetation maintenance in spring. As this species is migratory, no effects on mortality are anticipated during the winter.

Whip-poor-wills lay their eggs directly on the ground on the forest floor (Cink 2002), and the cleared right-of-way could provide suitable nesting habitat if sites are maintained within a state of early to mid-forest succession (COSEWIC 2009c). Collisions with transmission wires are seemingly uncommon, and do not appear to be a large source of mortality. No Project-related effects on whip-poor-will mortality are anticipated during the operation and maintenance phase.

Few Project-related effects on olive-sided flycatcher mortality are anticipated during the operation and maintenance phase. As olive-sided flycatchers are associated with semi-open forests, edges, and clear-cuts (Altman and Sallabanks 2000), nests could be destroyed during vegetation management on the right-of-way in spring. As olive-sided flycatchers are generally found in northern Manitoba, no measurable effects on olive-sided flycatcher populations are anticipated.

No direct effects on loggerhead shrike mortality are anticipated on the northern portion of the route during operation and maintenance, as the species' range is limited to southern Manitoba. As this species is migratory, no effects on mortality are anticipated during the winter. Predation on loggerhead shrike adults and eggs can increase near openings that attract predators (COSEWIC 2004), potentially contributing to mortality on the right-of-way. Effects on mortality would be limited to the southern portion of the transmission line, particularly around Winnipeg.

No direct effects on Sprague's pipit mortality are anticipated on the northern portion of the route during operation and maintenance, as the species' range is limited to southern Manitoba. As this species is migratory, no effects on mortality are anticipated during the winter. Sprague's pipits are susceptible to brood parasitism by brown-headed cowbirds (Flashpoehler *et al.* 2001; Holland *et al.* 2003a). Brood parasitism could reduce Sprague's pipit nest success, contributing to mortality. As Sprague's pipits nest on the ground in tall grasses (Holland *et al.* 2003a), nests could be damaged or destroyed during vegetation management in spring. Effects on mortality would be limited to the south-western portion of the route, the extent of Sprague's pipit range, where the landscape is already highly fragmented.

Golden-winged warblers and Canada warblers are susceptible to brood parasitism by brown-headed cowbirds (COSEWIC 2006c, Conway 1999), which could reduce nest success and contribute to mortality. For Canada warblers such effects would be limited to the southern and central portion of the route, the extent of Canada warbler range, where the landscape is already highly fragmented. For golden-winged warblers, as shrubby or disturbed habitat is preferred for nesting (Askins 1994; Edie *et al.* 2003a), nests could be damaged or destroyed during vegetation management on the right-of-way in spring. Effects on mortality would be limited to the south-western portion of the route, the extent of golden-winged warbler range. As both species are migratory, no effects on mortality are anticipated during the winter.

Rusty blackbirds most often breed in northern Manitoba (Nero and Taylor 2003), where maintenance activity will occur in winter; no effects on rusty blackbird mortality are anticipated for the northern portion of the route. Rusty blackbirds are uncommon breeders in south-central Manitoba, and will not likely be affected on the southern portion of the route during the operation and maintenance phase. As this species is migratory, no effects on mortality are anticipated during the winter.

Mortality of a few individuals would result in negligibly reduced local populations of common nighthawk, whip-poor-will, olive-sided flycatcher, loggerhead shrike, Sprague's pipit, golden-winged warbler, Canada warbler, and rusty blackbird.

Habitat Alteration

As vegetation management is expected to occur only during winter in the north no loss of effective habitat or disruption of movement is expected to occur. In the south, vegetation management may occur year round and may affect the breeding, nesting, and daily movements.

Sensory Disturbance

Sensory disturbances and disruption of movements will be limited to infrequent, temporary effects including site abandonment and avoidance by a few individuals. As most olive-sided flycatchers are found on the northern portion of the route, effects in the south will be further limited. Finally, there may also be occasional, temporary loss of effective habitat associated with sensory disturbances arising from recreational use (e.g., ATVs) and agricultural machinery along the route.

Mitigation

The following mitigation measures are proposed minimize and mitigate effects of the transmission and ac collector lines on species at risk during the operation phase:

- Shrubby vegetation will be maintained on the rights-of-way where possible to impede transportation via ATV and some foot traffic, to minimize access to the area and to reduce sensory disturbance (see Bipole III Birds Technical Report for potential habitat and locations);
- Shrubby vegetation will be maintained on the right-of-way where possible as potential olive-sided flycatcher and Canada warbler habitat;
- Vegetation management will be limited in areas where common nighthawk, whip-poor-will could occur from April 1 to July 31 to minimize the risk of nest destruction and sensory disturbance during the nesting season (see Bipole III Birds Technical Report for potential habitat and locations);
- Searches for nests will be undertaken prior to spring or summer vegetation management if the timing of maintenance activity overlaps with sensitive time periods and locations;
- Setback distances (see Construction section) will be applied if the timing of vegetation management overlaps with sensitive time periods;
- Night-time maintenance activities will be avoided in species at risk habitats during the nesting season to minimize disturbance to common nighthawk; and
- Where feasible, maintain golden-winged warbler habitat by selective basal spraying (Askins 1994) for vegetation management on the southern portion of the right-of-way.

Based on the above mitigation measures, residual effects on common nighthawk, whip-poor-will, olive-sided flycatcher, loggerhead shrike, Sprague's pipit, golden-winged warbler, Canada warbler and rusty blackbird during operation are characterized as negative in direction, small magnitude, limited to the Local Study Area, medium-term in duration, sporadic/intermittent in frequency, and reversible, and therefore considered not significant.

Keewatinoow Converter Station and Area

Waterfowl and Waterbirds VECs (Mallard, Sandhill Crane and Yellow Rail)

Construction

Project-related effects on mallard mortality, sensory disturbance, and disruption of movements during construction of the Keewatinoow Converter Station will be similar to those on the rights-of-way. It is estimated that less than 0.01% of the existing mallard habitat will be lost from the clearing and construction of the Keewatinoow converter station. It is estimated that less than 0.01% of sandhill crane habitat will be lost from the clearing and construction of the Keewatinoow Converter Station. The creation of a sewage lagoon in proximity to Keewatinoow Converter Station for the construction camp, it is expected to temporarily increase a small amount of mallard habitat.

There is no mitigation required for habitat loss at the converter station. Mitigation measures for clearing and construction of the Keewatinoow Converter Station are as follows:

- Hunting and harvesting of wildlife by Project staff will be limited while working on Project sites and restrict firearms at construction sites, minimizing the potential effect of harvesting on mallard mortality;
- Project clearing activities during bird breeding and brood rearing months will be restricted from April 1 to July 31, to reduce the risk of nest destruction and sensory disturbance; and
- Vegetated buffers will be maintained in riparian areas to minimize the effect of habitat alteration.

Based on the above mitigation measures, residual effects on mallard and sandhill crane during construction are characterized as negative in direction, small magnitude, limited to the Local Study Area, short-term in duration, regular/continuous in frequency, and reversible, and therefore are not considered significant.

Operation

Sensory disturbances from the operation of the Keewatinoow Converter Station may occur year round and consequently may affect the breeding, nesting, and daily movements of mallards and sandhill cranes. Although highly unlikely, increased bird-wire collisions may result in a few mallard mortalities. No mitigation measures are proposed. Following the decommissioning of the sewage lagoon in proximity to Keewatinoow Converter Station for the construction camp, it is expected that this temporary waterfowl habitat will be lost.

No direct Project-related effects on yellow rail are anticipated, as no habitat for this VEC has been identified in the vicinity of the Keewatinoow Converter Station.

Residual effects on mallard and sandhill crane are during operation are characterized as negative in direction, small magnitude, limited to the Local Study Area, medium-term in duration, sporadic/intermittent in frequency, and reversible, and therefore are not considered significant.

Colonial waterbirds (Great Blue Heron and Least Bittern)

No direct Project-related effects on great blue heron are anticipated, as limited habitat for this VEC has been identified in the vicinity of the Keewatinoow Converter Station. No direct Project-related effects on least bittern are anticipated, as the Keewatinoow Converter Station is beyond the northern extent of this species' range.

Birds of Prey VECs (Bald Eagle, Ferruginous Hawk, Burrowing Owl and Short-eared Owl)

Construction

Project-related effects on bird of prey mortality, sensory disturbance, and disruption of movements during construction of the Keewatinoow Converter Station will be similar to those on the right-of-way. There is no bald eagle habitat at the Keewatinoow converter station site.

No direct Project-related effects on ferruginous hawk and burrowing owl are anticipated, as the Keewatinoow Converter Station is beyond the northern extent of these species' ranges. No direct Project-related effects on short-eared owl are anticipated, as no habitat for this VEC has been identified in the vicinity of the Keewatinoow Converter Station.

Mitigation measures for clearing and construction of the Keewatinoow Converter Station are as follows:

- Trees containing large stick nests will be left undisturbed until unoccupied to minimize mortality due to nest destruction during the nesting season;
- Artificial structures will be provided for nesting if unoccupied nests must be removed to reduce the loss of nesting habitat (i.e., but only if the raptor nest is not located adjacent to a sensitive site e.g., sharp-tailed grouse lek or species at risk habitat);
- Buffers within a 200 m radius of eagle and osprey nests will be maintained from April 1 to July 31 to protect from sensory disturbance during the breeding season;

- Maintain buffers within a 100 m radius of eagle and osprey nests from August 1 to March 31 to protect nest trees and maintain the integrity of nesting sites; and
- Project clearing activities during bird breeding and brood rearing will be restricted months from April 1 to July 31, to reduce the risk of nest destruction and sensory disturbance.

Based on the above mitigation measures, residual effects on bald eagle during construction are characterized as negative in direction, small magnitude, limited to the Local Study Area, short-term in duration, regular/continuous in frequency, and reversible, and therefore are not considered significant.

Operation

Sensory disturbances from the operation of the Keewatinoow Converter Station may occur year round and consequently may affect the breeding, nesting, and daily movements of birds of prey. No mitigation measures are proposed.

No direct Project-related effects on short-eared owl are anticipated, as no habitat for this VEC has been identified in the vicinity of the Keewatinoow Converter Station.

Residual effects on bald eagle during operation are characterized as negative in direction, small magnitude, limited to the Local Study Area, medium-term in duration, sporadic/intermittent in frequency, and reversible, and therefore are not considered significant.

Upland Game Bird VECs (Sharp-tailed Grouse and Ruffed Grouse)

Construction

Project-related effects on sharp-tailed grouse mortality, sensory disturbance, and disruption of movements during construction of the Keewatinoow converter station will be similar to those on the rights-of-way. It is estimated that less than 0.08% of sharp-tailed grouse habitat will be lost from the clearing and construction of the Keewatinoow Converter Station.

No direct Project-related effects on ruffed grouse are anticipated, as limited habitat for this VEC has been identified in the vicinity of the Keewatinoow Converter Station.

There is no mitigation required for habitat loss at the converter station. Mitigation measures for clearing and construction of the Keewatinoow Converter Station are as follows:

- Hunting and harvesting of wildlife by Project staff will be limited while working on Project sites and restrict firearms at construction sites to minimize the effect of harvesting on sharp-tailed grouse mortality; and
- A buffer of 500 m will be maintained around sharp-tailed grouse leks.

Based on the above mitigation measures, residual effects on sharp-tailed grouse during construction are characterized as negative in direction, small magnitude, limited to the Local Study Area, short-term in duration, regular/continuous in frequency, and reversible, and therefore are not considered significant.

Operation

Sensory disturbances from the operation of the Keewatinoow Converter Station may occur year round and consequently may affect the breeding, nesting, and daily movements of sharp-tailed grouse. No mitigation measures are proposed.

No direct Project-related effects are anticipated for ruffed grouse, as limited habitat is available in the vicinity of the Keewatinoow Converter Station.

Residual effects on sharp-tailed grouse during operation are characterized as negative in direction, small magnitude, limited to the Local Study Area, medium-term in duration, sporadic/intermittent in frequency, and reversible, and therefore are not considered significant.

Woodpecker VECs (Pileated Woodpecker and Red-headed Woodpecker)

No direct Project-related effects on pileated woodpecker are anticipated, as limited habitat for this VEC has been identified in the vicinity of the Keewatinoow Converter Station. No direct Project-related effects on red-headed woodpecker are anticipated, as the Keewatinoow converter station is beyond the northern extent of this species' range.

Songbirds and Other Bird VECs (Common Nighthawk, Whip-poor-will, Olive-sided Flycatcher, Loggerhead Shrike, Sprague's Pipit, Golden-winged Warbler, Canada Warbler and Rusty Blackbird)

Construction

Project-related effects on common nighthawk, olive-sided flycatcher, and rusty blackbird, in terms of mortality, sensory disturbance, and disruption of movements during construction of the Keewatinoow Converter Station will be similar to those on the rights-of-way.

It is estimated that less than 0.03% of common nighthawk habitat will be lost from the clearing and construction of the Keewatinoow Converter Station. It is estimated that less than 0.02% of olive-sided flycatcher habitat will be lost from the clearing and construction of the Keewatinoow Converter Station. It is estimated that less than 0.04% of rusty blackbird habitat will be lost from the clearing and construction of the Keewatinoow Converter Station.

No direct Project-related effects on loggerhead shrike, Sprague's pipit, golden-winged warbler, and Canada warbler are anticipated, as the Keewatinoow Converter Station is beyond the northern extent of these species' ranges.

There is no mitigation required for habitat loss at the converter station. Mitigation measures for clearing and construction of the Keewatinoow Converter Station are as follows:

- Project clearing activities during bird breeding and brood rearing months will be restricted from April 1 to July 31, to reduce the risk of nest destruction and sensory disturbance.

Based on the above mitigation measures, residual effects on common nighthawk, olive-sided flycatcher and rusty blackbird during construction are characterized as negative in direction, small magnitude, limited to the Local Study Area, short-term in duration, regular/continuous in frequency, and reversible, and therefore are not considered significant.

Operation

Sensory disturbances from the operation of the Keewatinoow Converter Station may occur year round and consequently may affect the breeding, nesting, and daily movements. No mitigation measures are proposed.

Residual effects from operation on common nighthawk, olive-sided flycatcher, and rusty blackbird during operation are characterized as negative in direction, small magnitude, limited to the Local Study Area, medium-term in duration, sporadic/intermittent in frequency, and reversible, and therefore are not considered significant

Borrow Sites, Excavated Material Disposal Area and General Borrow Areas

Construction

Effects of clearing and construction of the borrow sites and excavated material disposal areas and general borrow areas on VECs are expected to be the similar as for the Keewatinoow Converter Station, with the exception of the degree of habitat alteration, as the area affected by the borrow sites and excavated material disposal areas and general borrow areas could be much larger.

The Bipole III Birds Technical Report documents an analysis of potential borrow sites and excavated material replacement areas, including the maximum number of VECs with potential habitat within the borrow sites and excavated material disposal areas and general borrow areas. Part of the analysis involved examining the number of potential species that could inhabit each site. In general, the largest borrow sites were found to have the greatest potential for habitat effects and borrow sites that intersect creeks are potentially at a higher risk for project related effects due to the higher degree of bird diversity associated with riparian zones. In addition, the larger excavated material disposal areas were found to have the greatest potential for habitat effects. All excavated material disposal areas have the same number of potential species at risk. As the utilization area of the borrow sites and excavated material disposal areas and general borrow areas is not known at this time the amount of habitat affected cannot be determined.

Sensory disturbance is expected to have a greater effect at the Keewatinoow Converter Station due to blasting. Mitigation measures proposed for the Keewatinoow Converter Station should be followed.

No Project effects are anticipated for least bittern, burrowing owl, red-headed woodpecker, whip-poor-will, loggerhead shrike, Sprague's pipit, golden-winged warbler, and Canada warbler for borrow sites and excavated material disposal areas because this geographic location is beyond the northern extent of these species' ranges. No Project effects are anticipated for yellow rail, great blue heron, ferruinous hawk, short-eared owl, ruffed grouse, and pileated woodpecker because there is no habitat for these species at these sites.

Based on the mitigation measures proposed, residual effects on mallard, sandhill crane, bald eagle, sharp-tailed grouse, common nighthawk, olive-sided flycatcher, and rusty blackbird during construction are characterized as negative in direction, small magnitude, limited to the Local Study Area, short-term in duration, regular/continuous in frequency, is and therefore are not considered significant.

Operation

The disposition of the borrow sites located in the Local Study Area includes site rehabilitation. Selection, development and reclamation of new borrow sites will be undertaken in accordance with provincial regulations and with the approval of the local Natural Resources Officer and local government authorities. Where borrow pits are required, exposed soils will be reclaimed by promoting re-growth of native vegetation and other mitigation measures in accordance with *The Mines Act*. There is however, a moderate level of uncertainty as to the timing of borrow site rehabilitation due to the potential need for the construction of Conawapa generating station if it is approved (see

Project Description Chapter 3). Timing of decommissioning and clean-up of some temporary facilities (e.g., borrow areas, etc.) may be subject to future development requirements (e.g., development of Conawapa Generating Station).

For all VECs, where potential borrow sites and excavated material disposal areas and General Borrow Areas are rehabilitated, the operation of these facilities will not result in any additional mortality or sensory disturbances for the Bipole III Project. However, habitat alteration or fragmentation effects may result in small but long term changes to the local bird community where habitat has been altered.

No Project effects are anticipated for least bittern, burrowing owl, red-headed woodpecker, whip-poor-will, loggerhead shrike, Sprague's pipit, golden-winged warbler, and Canada warbler for borrow sites and excavated material disposal areas because this geographic location is beyond the northern extent of these species ranges. No Project effects are anticipated for yellow rail, great blue heron, feriginous hawk, short-eared owl, ruffed grouse, and pileated woodpecker because there is no habitat for these species at these sites.

Riel Converter Station

As there is no suitable habitat for VECs in the vicinity of the Riel Converter Station except mallard, there are no anticipated effects for any other VEC during clearing, construction, or operation. No direct Project-related effects on olive-sided flycatcher and rusty blackbird are anticipated, as the Riel Converter Station is beyond the southern extent of these species' ranges.

Construction

Mallard

Sensory disturbances from the construction of the Riel converter station may occur during the spring and summer and consequently may affect the breeding, nesting, and daily movements of mallards that typically nest near a lagoon adjacent to the converter station. No mitigation measures are proposed as this area already experiences high levels of sensory disturbance from traffic and other industrial development. Birds in the area would most likely habituate to the noise if any mallards chose to nest in habitat adjacent to the site.

Residual effects on mallard during construction are characterized as negative in direction, small magnitude, limited to the Local Study Area, short-term in duration, regular/continuous in frequency, and reversible, and therefore are not considered significant.

Other VECs

No direct Project construction-related effects on other VECs are anticipated, as no habitat for these VECs has been identified in the vicinity of the Riel Converter Station. This applies to sandhill crane, yellow rail, great blue heron, least bittern, bald eagle, ferruginous hawk, burrowing owl, short-eared owl, sharp-tailed grouse, ruffed grouse, pileated woodpecker, red-headed woodpecker, common nighthawk, whip-poor-will, loggerhead shrike, Sprague's pipit, golden-winged warbler, and Canada warbler.

Operation

Mallard

Sensory disturbances from the operation of the Riel Converter Station may occur during the spring and summer and consequently may affect the breeding, nesting, and daily movements of mallards which typically nest near a lagoon adjacent to the converter station. No mitigation measures are proposed as this area already experiences large levels of sensory disturbance from traffic and other industrial development. Birds in the area would most likely habituate to the noise if any mallards chose to nest in habitat adjacent to the site.

Residual effects on mallard during operation are characterized as negative in direction, small magnitude, limited to the Local Study Area, medium-term in duration, sporadic/intermittent in frequency, and reversible, and therefore are not considered significant.

Other VECs

No direct Project operation-related effects on other VECs are anticipated, as no habitat for these VECs has been identified in the vicinity of the Riel Converter Station. This applies to sandhill crane, yellow rail, great blue heron, least bittern, bald eagle, ferruginous hawk, burrowing owl, short-eared owl, sharp-tailed grouse, ruffed grouse, pileated woodpecker, red-headed woodpecker, common nighthawk, whip-poor-will, loggerhead shrike, Sprague's pipit, golden-winged warbler, and Canada warbler.

Ground Electrodes and Lines

Construction

Effects of clearing and construction of the ground electrodes and lines on VECs are expected to be similar as those for the HVdc transmission line in the same geographic region, with the exception of the degree of habitat alteration which will be small to nil depending on the species. Mitigation measures proposed for HVdc transmission lines in the same geographic region should be followed.

No Project effects on least bittern, burrowing owl, red-headed woodpecker, whip-poor-will, loggerhead shrike, Sprague's pipit, golden-winged warbler, and Canada warbler are anticipated at the northern ground electrode and lines because this geographic location is beyond the northern extent of these species ranges.

Based on the proposed mitigation measures, residual effects on the remaining VECs during construction are characterized as negative in direction, small magnitude, limited to the Local Study Area, short-term in duration, regular/continuous in frequency, and reversible, and therefore are not considered significant.

Operation

For all VECs, the effects of operation and maintenance of the northern and southern ground electrodes and lines are expected to be the same as those of the HVdc transmission and ac collector lines in the same region. The amount of habitat created by regenerating vegetation is not expected to have any measurable effect on local bird populations. Mitigation measures proposed for HVdc transmission lines in the same geographic region should be followed.

No Project effects are anticipated for least bittern, burrowing owl, red-headed woodpecker, whip-poor-will, loggerhead shrike, Sprague's pipit, golden-winged warbler and Canada warbler for the northern ground electrode and lines because this geographic location is beyond the northern extent of these species ranges.

Based on the implementation of previous mitigation measures, residual effects on the remaining VECs during operation are characterized as negative in direction, small magnitude, limited to the Local Study Area, medium-term in duration, sporadic/intermittent in frequency, and reversible, and therefore are not considered significant.

8.2.7.5 Summary of Residual Environmental Effects and Significance

Potential residual effects from the Project include the following:

- Small increase in mortality to some bird populations in the local study area from increased predation, hunting, and/or bird-wire collisions;
- Small decrease in productivity to some local bird populations due to brood parasitism by brown-headed cowbird and possibly by opportunistic invasive species such as blue jay and American crow, which are known to occasionally consume eggs or young;

- Small alteration of habitat and its use by birds along the right-of-way and the electrode sites, and a small loss of habitat at the base of towers, and at the Keewatinoow and Riel converter stations;
- Small increases to nesting and foraging opportunities for some bird species, and small decreases of nesting and foraging opportunities for other bird species;
- Sensory disturbances resulting in temporary displacement into alternate habitats for local birds; and
- Small decrease in local movements of some bird species across the right-of-waymainly along the ac collector lines rights-of-way, and limited to the breeding season.

Such effects will be evident during the construction and operation phases of the Project. The residual effects are largely reversible based on decommissioning of Project components. Species at risk are listed by SARA and/or MESA. The loss of many individual birds could potentially have an irreversible effect on local populations during construction and operation. However, mortality of a few individuals as may be anticipated from the proposed project will result in negligibly reduced local populations. With the implementation of federal recovery strategies, these potential effects are considered reversible and will likely fall within the range of natural variability.

Residual effects include decreased productivity, habitat changes, sensory disturbances, and disruption of movements concurrent with breeding and nesting periods. Following required mitigation measures, the restriction of clearing, construction, operation, and maintenance activities during nesting season, from approximately April to the end of July, along the length of the Project route, will result in residual effects being eliminated or of only a small magnitude. A summary of the residual effects of the Bipole III Project are outlined in Table 8.2-9, which indicates the significance of residual effects on bird groups based on specific Project components. Bird species used in discussing residual effects were selected based on the use of VECs which can then be used as indicators to relate residual effects to varied bird communities. In addition, species at risk found along the Project route were also considered based on potential residual effects. After mitigation, the Project is expected to have no significant adverse residual effects on bird populations or their habitats.

Table 8.2-9: Residual Environmental Effects Summary – Birds

VEC	Project Component	Phase	Residual Effect	Assessment[2]
Waterfowl & Waterbirds (Mallard, Sandhill Crane & Yellow Rail) (No Yellow Rail in Keewatinoow site area)	HVdc Transmission Line and ac Collector Lines; Ground Electrodes and Lines in vicinity of HVdc line	Construction & Operation	Habitat loss primarily at tower footprints and habitat alteration in the ROWs; fragmentation effects in sensitive areas including habitat avoidance near the ROWs from sensory disturbances associated with human or mechanical activity;some potential mortalities from increased hunting, predation and/or bird-wire collisions	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term **Overall – Not Significant**
(Only Mallard in Riel site area)	Keewatinoow Converter Station and Area ; Borrow Areas, Excavated Material Placement Areas;	Construction & Operation	Habitat loss/alteration at footprints; habitat avoidance near infrastructure from sensory disturbances associated with human or mechanical activity; some potential mortalities from	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term **Overall – Not Significant**

VEC	Project Component	Phase	Residual Effect	Assessment[2]
			increased hunting, predation, and/or bird-wire collisions	
	Riel Converter Station;	Construction & Operation	Habitat avoidance from sensory disturbances associated with human or mechanical activity	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term **Overall – Not Significant**
Colonial Waterbirds (Great Blue Heron & Least Bittern)	HVdc Transmission Line and ac Collector Lines; Ground Electrodes and Lines in vicinity of HVdc line	Construction & Operation	Habitat loss primarily at tower footprints and habitat alteration in the ROWs; fragmentation effects in sensitive areas including habitat avoidance near the ROWs from sensory disturbances associated with human or mechanical activity; some potential mortalities from increased predation or bird-wire collisions.	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term **Overall – Not Significant**

VEC	Project Component	Phase	Residual Effect	Assessment[2]
Birds of Prey (Bald Eagle, Ferruginous Hawk, Burrowing Owl, Short-eared Owl) (Only Bald Eagle in Keewatinoow site area)	HVdc Transmission Line and ac Collector Lines; Ground Electrodes and Lines in vicinity of HVdc line Keewatinoow Converter Station and Area	Construction & Operation	Habitat loss or alteration in the ROWs, including increased nesting habitat, perches and foraging opportunities; fragmentation effects in sensitive areas including habitat avoidance near the ROWs from sensory disturbances associated with human or mechanical activity; some potential mortalities from vehicle collisions.	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term **Overall – Not Significant**
Upland Game Birds (Sharp-tailed Grouse & Ruffled Grouse) (Only Sharp-tailed Grouse in Keewatinoow	HVdc Transmission Line and ac Collector Lines; Ground Electrodes and Lines in vicinity of HVdc line Keewatinoow Converter Station and Area; Borrow Areas	Construction & Operation	Habitat loss primarily at tower footprints and habitat alteration in the ROWs; fragmentation effects in sensitive areas including habitat avoidance and disruption of daily movements near the ROWs from sensory disturbances associated with	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term **Overall – Not Significant**

VEC	Project Component	Phase	Residual Effect	Assessment[2]
site area)			human or mechanical activity; some potential mortalities from increased hunting vehicle collisions and bird-wire collisions.	
Woodpeckers (Pileated Woodpecker & Red-Headed Woodpecker)	HVdc Transmission Line and ac Collector Lines; Ground Electrodes and Lines in vicinity of HVdc line	Construction & Operation	Habitat loss and habitat alteration in the ROWs; fragmentation effects in sensitive areas including habitat avoidance near the ROWs from sensory disturbances associated with human or mechanical activity; some potential mortalities from vehicle collisions.	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term **Overall – Not Significant**
Songbirds (Common nighthawk, Whip-poor-will, Olive Sided Flycatcher, Loggerhead Shrike, Spraque's Pipit, Golden-	HVdc Transmission Line and ac Collector Line; Ground Electrodes and Lines in vicinity of HVdc line es;	Construction & Operation	Habitat loss primarily at tower footprints and habitat alteration in the ROWs; fragmentation effects in sensitive areas including habitat avoidance near the ROWs from	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term **Overall – Not Significant**

VEC	Project Component	Phase	Residual Effect	Assessment[2]
winged Warbler, Canada Warbler, Rusty Blackbird)			sensory disturbances associated with human or mechanical activity; some potential mortalities from vehicle collisions.	
Songbirds (Common nighthawk, Olive Sided Flycatcher, Rusty Blackbird)	Keewatinoow Converter Station and Area	Construction & Operation	Habitat loss at footprints; habitat avoidance near infrastructure from sensory disturbances associated with human or mechanical activity	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term **Overall – Not Significant**

Notes:

1. Definitions provided in Chapter 4 Section 4.4.
2. Expected residual effects (i.e., effects after mitigation) of the Project on each VEC are assessed using the regulatory significance evaluation approach and methods defined in Chapter 4, Section 4.2.10. Where feasible, regulatory significance is assessed for each non-negligible expected residual effect based on its expected direction, magnitude, geographic extent and duration (as each term is defined in Section 4.2.10); if an adverse residual effect is evaluated to be potentially significant, other factors are also considered (frequency, reversibility, ecological importance and societal importance). Scientific uncertainty is noted where it may materially affect the assessment.

8.2.7.6 Follow-up

In order to determine the long-term effects of the Project on birds, the effectiveness of mitigation measures, and where there is higher uncertainty in predicting Project effects, follow-up monitoring will be required. Recommended follow-up includes monitoring of listed species populations, assessment of bird-wire collisions, evaluations of the persistence of sharp-tailed grouse leks, and monitoring of previously identified bird colonies in proximity to the right-of-way.

Manitoba Hydro will monitor threatened and endangered species occurrences at locations where species at risk were observed, or where they may be found during the construction of the HVdc and ac transmission lines. This includes borrow sites and excavated material disposal areas, where preconstruction surveys are also required.

Pre-project monitoring surveys and nest searches are required in areas where summer construction is anticipated. Evaluation of the effectiveness of buffer zones and set-back distances for listed species will be assessed where construction occurs during the nesting season. If suggested sizes of buffer zones or set-back distances are determined to be inadequate if measureable effects are found, or where unanticipated effects have occurred, adaptive management will be employed to modify their sizes to eliminate any nest abandonment and to minimize potential effects to fledging success.

Limited increases in local traffic to and from construction sites in southern Manitoba, and low vehicle speeds along the rights-of-wayare expected to result in very few bird injuries or mortalities in the Local Study Area. As there is some level of uncertainty regarding this effects prediction due to the paucity of data, and especially as there is a higher risk to potentially affecting Species at Risk populations as noted in numerous reports, Manitoba Hydro will monitor and report vehicle-bird collisions during the construction and operation period. Although substantial effects are unlikely to occur, if bird-vehicle collisions are more frequent than anticipated, Manitoba Hydro will use adaptive management to minimize these effects by potentially applying vehicle speed restrictions along rights-of-wayand as may be necessary, further educating contractors and employees on means to avoid and minimize bird-vehicle collisions.

Very limited numbers of bird-wire collisions are anticipated for this Project, especially where bird deflectors are installed at sensitive sites. However, as there is a paucity of data for Manitoba, and as there is some level of uncertainty with the effects predictions, Manitoba Hydro will monitor and report the number of bird-wire collisions associated with the Project. Searches for dead or injured birds will be performed to determine the efficacy of this mitigation method in higher risk-of-collision habitats (e.g., near great blue heron colonies, Bonaparte's gull colonies). Similar searches are required at sites where effects were not anticipated. If unanticipated effects are encountered such as high numbers of bird-wire strikes, and especially if species at risk are involved even at low numbers detected, Manitoba Hydro will take remedial actions including the placement of bird deflectors at these unanticipated bird mortality sites.

Although highly unlikely to occur with this Project, Manitoba Hydro will collect data on bird electrocutions associated with this Project. If problem areas are identified, Manitoba Hydro will apply corrective actions such as the placement of perch guards, particularly in areas if, and where, species at risk are involved, to prevent future occurrences.

Sharp-tailed grouse are particularly vulnerable to bird-wire strikes and to increased rates of predation near leks where birds of prey use elevated perches such as transmission line towers near the lek to hunt birds. As there is some uncertainty concerning the effects predictions, and where there is uncertainty as to the proximity of sharp-tailed grouse leks to the HVdc transmission line, pre-project monitoring is required. Existing lek locations are needed to implement mitigation measures recommended, such as: 1) the placement of bird perch deterrents (e.g., porcupine wire or triangles) to discourage birds of prey from perching over and hunting at these leks; and 2) locate bird deflectors to minimize bird-wire collisions at these sites. Manitoba Hydro will conduct monitoring during operations to evaluate and report on the efficacy of these prevention measures. Where deterrents or perch guards were not used, Manitoba Hydro will collect data on mortality. If unanticipated effects are encountered such as high numbers of bird-wire strikes, and/or where large numbers of grouse have been predated, Manitoba Hydro will take remedial actions including the placement of bird deflectors and/or perch guards at these bird mortality sites.

8.2.8 Amphibians and Reptiles

8.2.8.1 Overview

General

Within the Project Study Area ecozones, amphibians and reptiles are distributed according to their individual niches, from prairie species residing in the sand prairies of south western Manitoba to boreal species overwintering under forest leaf litter or limestone outcrops. Additionally, Manitoba contains 41% of Canada's wetlands, essential for the breeding stage of several Manitoban anuran species.

In general, several issues may contribute to declines of amphibian and reptile species. For species at risk, habitat loss or alteration is one of the biggest concerns, resulting in fragmentation and changes in microclimate. Habitat fragmentation can have large effects on amphibian and reptile communities by creating habitat barriers (i.e. edge effects), inhibiting movements and altering dispersal patterns important for the retention of metapopulations and the prevention of isolated populations. Alteration of habitat also results in changes in microclimate, such as temperature and moisture levels, to which amphibians, with their small body size and permeable skin, are typically very sensitive.

A more detailed description of the amphibian and reptile environment within the Project Study Area can be found in Chapter 6.0 (Existing Environmental Setting) of this EIS and the Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report. This section describes the effects of the Project from a biophysical perspective, as it relates to the amphibians and reptiles within the Project Study Area. Effects of the Project are assessed based on information obtained from published literature, grey literature, government online databases, field studies, and habitat models. Key environmental effects are outlined, as they relate to species of interest. As it is not feasible to assess potential impacts of the Project on all amphibians and reptiles, selected species were identified (termed VECs and are described below).

Amphibian and Reptile Groups

There are 15 amphibian species with distributions within Manitoba. Of these, 12 have ranges overlapping or in close proximity to the Project Study Area. The COSEWIC lists two Manitoba amphibian species as being at-risk, one of which can be found in the Project Study Area. The northern leopard frog is listed by COSEWIC as a species of special concern. It is not listed under the MESA. Additionally, the plains spadefoot is found within the Study Area and is listed as protected under Division 6 of *The Manitoba Wildlife Act*. It is not listed under COSEWIC or MESA. In addition to the more common wood frog, both of these species have been selected, based on assessment of key criteria described below, as representative amphibians in the evaluation of environmental effects of the Project.

There are eight reptile species with distributions within Manitoba, all of which have ranges overlapping or in close proximity to the Project Study Area. COSEWIC lists two Manitoba reptile species, both of which can be found in the Project Study Area. The northern prairie skink is listed by COSEWIC as Endangered and as Protected under Division 6 of *The Manitoba Wildlife Act*. The common snapping turtle has recently been listed as a species of Special Concern by COSEWIC, but is not listed under the SARA. Neither species is listed under MESA. Additionally, the plains hognose snake is found within the Study Area and is listed as protected under Division 6 of The Manitoba *Wildlife Act*. It is not listed under COSEWIC or MESA. Of these three at-risk species, the northern prairie skink has been selected, based on assessment of key criteria described below, as a representative reptile in the evaluation of environmental effects of the Bipole III Project; garter snake hibernacula were also selected, due to their dependency on overwintering den sites leaves these concentrations of snake populations vulnerable to disturbance, degradation and local extirpation. Both species are further described below.

For a detailed description of the amphibian and reptile environment within the Project Study Area, please refer to Chapter 6 (Existing Environmental Setting) of this EIS, and the Bipole III Terrestrial Invertebrates, Amphibians, and Reptiles Technical Report.

8.2.8.2 Potential Effects and Key Topics

Potential effects of all Project-related activities can generally be divided into two broad categories:

- Alteration of habitat resulting from right-of-way, collector lines, and construction power line clearing and maintenance, electrode site clearing, construction of a converter station, and installation of permanent towers; and
- Effects of increased use of seasonal access trails and right-of-way and other machinery-related effects.

In general, key sensitive areas include sandy soil habitats, wetlands, and garter snake hibernacula.

Potential Habitat Alteration Effects

General

Habitat alteration, defined as a change in plant community and overall habitat type composition, may cause changes in the distribution, movement and overall abundance of amphibian and reptile populations, and is perhaps the single predominant Project-related activity affecting these groups. Habitat alteration may occur throughout most construction and maintenance phases of the Project, including clearing of habitat along the transmission line and collector line rights-of-ways, at electrode sites, at the Keewatinoow construction camp, at the converter station, during borrow site excavated material placement sites, and during the installation of permanent transmission towers along the right-of-way.

Many construction-related activities are expected to occur in areas where the degree of disturbance and habitat fragmentation is already high, such as human-impacted, urban or developed areas, or along existing linear features. In order to access the right-of-way, for example, existing linear features will be used. As such, construction-related activities in such areas are expected to have a minimal effect. Where habitat is relatively undisturbed, habitat alteration and fragmentation could have a more substantial effect.

Amphibians

Because of their small body size, permeable skin, and need for adequate moisture, amphibians rely on high quality water and land environments and can act as bio-indicators of environment condition, habitat change, and ecosystem imbalance (Barinaga 1990; Blaustein and Wake 1990; Wake 1991). These traits, and unique breeding, summering, and overwintering habitat requirements make amphibians particularly susceptible to habitat change such as that which can occur through habitat loss, habitat fragmentation, environmental contamination and increased incidence and severity of drought (COSEWIC 2009).

In general, undisturbed buffer zones of riparian vegetation along wetlands and streams are important in reducing effects of habitat fragmentation, and in providing cover, movement corridors, and breeding habitat for anurans (Seburn and Seburn 2000).

Reptiles

Alteration of habitat, such as that which will occur during the construction and maintenance phase of the Project, may cause changes in the distribution, movement and overall abundance of some reptile species. The alteration or loss of uncommon habitat, such as sandy-soil prairie habitat, can result in population declines of such reptile species as the northern prairie skink, which rely on this habitat extensively (COSEWIC 2004). In these areas, re-growth of vegetation following disturbance may increase encroachment of invasive plant species such as leafy spurge, a plant known for invading ridges of suitable skink habitat and displacing individuals (COSEWIC 2004).

Unlike amphibians, snake species abundance and richness has been found to increase with increasing removal of tree basal area, possibly offering greater opportunities for thermoregulation in these open areas than in closed canopy stands (Ross *et al.* 2000). Such areas may be beneficial for garter snake populations during migrations and movement between feeding and hibernation sites. Multiple snake species have been found to prefer linear features, such as a transmission line right-of-way, compared to surrounding forest habitat (Yahner 2001a and 2001b).

Mortality and Sensory Disturbance Effects

General

Traffic and machine-related activities are defined here as any direct or indirect actions that are associated with the use of machines and vehicles used during the construction or operation of the Bipole III Project. The increased use of both seasonal access trails and the right-of-ways, and associated vehicle-related effects can have multiple direct and indirect effects on amphibians and reptiles, ranging from direct mortality and injury to sensory disturbances and changes in distribution and movement patterns. Vehicular traffic will increase during the clearing of a transmission line, installation of towers, installation of electrode rings, construction of a converter station, and borrow areas excavation and borrow material placement associated with the construction phase of the Project. Intermittent traffic will be ongoing throughout the operation phase of the Project with maintenance, and increased use of both seasonal access trails and a developed right-of-way. Use of both seasonal access trails and the right-of-way will increase traffic-use effects in areas where access was previously limited. Lastly, accumulation of waste materials resulting from machinery and construction may occur during the construction and decommissioning phases of the Project.

Other Miscellaneous Potential Effects

Additional potential effects relate to ground electrodes, and include ground potential rise and leaching in imbedded coke. Although literature is limited on effects on amphibians and reptiles, modeling analysis of ground potential rise from ground electrodes along nearby water courses concluded that electrical fields would not reach levels that will affect aquatic biota (Exponent 2011).

More detailed information on potential environmental effects on amphibian and reptile species can be found in the Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report.

8.2.8.3 Valued Environmental Components

VEC species were selected for conducting the assessment of the project on the amphibian and reptile group of species. Some of the criteria used in the selection of VEC species included: current or historical distribution ranges within or in close proximity to the Bipole III right-of-way; presence of suitable habitat within the Local Study Area; listing by COSEWIC, SARA, or MESA; and/or sensitivity to habitat loss/alteration, disturbance, and population changes. In addition, connectivity of populations and associated habitats, and professional judgment were used. Information on potential VEC species was gathered using existing literature, habitat classification data, habitat models, field surveys and opportunistic observations.

The following amphibian species were selected as VECs:

- Plains spadefoot toad:
    - Isolated population occurring north of Riding Mountain National Park near the Dauphin Lake area;
    - Strong affinity for sandy soils, resulting in limited breeding opportunities; and
    - Vulnerable to alteration and destruction of suitable habitat.
- Wood frog:
    - Only anuran species found throughout Manitoba, and as far north as the Northwest Territories;
    - Studies have found the species sensitive to fragmentation effects; and

    - Good representation of forest-dwelling anuran.
- Northern leopard frog:
    - Hibernation sites are limited; and
    - The only federally or provincially-listed at-risk anuran species within Manitoba.

The following reptiles were selected as VECs:

- Red-sided garter snake:
    - The dependency on overwintering den sites leaves snake populations vulnerable to disturbance, degradation and local extirpation.
- Northern prairie skink:
    - Manitoba's only true lizard;
    - Manitoba's only endangered or threatened herptile;
    - Associated with isolated/fragmented sandy-soil prairies;
    - Habitat loss results from succession of prairie to Aspen Parkland, invasion by the exotic leafy spurge, cultivation, tree planting programs, and construction; and
    - Dependency on such a limiting and fragmented habitat type and its reliance on underground habitat leave the skink vulnerable to disturbance and habitat alterations.

8.2.8.4 Environmental Effects Assessment and Mitigation

A number of methods were used to evaluate the potential environmental effects of the Bipole III project on the selected VECs. The methods included the following activities:

- Desktop review of published literature, grey literature, various government resources, previous EISs, and federal and provincial legislation;
- Habitat modeling for selected VECs, in order to aid in the identification of possible sensitive areas within the Bipole III Study Area; and
- Field studies were conducted where modeled habitats overlapped the Project Study Area to aid in model verification and help determine the presence of VECs.

Field study methods included:

- Anuran (i.e. frogs and toads) call surveys;
- Prairie skink coverboard surveys; and

- Garter snake hibernacula visual encounter surveys at selected habitat transects.

Incidental species observations made during the course of surveys, or obtained from other disciplines or sources were also recorded.

The results of this habitat modeling and field studies were used to identify ESSs for VEC species in the local study area. The potential effects of the project on the VEC were then examined and mitigation measures specified to the ESSs and other areas of valued habitat such as wetlands. Project design and avoidance of areas has already been used to help minimize potential environmental effects, through the process of choosing the preferred route from three alternate routes and subsequent variations.

HVdc Transmission and ac Collector Lines

Plains Spadefoot

Construction

The plains spadefoot has an isolated distribution range within the Bipole III Local Study Area, limited to the vicinity of Dauphin Lake where suitable sandy-soil habitat is present. Suitable habitat overlaps both the Boreal Plain and Prairie Ecozones, including the Waterhen, Dauphin and Alonsa Ecodistricts. A total of 20.51 km^2 of habitat is found within the Local Study Area, 0.28 km2 (or 1.38%) of which is contained within the HVdc transmission line right-of-way (Map 8-6). Incidental observations during the course of 2009 field studies have confirmed the presence of the plains spadefoot in this area (Bipole III Terrestrial Invertebrates, Amphibians, and Reptiles Technical Report). The results of this habitat modeling and field studies were used to identify ESS for the plains spadefoot in the local study area. The potential effects of the project on the VEC were then examined and mitigation measures specified to the ESSs and other areas of valued habitat.

Buffer guidelines can be applied to any construction-related activity near lakes, streams, wetlands and identified suitable plains spadefoot habitat, where disturbance, vegetation removal, and vehicular traffic is to be limited; these guidelines and a list of identified plains spadefoot suitable habitat polygons can be found in the EnvPP for the Project and within the Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report. Such buffers help minimize impacts to microhabitat, sensory disturbance, cover and anuran breeding habitat (Seburn and Seburn 2000) during the construction phase of the Project. Effect pathways include rutting, ground disturbance, and changes in vegetation composition during spring and summer growth. If rights-of-ways can maintain natural habitat attributes along water bodies and wetlands necessary for breeding and migrating amphibians, potential negative effects could be minimized.

For the plains spadefoot, a buffer around potential breeding habitat, where disturbance, vegetation removal, and vehicular traffic is limited can greatly aid in minimizing impacts of construction and maintenance. Where patches of plains spadefoot breeding habitat are longer than the distance between permanent transmission line towers, it is not possible to avoid the habitat during tower installation, and mitigation recommendations include minimizing habitat disturbance where possible. In all remaining plains spadefoot habitat polygons, where linear length of the polygon is shorter than the distance between two towers, the placement of towers outside of buffered suitable habitat is possible. A list of identified plains spadefoot habitat polygons can be found in the Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report.

Mitigation measures that will help minimize potential effects on the plains spadefoot include strategic timing of construction, as well as retention of microhabitats and stream and wetland buffers. Specific measures are as follows:

- Construction at wetland habitats will occur in fall or winter, outside of peak breeding periods, occurring June 1 to August 15; or suitable buffers maintained according to forest management guidelines;
- Where possible, riparian buffers of 30 m will be retained around any identified suitable breeding/ wetland areas, within which disturbance, vegetation removal, and vehicular traffic will be limited;
- Where overstory/tall-growth vegetation (i.e. trees) need to be removed within buffers for transmission line clearance, removal methods that best minimize disturbance to soil and ground cover will be used; and
- Where feasible, right-of-way tower installation in wetlands and associated buffers will be avoided if occurring during the non frozen season.

After the application of mitigation recommendations, residual effects on the plains spadefoot from construction activities will include the fragmentation of sensitive areas where habitat polygons are larger than the distance between towers, and mortality and vehicle-related effects associated with the increases use of seasonal access trails and rights-of-way. Such residual effects during construction are characterized as negative in direction, moderate in magnitude, geographically confined to the Local Study Area, short-term in duration, infrequent, reversible, and therefore considered not significant.

Operation

As in forestry practices described above, buffer guidelines can be applied to operation-related maintenance activity at suitable plains spadefoot habitat, where all low-growth vegetation (shrub, forb and grass) is to be retained. Such buffers during right-of-way maintenance will help minimize impacts to microhabitat, sensory disturbance, cover and anuran breeding habitat (Seburn and Seburn 2000). Effect pathways associated with vegetation maintenance along the right-of-way are the same as in construction, and include rutting, ground disturbance, and changes in vegetation composition during spring and summer growth. However, extent of effect is reduced, as initial clearing has already taken place during the construction phase.

Mitigation measures that will help minimize potential effects on the plains spadefoot during operation-related activity include strategic timing of maintenance, as well as retention of microhabitats and stream and wetland buffers during maintenance. Specific measures are as follows:

- Right-of-way maintenance along wetland habitats will occur in fall or winter, outside of peak breeding periods, occurring June 1 to August 15;
- Where possible, riparian buffers of 30 m will be retained around suitable breeding/wetland habitat, in which disturbance, vegetation removal, and vehicular traffic is to be limited; and
- Where overstory/tall-growth vegetation (i.e. trees) needs to be removed within buffers for transmission line clearance, removal methods that best minimize disturbance to soil and ground cover will be used.

Residual effects on the plains spadefoot during operation include continued fragmentation of suitable habitat, and mortality and vehicle-related effects associated with increased use of seasonal access trails and rights-of-way, and are characterized as negative in direction, small in magnitude, geographically confined to the Local Study Area, medium-term in duration, sporadic/intermittent in frequency, reversible, and therefore considered not significant.

Wood Frog

Construction

As cover class information and anuran call surveys found (Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report), wood frog (i.e., wetland) habitat was found to be available throughout the right-of-way footprint. Due to their widespread distribution no attempt was made at specific avoidance of the species during preferred route selection. Potential project-related construction effects include alterations in wood frog breeding habitat throughout the Project Study Area with clearing of the right-of-way, as well as the vehicle-related effects as discussed such as direct mortality and pollution during the summering stage, and ground vibrations during the overwintering stage.

As with the northern leopard frog (see below), buffer guidelines from forestry practice can be applied to any construction-related activity near wetlands and water-bodies that are associated with transmission line right-of-way construction. Such buffers help minimize impacts to microhabitat, sensory disturbance, cover and anuran breeding habitat (Seburn and Seburn 2000) during the construction phase of the Project. Effect pathways include rutting, ground disturbance, and changes in vegetation composition during spring and summer growth. If rights-of-way can maintain natural habitat attributes along water bodies and wetlands necessary for breeding and migrating amphibians, potential negative effects could be minimized. Furthermore, although the wood frog is the only amphibian representative in the northernmost regions of Manitoba, it is found throughout the Study Area in the north, as anuran call surveys found, and it is not a listed species. For anuran call survey results, please refer to the Bipole III Terrestrial Invertebrates, Amphibians, and Reptiles Technical Report.

In order to minimize impacts on local anurans, mitigation measures will assist in prevention or reversal of any habitat alteration effects that may occur during Project activities. Such mitigation measures include strategic timing of construction, as well as retention of microhabitats and stream and wetland buffers. Specific mitigation recommendations include the following:

- Construction at wetland habitats will occur in fall or winter, outside of peak anuran breeding periods, occurring April 1 through the end of May, for the wood frog;
- Where possible, a buffer of 30 m will be retained around any identified breeding/wetland areas that occur along the Project right-of-way, in which disturbance, vegetation removal, and vehicular traffic is limited;
- Where overstory/tall-growth vegetation (i.e. trees) needs to be removed within buffers for transmission line clearance, removal methods that best minimize disturbance to soil and ground cover will be used; and
- Construction at wetland habitats will occur in fall or winter, outside of peak wood frog breeding periods, i.e. not between April 1 and May 31.

As with the plains spadefoot, residual effects of construction after the application of mitigation recommendations, will include the fragmentation of sensitive areas where suitable wood frog habitat polygons are larger than the distance between towers, and mortality and vehicle-related effects associated with the increases use of seasonal access trails and rights-of-way. Such residual effects on the wood frog during construction are characterized as negative in direction, small in magnitude, geographically confined to the Project Site/Footprint, short-term in duration, infrequent, reversible, and therefore considered not significant.

Operation

Wood frog (i.e. wetland) habitat was found to be available throughout the right-of-way. As such, project-related effects as a result of operation-related maintenance activities include changes in wood frog breeding habitat, as well as the vehicle-related effects as discussed above. Specifically, project-related construction effects include potential loss of breeding and summering habitat with clearing of the right-of-way, as well as vehicle-related effects such as direct mortality and pollution if maintenance occurs during the summering stage and ground vibrations if maintenance occurs during the overwintering stage. As with the plains spadefoot and northern leopard frog, extent of effect is reduced, as initial clearing will have already taken place during the construction phase.

Mitigation measures that will help minimize potential effects on the wood frog during operation-related maintenance activities include strategic timing of construction, as well as retention of microhabitats and stream and wetland buffers. Specific mitigation recommendations include the following:

- Right-of-way maintenance at wetland habitats will occur in fall or winter, outside of peak wood frog breeding periods, occurring April 1 through the end of May;
- Where possible, a vegetation buffer of 30 m will be retained around any identified breeding/wetland areas that occur along the Project right-of-way, in which disturbance, vegetation removal, and vehicular traffic is to be limited; and
- Where overstory/tall-growth vegetation (i.e. trees) needs to be removed within buffers for transmission line clearance, removal methods that best minimize disturbance to soil and ground cover will be used.

Residual effects on the wood frog during operation are similar to the plains spadefoot and are characterized as negative in direction, small in magnitude, geographically confined to the Project Site/Footprint, medium-term in duration, sporadic/intermittent in frequency, reversible, and therefore considered not significant.

Northern Leopard Frog

Construction

Project-related construction effects include potential loss of breeding and summering habitat with clearing of the right-of-way, as well as vehicle-related effects such as direct mortality and pollution during the summering stage, and ground vibrations during the overwintering stage.

The western boreal population, encompassing Alberta, Saskatchewan and western Manitoba is a species of special concern while the Eastern population (Eastern Manitoba and eastward) is not considered at risk. In general, if right-of-ways can maintain natural habitat attributes along streams and wetlands necessary for breeding and migrating amphibians, potential negative effects can be minimized.

In order to minimize impacts on local anurans, mitigation measures must assist in prevention or reversal of any habitat alteration effects that may occur during Project activities. For the northern leopard frog, such mitigation measures focus on wetland habitat, and are the same as with the wood frog mitigation strategies.

Following the application of mitigation recommendations, as with the wood frog, residual effects on the northern leopard frog will include the fragmentation of sensitive areas where suitable breeding habitat polygons are larger than the distance between towers, and mortality and vehicle-related effects associated with the increases use of seasonal access trails and rights-of-way. Such residual effects during construction are characterized as negative in direction, moderate in magnitude, geographically confined to the Local Study Area, short-term in duration, infrequent, reversible, and therefore considered not significant.

Operation

Project-related operation effects include potential changes to breeding and summering habitat with operation-related maintenance activities along the right-of-way, as well as vehicle-related effects such as direct mortality and pollution if maintenance is to occur during the summering stage and ground vibrations if maintenance is to occur during the overwintering stage. As with the plains spadefoot, the extent of effect is reduced as initial clearing will have already taken place during the construction phase.

Mitigation measures that will help minimize potential effects on the northern leopard frog during operation-related maintenance activities include strategic timing of maintenance, as well as retention of microhabitats and stream and wetland buffers during maintenance. Specific recommended mitigation measures are the same as for the wood frog.

As with the wood frog, residual effects during operation on the northern leopard frog include continued fragmentation and increased use of seasonal access trails and rights-of-way, and are characterized as negative in direction, small in magnitude, geographically confined to the Local Study Area, medium-term in duration, sporadic/intermittent in frequency, reversible, and therefore considered not significant.

Red-Sided Garter Snake

Construction

Project effects, as related to the red-sided garter snake (garter snake hibernacula), are limited to the Project right-of-way, as suitable habitat was not identified near electrode sites or converter stations (Map 8-7). Field surveys and ATK interviews were both used to validate the present of both garter snakes and hibernacula at various locations within the Local Study Area and associated right-of-way. More detailed information on observations can be found in the Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report.

Any Project activities associated with right-of-way construction and the installation of permanent transmission line towers at suitable garter snake habitat may prove detrimental to garter snake populations. This may be particularly true within the Summerberry and Overflowing River Ecodistricts, where nearly 10% of suitable habitat within the transmission line Local Study Area is found along the 66 m right-of-way. A list of identified suitable garter snake hibernation habitat polygons can be found in the EnvPP for the Project and within the Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report.

Hibernacula setback distances of 200 m are listed for Saskatchewan for any activity occurring during spring and fall migration of various not-at-risk snake species (from April 15 to May 30, and from September 1 to October 15, respectively; Saskatchewan Environment 2003), assuming a moderate level of activity during construction. These guidelines are described in more detail in the preliminary EnvPP. The objective of this buffer is to protect garter snakes from sensory disturbance and physical harm caused by machinery, vibrations from drilling, and blasting activity, as well as to protect hibernacula and maintain the integrity of surrounding habitat.

Installation of permanent towers along the right-of-way may have detrimental effects on garter snake hibernacula habitat, particularly where blasting of sloping bedrock is required. Effects include direct mortality and destruction of hibernacula sites in areas where suitable overwintering habitat has been identified. Where suitable garter snake hibernacula habitat spans less than the distance between two permanent tower sites, avoidance of habitat during tower installation is feasible. Where habitat spans greater than the distance between towers, avoidance of polygons is not feasible, and site-specific summer field surveys at suitable garter snake hibernacula habitat are recommended prior to permanent tower placements. These surveys would help with recommendations for tower placement adjustments, based on garter snake hibernacula habitat quality, where needed.

The creation of a cleared transmission line right-of-way may be beneficial for garter snake populations using such areas for migration and movement between feeding and hibernation sites. Multiple snake species have been found to prefer linear features, such as a transmission line right-of-way, compared to surrounding forest habitat. It is possible, however, that the increased use of right-of-ways as movement corridors may result in a direct increased predation effect. Additionally, increased recreational use of the right-of-way by ATVs may result in an increase in mortalities of migrating individuals. However, continued use of these rights-of-way suggests these effects do not appear to play a major role in garter snake avoidance of such areas.

Mitigation measures include the following:

- Where suitable garter snake hibernacula habitat and associated buffers fall between two permanent tower sites, avoidance of habitat during tower installation is recommended;
- A buffer of 200 m will be maintained around garter snake hibernacula habitat year-round, especially from permanent tower sites, within which blasting, ground disturbance, vegetation removal and vehicular traffic will be limited;
- Where removal of tall-growth vegetation is necessary at suitable hibernacula habitat and buffers, ground disturbance will be minimized wherever possible; and
- If avoidance of tower installation is not possible at suitable hibernacula habitat, tower installation will occur during the summer months (from June 1 to August 31), outside of the hibernacula activity period, or summer field investigations will be conducted, prior to tower placement.

Following the application of mitigation recommendations, residual effects on the garter snake will include habitat alteration/disturbance as a result of right-of-way clearing and tower installation, possible fragmentation of sensitive areas, mortality and vehicle-related effects associated with increased use of seasonal access trails and the right-of-way, and the creation of a movement corridor along the right-of-way. Overall, residual effects during construction are characterized as negative in direction, moderate in magnitude, geographically confined to the Local Study Area, short-term in duration, infrequent, reversible, and considered not significant.

Operation

Operation-related effects related to this Project and the red-sided garter snake are limited to the Project right-of-way, as suitable habitat was not identified near electrode sites or converter stations.

As with the construction phase of the Project, buffers associated with vegetation maintenance can protect garter snakes from sensory disturbance and physical harm caused by traffic and machinery-related activity, protect hibernacula and maintain the integrity of surrounding habitat. In general, clearing of the right-of-way may be beneficial for garter snake populations during migrations and movement between feeding and hibernation sites.

Mitigation measures will include the following:

- A buffer of 200 m will be maintained around identified garter snake hibernacula habitat during the growing season, where maintenance activities will be planned to avoid disturbance or damage.; and
- Where removal of tall-growth vegetation is necessary, ground disturbance will be minimized.

Following mitigation recommendations, residual effects on the garter snake during operation will include possible fragmentation of sensitive areas, and the maintenance of a movement corridor along the right-of-way. Overall, residual effects are characterized as positive in direction, small in magnitude, geographically confined to the Local Study Area, medium-term in duration, regular/continuous in frequency, reversible, and therefore considered not significant.

Northern Prairie Skink

Construction

In general, construction-related effects associated with the northern prairie skink are limited to the southern portion (i.e. Prairie Ecozone) of the Local Study Area and associated 66 m right-of-way (Map 8-8) and are associated predominantly with the clearing of the right-of-way and the installation of transmission towers within potential sandy-soil habitat. Habitat alteration effects as a result of right-of-way clearing and associated vehicle-related activities within these areas can result in the loss of suitable resources and potential suitable habitat for the northern prairie skink.

Although the northern prairie skink distribution range does not overlap the Project Footprint and individuals were not observed during the course of coverboard surveys and related field studies, suitable sandy-soil habitat does occur along the right-of-way. The modeled habitat that exists in the preferred route right-of-way represents 2.5% of the total found in the local study area (Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report). As such, potential environmental effects of the Project may exist, and are concentrated in areas where suitable habitat was identified: the St. Claude/Assiniboine River area (Stockton, Alonsa, and MacGregor ecodistricts).

Additionally, one instance of potential prairie skink tracks was observed within the right-of-way, and incidental observations included a potential skink track in sandy-soil habitat near the right-of-way (Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report). Both of these potential skink tracks are outside of the known distribution range of the prairie skink, and if confirmed, would result in an east-ward range extension of the Manitoba distribution range. Furthermore, ATK interviews noted skinks/lizards in dry, sandy areas along the right-of-way. It should be noted that the differentiation between particular skink, lizard and salamander observations was not made by community members.

There is at present no critical habitat identified federally for the prairie skink, but a GIS protocol is currently being developed to identify proposed critical habitat and recovery habitat (Rutherford 2010) and a national recovery strategy is currently being proposed (Prairie Skink Recovery Team 2006).

Within sandy-soil habitat, alteration of plant communities as a result of Project construction can result in the loss of suitable northern prairie skink habitat. Vehicle-related effects, such as vehicular noise, light pollution, traffic volume, dust, spills and leaks, exhaust fumes and vehicle emissions, as well as ground vibrations, can further negatively impact potential populations.

A list of identified suitable prairie skink habitat polygons can be found in the EnvPP for the Project and within the Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report. At suitable habitat patches that are shorter than the distance between two towers, avoidance of tower installation is possible. Where habitat length is greater than the distance between two towers, site-specific summer field surveys in sandy-soil habitat polygons prior to permanent tower placements would help with recommendations for tower location adjustments, based on sand prairie quality. Additionally, surveys will help determine if possible nesting/burrowing sites exist.

Due to the low-growth nature of sandy-soil habitat, complete clearing of the right-of-way is likely not required at these sites. Manitoba forest management guidelines recommend year-round buffers around native grass meadows. Similarly, a 30 m set-back distance is recommended for plant species at risk, where activity is repeated to create a visible and lasting track-trail, as well as at above-ground transmission lines (Henderson 2009). For petroleum industry activity, setback distances of 50 m, 100 m, and 200 m are recommended, at low, medium, and high activity levels, respectively, at skink burrows (Environment Canada 2009). These guidelines are described in more detail in the EnvPP.

Overall, the construction of a transmission line overhead of sandy-soil habitat will likely result in minimal habitat alteration and vehicle/machinery-related effects. Mitigation recommendations include the following:

- A 100 m buffer will be maintained around sandy-soil habitat polygons where intercepted by the Project right-of-way, within which disturbance, vegetation removal, and vehicular traffic will be limited;
- Avoidance of modeled habitat will occur during tower installation where the habitat polygons are shorter than the distance between towers;
- As the installation of permanent structures is considered a high level activity, towers will be located 200 m from any observed or located skink nests; and
- Where polygons plus associated buffers span greater than the distance between two towers, site-specific summer field surveys will be undertaken in sandy-soil habitat polygons prior to permanent tower placements.

Following the application of mitigation recommendations, residual effects on the northern prairie skink will include habitat alteration/disturbance at the tower footprint and from transmission line right-of-way construction in sensitive areas where polygons span the distance of two towers. Such residual effects during construction are characterized as negative in direction, moderate in magnitude, geographically confined to the Local Study Area, short-term in duration, infrequent, reversible, and considered not significant.

Operation

As with the construction phase, potential environmental effects of the Project associated with the prairie skink are limited to the sandy-soil habitat present within the Local Study Area and associated 66 m right-of-way. Where this limiting habitat occurs along the right-of-way, alteration of plant communities as a result of operation-related maintenance can result in the alteration of suitable northern prairie skink habitat.

As mentioned above, there is at present no critical habitat identified federally for the prairie skink, but a GIS protocol is currently being developed to identify proposed critical habitat and recovery habitat (Rutherford 2010) and a national recovery strategy is currently being proposed (Prairie Skink Recovery Team 2006).

Due to the low-growth nature of sandy-soil habitat, complete clearing of the right-of-way is likely not required at these sites during maintenance and will likely result in minimal habitat alteration and vehicle or machinery-related effects.

Mitigation recommendations include the following:

- A 100 m buffer will be maintained around sandy-soil habitat polygons where intercepted by the Project right-of-way, in which disturbance, vegetation removal, and vehicular traffic is to be limited; and
- A 200 m buffer will be maintained around any observed or located prairie skink nests.

Following mitigation recommendations, residual effects on the northern prairie skink may include alteration or disturbance of suitable habitat where maintenance occurred in the vicinity of suitable habitat polygons, as invasive plant species such as leafy spurge are at risk on encroaching on native vegetation following right-of-way maintenance. Residual effects during operation are characterized as negative in direction, small in magnitude, geographically confined to the Local Study Area, medium-term in duration, infrequent, reversible, and therefore considered not significant.

8.2.8.5 Keewatinoow Converter Station Area

For the purposes of the environmental assessment, the development of the Keewatinoow Converter Station includes all associated facility development including the start-up and main construction camps, borrow areas, excavated material placement areas, and contractor lay-down and marshalling areas.

Construction and Operation

Plains Spadefoot

Known historical distribution range of the plains spadefoot was not in close proximity to the Keewatinoow Converter Station. As such, no construction effects or mitigation recommendations are presented.

Wood Frog

Based on cover class analysis, wetland habitat associated with breeding wood frogs was found to be available within the Keewatinoow Converter Station area. As such, potential construction and operation effects include changes in breeding habitat and vehicle-related effects as discussed above. Descriptions of locations of suitable wood frog habitat (i.e. wetlands) within the Keewatinoow Converter Station area are found in the Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report.

Mitigation measures will include the following:

- Construction at wetland habitats will occur in fall or winter, outside of peak wood frog breeding periods, (i.e. not between April 1 and May31).

Following mitigation recommendations, residual effects on the wood frog will include fragmentation of suitable habitat and mortality and vehicle-related effects associated with increased traffic. Residual effects are characterized during construction and operation as negative in direction, small in magnitude, geographically confined to the Project Footprint, medium-term in duration, regular/continuous in frequency, reversible, and therefore considered not significant.

Northern Leopard Frog

Wetland habitat within the Keewatinoow Converter Station, as discussed in relation to the wood frog above, is also associated with breeding northern leopard frogs. Project-related effects, recommended mitigation measures, and residual effects are the same as with the wood frog. Descriptions of locations of suitable northern leopard frog habitat (i.e. wetlands) within the Keewatinoow Converter Station footprint are found in the Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report.

Red-Sided Garter Snake

There was no suitable red-sided garter snake hibernacula habitat identified within the Keewatinoow Converter Station footprint. As such, no construction effects or mitigation recommendations are presented.

Northern Prairie Skink

The known distribution range of the northern prairie skink was not in close proximity to the Keewatinoow Converter Station. As such, no construction effects or mitigation recommendations are presented.

8.2.8.6 Riel Converter Station

Construction and Operation

Plains Spadefoot

Known historical distribution range of the plains spadefoot was not in close proximity to the Riel Converter Station. As such, no construction effects or mitigation recommendations are presented.

Wood Frog

Wetland habitat associated with breeding wood frogs was not found within the Riel Converter Station footprint. As such, no construction effects or mitigation recommendations are presented.

Northern Leopard Frog

Wetland habitat associated with breeding northern leopard frogs was not found within the Riel Converter Station footprint. As such, no construction effects or mitigation recommendations are presented.

Red-Sided Garter Snake

There was no suitable red-sided garter snake hibernacula habitat identified within the Riel Converter Station footprint. As such, no construction effects or mitigation recommendations are presented.

Northern Prairie Skink

There was no suitable northern prairie skink habitat identified within the Riel Converter Station footprint. As such, no construction effects or mitigation recommendations are presented.

8.2.8.7 Ground Electrodes and Lines

Construction and Operation

Plains Spadefoot

Known historical distribution range of the plains spadefoot was not in close proximity to the ground electrodes and lines. As such, no construction effects or mitigation recommendations are presented.

Wood Frog

Based on cover class analysis, wetland habitat associated with breeding wood frogs was found within the northern electrode site, but not at the southern electrode site (Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report). Project-related effects include alteration of habitat, and vehicle-related effects.

Specific recommended mitigation measures include the following:

- Construction will occur in fall or winter, outside of peak anuran breeding periods, occurring April 1 through the end of May for the wood frog.

Following mitigation recommendations, residual effects on the wood frog from construction will include fragmentation of suitable habitat and mortality and vehicle-related effects associated with increased traffic. Residual effects from construction are characterized as negative in direction, small in magnitude, geographically confined to the Project Site/Footprint, short-term in duration, infrequent, reversible, and therefore considered not significant.

Ground potential rise from the operation of the ground electrode is a potential effect. Although literature is limited on effects on amphibians and reptiles, modeling analysis of ground potential rise from ground electrodes along nearby water courses concluded that electrical fields would not reach levels that will affect aquatic biota (Bipole III EMF Technical Report). As such, no mitigation recommendations are presented for operation.

Northern Leopard Frog

As with the wood frog, wetland habitat associated with breeding northern leopard frogs was found within the northern electrode site, but not at the southern electrode site.

Wetland habitat within the north electrode site, as discussed in relation to the wood frog above, is also associated with breeding northern leopard frogs. Project-related effects, recommended mitigation measures, and residual effects are the same as with the wood frog. Descriptions of locations of suitable northern leopard frog habitat (i.e. wetlands) within the ground electrode footprints are found in the Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report.

Red-sided Garter Snake

There was no suitable garter snake hibernacula habitat identified within the ground electrodes and lines. As such, no construction effects or mitigation recommendations are presented.

Northern Prairie Skink

Known historical distribution ranges of the northern prairie skink were not in close proximity to the northern and southern ground electrodes and lines. Furthermore, there was no suitable prairie skink habitat identified within the southern ground electrode footprint. As such, no construction effects or mitigation recommendations are presented.

8.2.8.8 Summary of Residual Environmental Effects and Significance

Potential negative residual impacts are associated with the habitat alteration along the transmission right-of-way, as well as traffic-related mortalities and pollution. The utilization of buffers used to minimize disturbance, vegetation removal, and vehicular traffic around sensitive sites along the Project right-of-way is expected to help minimize effects incurred by habitat degradation in VEC habitats. Additionally, careful storage and removal of any hazardous materials and the infrequent use of seasonal access trails and the right-of-way will further alleviate impacts on VEC species. Summaries of residual effects assessments are presented in Table 8.2-10.

Plains Spadefoot

Residual environmental effects of the Project on the plains spadefoot are limited to the right-of way, and are associated with the clearing and maintenance of the right-of-way, and the installation of permanent transmission towers. In general, construction-related activity of the Project is expected to have a negative effect on the plains spadefoot. Following mitigation recommendations, construction-related residual environmental effects will include fragmentation of suitable habitat, habitat alteration/disturbance, and mortality and vehicle-related effects associated with increased use of seasonal access trails and rights-of-way. Residual effects are not significant. Following mitigation recommendations, operation-related residual environmental effects will include continued fragmentation of suitable habitat, and mortality and vehicle-related effects associated with increased use of seasonal access trails and rights-of-way. Operation-related activity of the Project are not significant.

Wood Frog

Residual environmental effects of the Project on the wood frog are associated with the clearing and maintenance of the right-of-way, the installation of permanent transmission towers, the construction and operation of the Keewatinoow Converter Station, the construction of the north electrode site, and borrow area excavations and at excavation material placement sites. In general, construction-related residual environmental effects will include fragmentation of suitable breeding habitat, habitat alteration/disturbance, and mortality and vehicle-related effects associated with increased use of seasonal access trails and rights-of-way. The Project is expected to have small, negative effects on the wetland habitat associated with wood frog habitat, and the residual environmental effects, including continued fragmentation of suitable habitat, and mortality and vehicle-related effects associated with increased use of seasonal access trails and rights-of-way, are not significant.

Northern Leopard Frog

Residual environmental effects of the Project on the northern leopard frog are associated with the clearing and maintenance of the right-of-way, the installation of permanent transmission towers, the construction and operation of the Keewatinoow Converter Station, the construction of the north electrode site, and borrow area excavations and at excavation material placement sites. In general, the Project is expected to have negative effects on wetlands associated with the northern leopard frog, and the residual environmental effects are concluded to be the same as with the wood frog.

Red-Sided Garter Snake

Residual environmental effects of the Project on red-sided garter snake hibernacula are limited to the right-of way, and are associated with the clearing and maintenance of the right-of-way, and the installation of permanent transmission towers. Specifically, these effects include habitat alteration/disturbance, possible fragmentation of sensitive areas, as well as mortality and vehicle-related effects associated with increased use of seasonal access trails and the right-of-way, and the creation of a movement corridor along the right-of-way. In general, construction-related activity associated with the Project is expected to have negative effects on the red-sided garter snake hibernacula, and the residual environmental effects are concluded to be not significant.

As discussed above, small positive effects are possible for garter snakes where clearing of the right-of-way occurs within forest habitat. As such, operation-related activity associated with the Project is expected to have positive effects on red-sided garter snake, and the residual environmental effects are concluded to be therefore not significant.

Northern Prairie Skink

Residual environmental effects of the Project on the northern prairie skink are limited to the right-of way, and are associated with the clearing and maintenance of the right-of-way, and the installation of permanent transmission towers. Specifically, residual effects include habitat alteration/disturbance at the tower footprint and from transmission line right-of-way construction in sensitive areas where polygons spanned the distance of two towers. Construction-related activity associated with the Project is expected to have negative effects on the northern prairie skink, and the residual environmental effects are concluded to be not significant.

Operation-related activity associated with the Project is expected to have negative effects on the northern prairie skink, with similar effects as construction, and the residual environmental effects are concluded to be not significant.

Table 8.2-10: Residual Environmental Effects Summary – Amphibians and Reptiles

VEC	Project Component	Phase	Residual Effect	Assessment[1]
Plains Spadefoot	HVdc Transmission Line and ac Collector Lines	Construction	Fragmentation of sensitive area; habitat alteration/disturbance mortality and vehicle-related effects associated with increased use of seasonal access trails and RoWs	Direction – Negative Magnitude – Moderate Geographic Extent – Local Study Area Duration – Short-Term **Overall – Not Significant**
		Operation		Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term **Overall – Not Significant**
Wood Frog	HVdc Transmission Line and ac Collector Lines; Keewatinoow Converter Station; Borrow Areas; Ground Electrode and Line	Construction & Operation	Fragmentation of sensitive area; habitat alteration/disturbance; mortality and vehicle-related effects associated with increased use of seasonal access trails and RoWs	Direction – Negative Magnitude – Small Geographic Extent - Project Site/Footprint Duration – Medium-Term (Op) **Overall – Not Significant**
Northern Leopard Frog	HVdc Transmission Line and ac Collector Lines;	Construction & Operation	Fragmentation of sensitive area; habitat alteration/disturbance; mortality and vehicle-related effects associated with increased use of seasonal access trails and RoWs	Direction – Negative Magnitude – Moderate (Const) Small (Op) Geographic Extent – Local Study Area Duration – Medium-Term (Op) **Overall – Not Significant**

VEC	Project Component	Phase	Residual Effect	Assessment[1]
Northern Leopard Frog	Keewatinoow Converter Station; Borrow Areas; Ground Electrode and Line	Construction & Operation	Fragmentation of sensitive area; habitat alteration/disturbance; mortality and vehicle-related effects associated with increased use of seasonal access trails and RoWs	Direction – Negative Magnitude – Small Geographic Extent - Project Site/Footprint Duration – Medium-Term (Op) **Overall – Not Significant**
Red-sided garter snake	HVdc Transmission Line and ac Collector Lines	Construction	Habitat alteration/ disturbance; fragmentation of sensitive areas; mortality and vehicle-related effects associated with increased use of seasonal access trails and the RoW; creation of movement corridors along the RoW	Direction – Negative Magnitude – Moderate Geographic Extent – Local Study Area Duration – Short-Term **Overall – Not Significant**
		Operation		Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term **Overall – Not Significant**
Northern Prairie Skink	HVdc Transmission Line and ac Collector Lines	Construction & Operation	Habitat alteration/ disturbance in sensitive areas; alteration-disturbance of suitable habitat (risk of invasive plant species encroachment)	Direction – Negative Magnitude – Moderate (Const) Small (Op) Geographic Extent – Local Study Area Duration – Short Term (Const) Medium Term (Op) **Overall - Not Significant**

Note:

1. Expected residual effects (i.e., effects after mitigation) of the Project on each VEC are assessed using the regulatory significance evaluation approach and methods defined in Chapter 4, Section 4.2.10. Where feasible, regulatory significance is assessed for each non-negligible expected residual effect based on its expected direction, magnitude, geographic extent and duration (as each term is defined in Section 4.2.10); if an adverse residual effect is evaluated to be potentially significant, other factors are also considered (frequency, reversibility, ecological importance and societal importance). Scientific uncertainty is noted where it may materially affect the assessment.

8.2.8.9 Follow-up

No follow-up anuran habitat surveys are expected. In the case of northern prairie skinks and garter snakes, where tower placement may overlap suitable habitat, summer field surveys will be conducted prior to tower installation. Such surveys would help with recommendations for tower placement adjustments, based on red-sided garter snake and prairie skink habitat quality, where needed. Standard inspection and effects monitoring will be sufficient to determine whether wetland mitigation recommendations are adhered to, such as the retention of adequate lake, stream, river and wetland buffers.

Standard inspection and effects monitoring will be used to determine whether recommended mitigation measures were followed for both potential red-sided garter snake habitat and prairie skink habitat polygons. Monitoring is recommended following initial construction and subsequent vegetation management.

8.2.9 Terrestrial Invertebrates

8.2.9.1 Overview

This section describes the potential effects of the Project from a biophysical perspective as it relates to the terrestrial invertebrates within the Project Study Area. Effects of the Project are assessed based on information obtained from published literature, grey literature, government online databases, field studies, and habitat models. Key environmental effects are outlined, as they relate to species of interest. As it is not feasible to assess potential impacts of the Project on all terrestrial invertebrates, selected species were identified (termed VECs, and described below).

In general, several issues may contribute to declines of terrestrial invertebrate species. For species at risk, habitat loss or alteration is one of the biggest concerns (COSEWIC 2003), resulting in fragmentation and changes in microclimate. Habitat fragmentation can have large effects on invertebrate communities by creating habitat barriers (i.e. edge effects) (Haskell 2000; Strong *et al.* 2002), inhibiting movements and altering dispersal patterns (Mader *et al.* 1990; Holmquist 1998; Strong *et al.* 2002). On a smaller scale, alteration of habitat also results in changes in microclimate, such as temperature and moisture levels, to which terrestrial invertebrates are typically very sensitive (Klein 1989; Didham *et al.* 1996).

Potential environmental effects of key Project component activities were examined as they relate to VEC species. Mitigation strategies to reduce or eliminate the environmental effects of identified Project activities are also identified. Where an environmental effect still likely remains following the implementation of mitigation recommendations, it is identified as a residual effect; residual effects are identified and summarized.

Currently there are eleven terrestrial invertebrate species in Manitoba that are listed as at-risk, nine of which have present or historical distributions overlapping or in close proximity to the Bipole III Study Area. Of these nine species, three have been selected based on assessment of key criteria described below, as representative terrestrial invertebrates in the evaluation of environmental effects of the Project:

- The Dakota Skipper;
- The Uncas Skipper; and
- The Ottoe Skipper.

8.2.9.2 Potential Effects and Key Topics

Project design and avoidance of areas has already been used to help minimize potential environmental effects, through the process of choosing the preferred route from three alternate routes and subsequent variations. The mitigation recommendations below will further help in minimizing potential environmental effects. In general, effects of all project-related activities can generally be divided into two broad categories:

1. Alteration of habitat resulting from right-of-way construction and maintenance, and installation of permanent towers; and
2. Effects of increased use of seasonal access trails and rights-of-way and other machinery-related effects.

Project specific effects, as they relate to the two broad effect categories listed above, are further described in following sections within individual Project components. Overall, key sensitive areas where such effects occur include sandy soil habitats and prairie habitats. The Project Study Area is primarily composed of sandy-soil habitats and little to no high-grade prairie habitat was found within the Project footprint. As a result, no environmentally sensitive sites were identified for that category. Additional information on identified suitable habitat, as based on cover-class analysis, is found in the Bipole III Terrestrial Invertebrates, Amphibians, and Reptiles Technical Report.

Habitat Alteration Effects

Habitat alteration, defined as a change in plant community and overall habitat type composition, is perhaps the single predominant project-related activity affecting terrestrial invertebrates (Meffe and Carroll 1997). Habitat alteration may occur during activities such as the clearing and maintenance of habitat along the transmission line and collector line rights-of-way, at electrode sites, at the Keewatinoow construction power camp, at the converter stations, and during the installation of permanent transmission towers along the right-of-way.

In general, habitat alteration effects have a greater effect on species that have specialized distributions associated with isolated habitat types and key adult and larval host plants, than on generalist species. Examples of specialist species include the Dakota skipper found in native prairie remnants (COSEWIC 2003), and the Ottoe and Uncas skippers, which inhabit isolated sandy-soil prairies within the prairie ecozone (COSEWIC 2005). Both of these habitat types were historically more continuous throughout the prairie ecozone. Such specialist species with isolated populations are less likely to be re-founded by natural dispersal once a population declines (COSEWIC 2003).

Many construction-related activities are expected to occur in areas where the degree of disturbance and habitat fragmentation are already high, such as human-impacted, urban or developed areas, or along existing linear features. In order to access the right-of-way, for example, existing linear features will be used. As such, construction-related activities in such areas are expected to have a minimal effect. Where habitat is relatively undisturbed, habitat alteration and fragmentation will have a more substantial effect.

Mortality and Sensory Disturbance Effects

Traffic and machine-related activities are defined here as any direct or indirect actions associated with the use of machines and vehicles used during the construction or operation of the Bipole III Project. The increased use of both seasonal access trails and the right-of-ways, and associated vehicle-related effects can have multiple direct and indirect effects on terrestrial invertebrates, ranging from direct mortality to sensory disturbances. Vehicular traffic will increase during the construction and decommissioning phases of the Project, and intermittent traffic will be ongoing throughout the operation phase of the Project. Use of both seasonal access trails and the right-of-way will increase traffic-use effects in areas where access was previously limited. Lastly, accumulation of waste materials resulting from machinery and construction may occur during the construction and decommissioning phases of the Project.

Vehicular traffic and machinery operation may crush and thereby cause mortality of a small number of individuals. Sensory disturbance effects are also associated with vehicular traffic and machinery use and include such sources as exhaust emissions, noise, dust, headlight illumination, as well as spills and leaks. In general, traffic levels and resultant effects will be relatively low during construction and decommissioning of the right-of-way and negligible during the maintenance phase of the Project.

8.2.9.3 Valued Environmental Components

As described in Chapter 4 (Approach to Assessment), the following three species of terrestrial invertebrates were selected as VECs within the context of the Project:

- Dakota skipper;
- Ottoe skipper; and
- Uncas skipper:

All three terrestrial invertebrate VEC species have current or historical distribution ranges in close proximity to the Bipole III HVdc transmission line right-of-way and may be sensitive to habitat loss and/or alteration, disturbance, and population changes as a result of Project activities. Although known populations do not overlap the Local Study Area, suitable habitat exists for these species within the Project Footprint. The Ottoe and Uncas skippers have similar habitat requirements and as such, will be discussed together within the Environmental Effects Assessment and Mitigation section below. For a detailed description of skipper distribution ranges and biology, please refer to Chapter 6 (Existing Environmental Setting) and the Bipole III Terrestrial Invertebrates, Amphibians, and Reptiles Technical Report.

8.2.9.4 Environmental Effects Assessment and Mitigation

This section outlines potential impacts of specific Project activities on terrestrial invertebrate VEC species, during the construction, operation, and decommissioning of construction activities of the Project.

A number of methods were used to evaluate the potential environmental effects of the Bipole III Project on the selected VECs. The methods included the following activities:

- Desktop review of published literature, grey literature, various government resources, previous EIS and federal and provincial legislation;
- Habitat modeling for selected VECs in order to aid in the identification of possible sensitive areas within the Bipole III Study Area; and
- Field studies were conducted where modeled habitats overlapped the Project Study Area to aid in model verification and help determine the presence of VECs.

Field study methods included:

- Terrestrial invertebrate sweep-net surveys.

Incidental species observations made during the course of surveys, or obtained from other disciplines or sources were also recorded.

The results of this habitat modeling and field studies were used to identify ESSs for VEC species in the Local Study Area. The potential effects of the Project on the VEC were then examined and mitigation measures specified to the ESSs and other areas of valued habitat such as sand-prairie.

A more detailed description of the terrestrial invertebrate environment within the Project Study Area can be found in Chapter 6 (Existing Environmental Setting) of this EIS and the Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Transmission Project Technical Report.

HVdc Transmission and ac Collector Lines

Dakota Skipper

Construction and Operation

Construction and operation effects related to the Dakota skipper are limited to the southern portion (i.e. prairie ecozone) of the Local Study Area and associated 66 m HVdc transmission line right-of-way. However, when these sites were examined using field surveys, it was determined that most of the habitat was not high-grade prairie habitat. As such, no environmentally sensitive sites were identified at suitable Dakota skipper habitat located within the Local Study Area. Consequently, potential environmental effects of the Project on the Dakota skipper are considered to be negligible and mitigation recommendations are not associated with any identified environmentally sensitive areas. In general, the retention of desired low-growth plant-cover resistant to tree invasion within prairie habitat along the right-of-way may aid in preserving desired key adult and larval food resources for potential Dakota skipper populations.

As prairie habitat consists predominantly of low-growth vegetation, maintenance of overhead vegetation during the operation phase is not extensively required at such areas. To this effect, any native prairie remnants within known Dakota skipper modeled habitat will likely remain relatively unaffected along the transmission line right-of-way during the operation phase of the Project. In general, where removal of high-growth vegetation is required in prairie habitat during right-of-way maintenance, it is recommended that methods be used that minimize ground disturbance. There are no negative residual effects on Dakota skipper from the construction or operation of the HVdc transmission line.

Ottoe and Uncas Skippers

Construction

In general, construction-related effects associated with the Ottoe and Uncas skippers are limited to the southern portion (i.e. prairie ecozone) of the Local Study Area and associated 66 m right-of-way (Chapter 6 Appendix A) and are associated predominantly with the clearing of the right-of-way and the installation of transmission towers within potential sandy-soil habitat. Although no known population centres of either species overlap the Project Footprint, suitable sandy-soil habitat does occur. This isolated and fragmented sandy-soil habitat is extremely limiting and could be important for population movements, should this species occur in the area. Potential environmental effects of the Project may exist, and are concentrated in areas where suitable habitat was identified: the St. Claude/Assiniboine River area (Stockton, Alonsa, and MacGregor ecodistricts). Habitat alteration effects as a result of right-of-way clearing and associated vehicle-related activities within these areas can result in the loss of suitable resources and potential suitable habitat for the Ottoe and Uncas skippers.

Based on field studies, it appears much of the suitable Ottoe and Uncas skipper sandy-soil habitat is predominantly located on grazed (and therefore disturbed) land (Bipole III Terrestrial Invertebrates, Amphibians, and Reptiles Technical Report). As such, the construction of a transmission line overhead of such areas will likely result in minimal additional habitat alteration and vehicle/machinery-related effects. As sandy-soil prairie habitat consists predominantly of low-growth vegetation, complete clearing is not required at these sites during the construction of the transmission line right-of-way. Where high-growth vegetation does occur within these habitats, methods should be used that minimize disturbance. To this effect, sandy-soil prairies will likely remain relatively unaffected along the transmission line right-of-way during the construction phase of the Project.

In addition to the right-of-way, habitat alteration will also occur at permanent tower locations, each with an estimated 7.8 m^2 footprint. During the installation of permanent towers, habitat clearing and soil disturbance will be necessary at tower footprints and may result in disturbance of suitable habitat where the towers overlap suitable Ottoe and Uncas skipper habitat. Where habitat patches span less than the distance between the towers (i.e. less than 480 m), avoidance of habitat is possible. Linear lengths of suitable habitat patches along the right-of-way range from 36 m to 163 m and as such, it is feasible to avoid this habitat during tower installations.

Mitigation measures will include the following:

- Suitable habitat patches will be avoided, where feasible;

- A 30 m vegetation buffer will be maintained around sandy-soil prairie habitat where intercepted by the Project right-of-way, in which disturbance, vegetation removal, and vehicular traffic is to be limited;
- Where removal of high-growth vegetation is required in sandy-soil prairie habitat and associated buffer, it is recommended that methods be used that minimize ground disturbance;
- Suitable habitat will be avoided during installation of permanent towers, where feasible; and
- Where polygons plus associated buffers span greater than the distance between two towers, site-specific summer field surveys will be undertaken in sandy-soil habitat polygons prior to permanent tower placements.

Following mitigation recommendations, residual effects on the Ottoe and Uncas skippers include habitat alteration and disturbance as a result of right-of-way construction, including at tower footprints. Residual effects are characterized as negative in direction, moderate in magnitude, geographically confined to the Local Study Area, short-term in duration, infrequent, reversible, and therefore considered not significant.

Operation

Field surveys confirmed that much of the suitable Ottoe and Uncas skipper sandy-soil habitat is located on grazed and therefore disturbed land (Bipole III Terrestrial Invertebrates, Amphibians, and Reptiles Technical Report), the maintenance of a transmission line overhead of such areas during the operation phase of the Project will likely result in minimal habitat alteration and vehicle/machinery-related effects. Key larval and nectar host plants are herbaceous and associated sandy-soil prairie habitat generally consists predominantly of low-growth vegetation. As such, complete clearing during maintenance of the right-of-way is likely not required and suitable habitat will not be affected to any great extent by overhead vegetation maintenance along the right-of-way during the operation phase of the Project. Mitigation measures described above for construction will also mitigate activities of the operation phase of the project.

Following mitigation recommendations, residual effects on the Ottoe and Uncas skippers from Project operation include continued habitat alteration. Disturbances are characterized as negative in direction, small in magnitude, geographically confined to the Local Study Area, medium-term in duration, infrequent, reversible, and therefore considered not significant.

Keewatinoow Converter Station and Area

For the purposes of the environmental assessment, the development of the Keewatinoow converter station includes all associated facility development including the start-up and main construction camps, borrow areas, excavated material placement areas, and contractor lay-down and marshalling areas

Dakota Skipper

Known historical distribution range of the Dakota skipper was not in close proximity to the Keewatinoow Converter Station area. As such, no construction effects or mitigation recommendations are presented.

Ottoe and Uncas Skipper

Known historical distribution ranges of the Ottoe and Uncas skippers were not in close proximity to the Keewatinoow Converter Station area. As such, no construction effects or mitigation recommendations are presented.

Riel Converter Station

Dakota Skipper

There was no suitable Dakota skipper habitat identified within the Riel Converter Station footprint. As such, no construction effects or mitigation recommendations are presented.

Ottoe and Uncas Skipper

There was no suitable Ottoe and Uncas skipper habitat identified within the Riel Converter Station footprint. As such, no construction effects or mitigation recommendations are presented.

Ground Electrodes and Lines

Dakota Skipper

Known historical distribution range of the Dakota skipper was not in close proximity to the northern and southern ground electrodes and lines. Furthermore, there was no suitable Dakota skipper habitat identified within the ground electrode footprints. As such, no construction effects or mitigation recommendations are presented.

Ottoe and Uncas Skipper

Known historical distribution ranges of the Ottoe and Uncas skippers were not in close proximity to the northern and southern ground electrodes and lines. Furthermore, there was no suitable Ottoe and Uncas skipper habitat identified within the ground electrode footprints. As such, no construction effects or mitigation recommendations are presented.

8.2.9.5 Summary of Residual Environmental Effects and Significance

Potential negative residual impacts are associated with the habitat alteration along the transmission right-of-way. The preservation of existing low-growth vegetation along the right-of-way and buffers around sensitive sites is expected to minimize effects incurred by habitat degradation in these VEC habitats. Additionally, careful storage and removal of any hazardous materials and the infrequent use of seasonal access trails and the right-of-way will further alleviate impacts on terrestrial invertebrates. Summaries of residual effects assessments are presented in Table 8.2-11.

Dakota Skipper

Potential environmental effects of the Project on the Dakota skipper are restricted to the right-of-way and are negligible. In general, the retention of desired low-growth plant-cover resistant to tree invasion within prairie habitat along the right-of-way may aid in preserving desired key adult and larval food resources for potential Dakota skipper populations. There are no residual project effects on the Dakota skipper.

Ottoe and Uncas Skippers

Residual environmental effects of the Project on the Ottoe and Uncas skippers are limited to the right-of way, its clearing and maintenance, and the installation of permanent transmission towers. In general, construction-related activities are expected to have negative effects on the Ottoe and Uncas skippers, however, the residual environmental effects are concluded to be not significant.

Operation-related activities are expected to have negative effects on the Ottoe and Uncas skippers, and the residual environmental effects are concluded to be not significant. In particular, if minimal right-of-way clearing is expected in areas with low-growth vegetation at prairie habitats associated with suitable skipper habitat, residual effects will be restricted to permanent tower footprints within suitable habitat and where tall-growth vegetation is cleared and maintained.

Table 8.2-11: Residual Environmental Effects Summary – Terrestrial Invertebrates

VEC	Project Component	Phase	Residual Effect	Assessment[1]
Ottoe skipper & Uncas skipper	HVdc Transmission Line and ac Collector Lines	Construction	Habitat alteration/ disturbance from construction and maintenance in sensitive areas	Direction – Negative Magnitude – Moderate Geographic Extent – Local Study Area Duration – Short Term **Overall – Not Significant**
		Operation		Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium Term **Overall – Not Significant**

Note:

1. Expected residual effects (i.e., effects after mitigation) of the Project on each VEC are assessed using the regulatory significance evaluation approach and methods defined in Chapter 4, Section 4.2.10. Where feasible, regulatory significance is assessed for each non-negligible expected residual effect based on its expected direction, magnitude, geographic extent and duration (as each term is defined in Section 4.2.10); if an adverse residual effect is evaluated to be potentially significant, other factors are also considered (frequency, reversibility, ecological importance and societal importance). Scientific uncertainty is noted where it may materially affect the assessment.

8.2.9.6 Follow-up

A monitoring program is not anticipated for terrestrial invertebrates. As Dakota, Ottoe, or Uncas skipper individuals were not found, nor were they expected during 2010 field surveys (for additional information, please refer to the Terrestrial Invertebrates, Amphibians and Reptiles Bipole III Transmission Project Environmental Assessment Technical Report), no reference is available for follow-up monitoring.

Field studies at sandy-soil prairie habitats are recommended prior to tower installation for the northern prairie skink. At this time, observations will be made to determine whether recommendations for mitigation measures were adhered to for terrestrial invertebrates.

8.3 SOCIO-ECONOMIC EFFECTS ASSESSMENT

Socio-economic effects of the Project are identified and assessed below separately for each major socio-economic component of the environment. In each instance, the following are examined:

- Project effects and key topics;
- VECs;

- Environmental effect assessment and mitigation (by VEC, effects by Project component and phase);
- Summary of residual effects assessment and significance (includes summary table for each VEC with a residual effect from the Project that is not negligible); and
- Follow-up.

Socio-economic effects are examined separately for the HVdc transmission line component, the Keewatinoow Converter Station and associated facilities (includes construction camp, construction power station, construction powerline, ac collector lines, ground electrode and electrode line), and the Riel Converter Station and associated facilities (ground electrode and electrode line).

VECs were selected to represent those broader components of the environment which had one or more of the following attributes: particular scientific/regulatory importance, important to potentially affected communities or society as a whole (cultural, economic, etc.), and ideally were measurable, in order to more effectively predict and monitor changes resulting from the Project. Expert judgement and other similar projects were also used in the selection of VECs.

The socio-economic effects assessment includes the following broad environmnental components:

- Land Use;
- Resource Use;
- Economy;
- Services;
- Personal, Family and Community Life; and
- Culture and Heritage Resources.

Relevant potential effects and key topics are outlined below for each of the above broad environmental components. These are primarily the main mechanisms of effects and sensitivities associated with each broader component and applicable to most of the VECs that represent the broader component. After introducing the VECs, the environmental effects assessment and mitigation are organized by VEC and around each Project component and phase of the Project in order to document the assessments. A summary of residual environmental effects and significance is provided, along with follow-up.

8.3.1 Land Use

8.3.1.1 Potential Effects and Key Topics

The range of issues/concerns and related impacts in terms of land use will vary for the different Project components and for the specific area studied (i.e., northern resource areas versus southern agricultural areas; undeveloped lands versus more intensively developed lands with rural residences, etc.). Based on prior experience with routing/siting and environmental assessments for similar transmission projects, SSEA related issues for land use typically cover a spectrum of issues and concerns. Some will relate specifically to potential Project effects, while others will reflect the perception of potential land use conflicts and related effects on the enjoyment or value of property. Related concerns may vary regionally in relation to factors such as geographic context and property tenure, as well as existing and prospective land use patterns. Site-specific land use issues such as First Nation Reserve lands, communities and rural residences are generally avoided through the SSEA process. A general listing of potential issues in terms of land use was prepared as part of study area characterization and is listed in Chapter 7. The listing of issues is indicative of the range of potential effects on land use and analyses undertaken in the course of SSEA process and liaison activities.

8.3.1.2 Valued Environmental Components

The selection of VECs initially involved a scoping of potential issues pertinent to the Project. The rationale for the selection of the VECs was based on the following regulatory importance; the Environmental Assessment Consultation Program (EACP) [including Key Person Interviews]; Aboriginal Traditional Knowledge (ATK), expert judgement, and other similar projects. The following VECs were selected to assess project effects on land use:

- Land tenure and residential development;
- Private forest lands (shelterbelts, managed private woodlots);
- Aboriginal lands (Reserve Lands and Treaty Land Entitlement selections);
- Designated Protected Areas and Protected Areas Initiative (Areas of Special Interest, enduring features);
- Infrastructure (aerodromes, communications towers, roads, rail, pipelines, drains, culverts); and
- Agricultural land use/productivity.

Issues such as human health effects (Electric and Magnetic Fields [EMFs], noise, vibration, dust and herbicide use) and aesthetics, which are linked to land use, are discussed under Personal, Family and Community Life. Access concerns which were identified during the EACP (Chapter 5) are discussed under Domestic Resource Use.

8.3.1.3 Environmental Effects Assessment and Mitigation

The potential effects of the Project on land use were examined according to the stage of the Project (construction and operations). Based in part on prior project experience in SSEA studies for transmission facilities, potential environmental effects are addressed for identified VECs and in the context of established issues and concerns.

During the construction stage, potential effects are expected to include disturbance and nuisance effects such as noise, dust and traffic. These effects are discussed under Personal, Family and Community Life, and are generally addressed through application of Project-specific Environmental Protection Plans (EnvPPs). In addition, during the construction phase, effects can include loss of private woodlots and shelterbelts where they cannot be avoided, as well as loss of agricultural land use/productivity where the HVdc line and facilities such as the Riel ground electrode line are located in agricultural Manitoba.

During the operations stage, the Bipole III line and associated Project components will be part of the landscape. EnvPPs for operations of the Project will include measures to reduce the effects of the Project components on land use (e.g., where possible, observing municipal and local protocols and by-laws).

Upon completion of transmission line construction, relevant site decommissioning for the Project can include: temporary right-of-way access trails, marshalling yards, borrow sites, and mobile construction camp locations. Minor deviations from the right-of-way (i.e., in severe terrain conditions) unless required for ongoing maintenance would not be regularly maintained post construction. Marshalling yards typically established near transmission line routes for the storage of construction materials and equipment will be restored to pre-Project conditions, including any site remediation required, and will be allowed to regenerate naturally following construction. New borrow locations required for construction will be reclaimed by promoting regrowth of native vegetation and other mitigation measures in accordance with *The Mines and Minerals Act*. In addition, mobile construction camps, which are generally located along the right-of-way in well drained areas, will be restored to pre-Project conditions and allowed to regenerate naturally.

The assessment approach in each section describes both positive and negative environmental effects. Mitigation strategies (i.e., design mitigation and effects mitigation) are an important part of the analysis. To minimize adverse effects, mitigation measures are identified for each potential effect to avoid, minimize or remedy and, in some cases, compensate for adverse environmental effects. Following the identification of mitigative measures, the assessment analyzed whether or not residual effects (after application of mitigation measures) would remain from the Project, and whether or not the residual effects are significant.

HVdc Transmission Line

In northern Manitoba, the Bipole III line will require a 66 m right-of-way obtained via easement through a Crown land reservation (which will be converted to easement). In southern agricultural Manitoba, the 66 m right-of-way for the Bipole III line will utilize a combination of easements adjacent to the public road allowance, in-field alignments or will generally be centred on the half-mile line (subject to the development of possible site-specific mitigation measures). Where the line is routed adjacent to the road allowance in agricultural Manitoba (i.e., south of PTH 16 which roughly corresponds to the intensive agricultural use area), the steel lattice towers will typically be situated more than 38 m into a property from the road allowance edge.

Two tower types have been selected for use in the Project. In northern Manitoba and forested/pasture areas in the south, the line conductors will be suspended from guyed lattice steel structures. Guyed structure design and construction was chosen because it can be adjusted to difficult or shifting foundation conditions, and enables periodic adjustment of the guys at their anchors, to accommodate such changes. In the more densely developed areas of southern Manitoba, self-supporting lattice steel structures will be used to reduce the Site/Footprint and property acquisition requirement, and to minimize potential impact on agricultural land use/productivity.

Land Tenure and Residential Development

Construction

Construction can potentially have an effect on properties and rural residences along the route for the Bipole III line. A number of concerns with respect to the potential effects of the line on private property and rural residences were raised during the EACP. These concerns are consistent with Manitoba Hydro's past experience with SSEA studies and include:

- Proximity to residences and built-up areas, and avoidance of residences and residential development including areas of potential future residential development;
- Impacts on residential property values: potential decrease in the value of properties in proximity to a transmission line;

- Aesthetic impacts: concerns about impacts on residences and the landscape itself in relation to the presence of a transmission line (e.g., view shed); line placement interfering with the image of a property or attractiveness of the landscape; and
- Concerns about health and safety: health effects and EMFs and other electrical effects (e.g., interference with television and radio reception, audible noise, and interference with other electrical devices such as GPS).

Each of these potential issues, with the exception of aesthestics, health and safety, and electrical effects, are discussed below. As noted above, aesthetics, health and safety, and electrical effects are addressed under Personal, Family and Community Life, and access is addressed under Domestic Resource Use.

In portions of agricultural Manitoba north of PTH 16, the steel lattice towers for Bipole III will typically be situated 30 m into the property from the road allowance edge. Overall, in agricultural Manitoba (RM of Mountain to the Riel Converter Station) and north-central Manitoba (in the RM of Kelsey), the easement required for the line (assuming structures centered along the half-mile line, on an in-field alignment or adjacent to the road allowance) would affect a total of approximately 540 private properties. Some of these are in common ownership. Potential effects from line placement can include crossing through or splitting properties. Of the total number private properties affected, the easement would pass along on the same side as the road allowance of approximately 165 properties and split approximately 370 properties. A total of approximately 155 private properties are located on the opposite of the road allowance and are not directly affected by the line. In addition to private properties, the easement for the line would affect approximately 115 properties that are Crown lease and five properties that are municipally-owned.

Construction-related activities will potentially have short-term effects on residences. The route for the Bipole III line generally avoids rural residences and areas of rural residential development, including areas designated for future urban and rural residential development. The final preferred route was selected to avoid displacing or passing within close proximity to rural residences (i.e., within 100 m) to the maximum extent possible. One rural residence is located within 100 m from the final preferred route for the Bipole III line (SW16-39-24WPM). An additional 18 rural dwellings are located between 101 and 200 m of the final preferred route, while an additional 12 are located between 201 and 270 m. In addition to the rural dwellings, a rural residential area is located within approximately 0.8 km to the west of the final preferred route in the RM of Tache at Rosewood (approximately 4.0 km north of the Trans Canada Highway).

Measures to mitigate project-related construction effects will include the following:

- Subject to detailed engineering analysis, tower location (tower "spotting") will be used, where feasible, to reduce potential negative effects, and location preferences identified in the course of the SSEA process (including more detailed pre-construction evaluation of the selected right-of-way) will be included in the engineering analysis and, where technically and economically feasible, incorporated in the structure placement decision;
- Municipal and local protocols and by-laws will generally be respected and appropriate methods will be applied to comply with regulatory standards during construction of the line; and
- Care will be taken so that construction activities/ equipment do not impact neighbouring properties.

Apart from the mitigation measures identified above, Manitoba Hydro has a compensation policy in place for landowners whose properties will be directly affected by the right-of-way and for any physical damages incurred during construction (Chapter 3, Project Description). A compensation policy of land acquisition is in place for those rural residences located on properties within 75 m of the centre of the right-of-way. The process of consulting property owners prior to construction (i.e., establishing easements with landowners and planning detailed transmission line design) will be used to address and preclude potential impacts on residences and property where possible.

Given these mitigation measures, potential effects on land tenure and residential development during construction are anticipated to be negative, small in magnitude, Project Site/Footprint in geographic extent, short-term in duration and are therefore not significant.

Operation

Given the life expectancy and presence of the line, it will have long-term effects on land tenure and residential development. In terms of property values decreases, Manitoba Hydro's position is that the presence of transmission lines does not significantly affect residential property values. Since 2000, Manitoba Hydro has undertaken an annual Property Value Monitoring Program in the Birds Hill and Lister Rapids areas (RMs of East and West St. Paul), north of the City of Winnipeg. The program was initiated in response to concerns about property values as these residential areas are located north of an existing transmission line right-of-way containing 500 kV and 230 kV transmission lines. Real estate transactions for residential properties have been tracked over the period from January 1, 1992.

Operations have less potential for disturbance to property and residential development.

Measures to minimize or mitigate Project-related effects include the following:

- Municipal and local protocols and by-laws will be generally respected and appropriate methods will be applied to comply with regulatory standards during operations of the line; and
- Care will be taken to ensure that operations activities/equipment do not impact neighbouring properties.

In the unlikely event that physical damages are incurred by a landowner during operations of the transmission line, damages are subject to compensation through Manitoba Hydro's existing compensation policies (Chapter 3, Project Description).

Given these mitigation measures, operational effects are anticipated to be negative, small in magnitude, Local Study Area in geographic extent, medium-term in duration given the ongoing physical presence of the line, and therefore not significant.

Private Forestlands (Managed Private Woodlots, Shelterbelts)

Construction

The effect of the Bipole III line on managed private woodlots is limited to a direct impact to three of 837 woodlot management plans registered by Manitoba Agriculture Foods and Rural Initiatives (MAFRI) and the Manitoba Forestry Association (MFA). This represents 0.36 % of the registered woodlots in Manitoba. A total of 21.24 ha are overlain by the Project Site/Footprint, which represents 4.7% of the total area (453.25 ha) of the three affected woodlots. Although semi-permanent (life of the Project) in nature and directly impacting three affected woodlot owners, the effect is proportionately very small and can be mitigated. Purely from an aerial extent perspective, the effect appears limited. However, the effect to an individual affected woodlot owner is dependant on their specific perspective. Aside from the three woodlots, no other managed private woodlots are located within close proximity (500 m) of the final preferred route.

Approximately 19 ha of shelterbelts within the agricultural zone (south of Mafeking) will be affected by the line. Some will be intersected perpendicularly, thereby necessitating clearing of only 66 m of these shelterbelts, while others are oriented longitudinally with the transmission line right-of-way and will have to be removed for the entire length that the two overlap. Some shelterbelts represent a substantial investment of time and resources, while others are natural hedgerows with varying degrees of locally designed benefits. The effects on shelterbelts are minimal at the provincial level, but are likely much more important at the individual landowner level.

Measures to mitigate negative effects on private managed woodlots and shelterbelts include the following:

- Meetings will occur with each individual owner to discuss and negotiate mitigation measures (i.e., replanting shelterbelt) that are reflective of management objectives and investments during the easement negotiation phase; and
- Locations will be identified in the construction EnvPP for the line to avoid additional damage (e.g., errant construction equipment).

Given these mitigation measures, the potential for adverse effects on private managed wood lots and shelterbelts during construction of the line are anticipated to be negative, moderate in magnitude, Project Site/Footprint in geographic extent, short-term in duration, and therefore not significant. Mitigation will serve to minimize woodlot and shelterbelt area loss although there will be the loss of woodlot/shelterbelt area as a residual effect.

Operation

The three directly affected private managed woodlots and approximately 19 ha of shelterbelts will be identified in an Operations EnvPP for the line to minimize the potential for additional impacts. Effects during operations are anticipated to be negative, moderate in magnitude, Project Site/Footprint in geographic extent, medium term in duration and therefore not significant.

Aboriginal Lands (Reserve Lands and Treaty Land Entitlements)

Construction

Construction effects may occur from a transmission line being located in different land ownership and tenure areas, including unorganized Crown lands where TLE selections have been made. No existing First Nation Reserve lands or Federal lands are crossed by the final preferred route for the Bipole III line.

Opakwayak Cree Nation (OCN) identified a TLE (May 2011) along the final preferred route for the Bipole III line. The TLE will be subject to ongoing discussions between Manitoba Hydro and the OCN.

The potential for effects on Aboriginal lands (reserve lands and TLEs) during construction of the Bipole III line are anticipated to be negative, small in magnitude, Project Site/Footprint in geographic extent, short-term in duration, and therefore not significant. Other Aboriginal interests are discussed further under Domestic Resource Use.

Operation

The Bipole III route does not cross any Reserve Lands or Federal lands. Effects of the line on Aboriginal Lands (Reserve Lands and TLEs) during operations are anticipated to be small in magnitude, Project Site/Footprint in geographic extent, medium-term in duration and therefore not significant.

Designated Protected Areas and Protected Areas Initiative (Areas of Special Interest, Enduring Features)

The final preferred route for the Bipole III line does not cross through any designated protected areas.

Provincial Parks

The closest designated protected areas from the route are two provincial parks ─ Clearwater and Red Deer River ─ in which their boundaries fall within the 4.8 km (3.0 mile) Local Study Area centered on the final preferred route. With respect to Clearwater Provincial Park, the final preferred route parallels the Hudson Bay Rail (HBR) line and the Herblet Lake to Rall's Island Stations (H75P) 230 kV transmission line and, hence no effects are anticipated. Red Deer River Provincial Park is a small recreation park located adjacent to PTH10 and is located approximately 1.0 km from the final preferred route. No negative effects are anticipated.

Areas of Special Interest (ASIs)

The final preferred route crosses through one ASI (ASI 114 Stephens Lake) under the Protected Area Initiative (PAI). The final preferred route crosses through approximately 76 km of the ASI and was selected to avoid enduring features where possible ─ where interaction occurs, the route affects a small percentage of the overall representation (Bipole III Lands of Special Interest and TLE Lands Technical Report). Within the ASI, two rare occurrence PAI enduring features are intersected by the line, as follows (Bipole II Terrain and Soils Technical Report):

- **Rare Occurrence Deep Basin / Eutric Brunisol:** Approximately 36 ha, or 2% of this 1,657 ha rare occurrence PAI enduring feature, located within the ASI east-northeast of Little Limestone Lake, is intersected by the line. Rare occurrence PAI enduring features not affected by the Project Footprint/Site are located within and beyond the ASI to the northeast and southeast of the line, occupying 9,476 ha, 56 ha and 2,110 ha of land. This feature is predominantly a soil feature, rather than a topographic feature and therefore, effect to terrain integrity is considered minimal. It is estimated that the representation or total proportion of the Deep Basin / Eutric

Brunisol feature which would remain available for protection (i.e., not affected by the line) within and outside the ASI is 13,263 ha or 99.7% of this feature type.

- **Rare Occurrence Glaciofluvial Deposits / Organic Cryosol (mesic woody forest) Moraine:** Approximately 42 ha, or 3% of this 1,441 ha rare occurrence PAI enduring feature, located within the ASI southwest of Little Limestone Lake, is intersected by the line. The majority of this feature is within the Local Study Area. Two similarly described enduring features not affected by the line are located within and outside the ASI, occupying 2,755 ha and 456 ha, respectively. Therefore, it is estimated that the representation or total proportion of Glaciofluvial Deposits / Organic Cryosol (mesic woody forest) Moraine feature which would remain available for protection (i.e., not affected by the line) within and outside the ASI is 4,611 ha or 99% of this feature type.

Wildlife Management Areas and Forest Reserves

Although not formally protected, WMAs and forest reserves are of interest to the PAI. The final preferred route crosses approximately 14 km of the Churchill WMA and 50 km of the Tom Lamb WMA. In terms of the Churchill WMA, Manitoba Conservation has indicated that this area crossed by the final preferred route will be excluded from the WMA as the Province moves forward with plans to increase the protection status of the WMA. Of the total length through the Tom Lamb WMA, approximately 20 km of the route parallels the existing HBR rail line and the H75P 230 kV transmission line. The final preferred route crosses approximately 15 km of the Swan-Pelican Provincial Forest Reserve although it has been set aside for harvesting and development.

Southeast of The Pas, the PAI is planning a number of new WMAs. In this area, the final preferred route crosses the proposed Red Deer WMA for a distance of approximately 27 km. In addition, two portions of the proposed Summerberry WMA are crossed by the final preferred route, which has both a protected and an unprotected component. The proposed protected portion (under PAI) is crossed for a distance of approximately 29 km, while the unprotected portion of the WMA is crossed for a distance of approximately 17 km. Within Tom Lamb WMA and Summerberry proposed WMA, one rare and one single occurrence PAI enduring soils features are intersected by the right-of-way, as follows:

- **Single Occurrence Alluvial Deposits/Organic Mesisol (mesic sedge):** Approximately 67 ha, or 0.2% of this 36,396 ha single occurrence PAI enduring feature, located within the Tom Lamb WMA and Summerberry Proposed WMA along the Saskatchewan River, east and southeast of The Pas, is intersected by the route. This feature is primarily a soil feature, rather than a terrain feature and therefore, disturbance in this feature is considered to have a relatively low effect to the landscape. Avoidance of this feature was not possible based on limited routing options in this area. It is estimated that the representation or total proportion of Alluvial Deposits / Organic Mesisol (mesic sedge) feature which would remain available for protection (i.e., not affected by the line) within and outside the ASI is 36,329 ha or 99.8% of this feature.

- **Rare Occurrence Alluvial Deposits/Organic Mesisol (mesic woody forest):** Approximately 16 ha, or 0.6% of this 2,485 ha rare occurrence PAI enduring feature, located within the Tom Lamb WMA Summerberry Proposed WMA between the Saskatchewan River and Kelsey Lake southeast of The Pas, is intersected by the route. A similarly described enduring feature not affected by the route is located immediately northwest of this feature within and extending beyond the ASI, occupying 288 ha. Therefore, it is estimated that the representation or total proportion of Alluvial Deposits/Organic Mesisol (mesic woody forest) feature which would remain available for protection (i.e., not affected by the line) within and outside the ASI is 2,757 ha or 99.4% of this feature type.

Ecological Reserves, Crown Lands and Conservation Districts

The final preferred route for the line avoids all Ecological Reserve lands, but the 4.8 km (3.0 mile) Local Study Area is in close proximity to the existing and proposed addition to Lake Winnipegosis Salt Flats Ecological Reserve. However, PTH 10 and an existing transmission line are also adjacent to the existing and proposed addition to the ecological reserve. Manitoba Conservation has identified a salt spring that provides salt water to the flats within the 4.8 km (3.0 mile) Local Study Area around the route, and wants to avoid any impacts to the spring as it may result in negative impacts to the existing and proposed ecological reserve.

The final preferred route for the line is located close to the west shore of lakes Winnipegosis and Manitoba and, as a result, a number of Crown land parcels are crossed. The preferred route is adjacent to the boundaries of three community pastures ─ the Lenswood/Birch River Community Pasture for approximately 7.5 km, the Alonsa Community Pasture for approximately 4.0 km, and the Lakeview Community Pasture for approximately 5.0 km. Although not formally protected, both the Crown lands and community pastures in this area are of interest to the PAI as they represent some of the only available lands which represent the prairie ecosystem.

The final preferred route crosses several conservation districts: Kelsey, Swan Lake Watershed, Intermountain, Alonsa, Whitemud Watershed, La Salle Redboine, Seine-Rat River, and Cooks Creek. There are no properties owned by the conservation districts along the final preferred route. No negative effects are anticipated.

Unique Terrain Features

Construction

Unique terrain features crossed by the route will be affected by the construction and physical presence of the line during operations, including off-right-of-way activities. This could result in a total impairment or loss of approximately 561 ha of landscape integrity, comprised of 161 ha of PAI enduring features and 400 ha of other identified unique terrain and soil features. The affected PAI enduring features are located in the Stephen's Lake ASI, Tom Lamb WMA and Summerberry Proposed WMA.

Residual effects to unique terrain will be primarily related to some impairment of landscape integrity of three single and one rare occurrence PAI enduring features crossed by the final preferred route. The landscape integrity of the four enduring features crossed by the route will be permanently altered. However, it is not anticipated to impede conservation goals of achieving adequate representation of these unique terrain features.

Measures to mitigate or minimize the effects of Project-related impacts on areas of interest to the PAI and unique terrain features includes the following:

- Subject to detailed engineering analysis, tower location (tower "spotting") will be used, where feasible, to reduce adverse effects;
- Where technically and economically feasible structure placement decisions will incorporate more detailed preconstruction evaluation of the right-of-way as well as location preferences identified through discussions with Manitoba Conversation PAI representatives. To date, this request has been made with respect to potential issues relating to the salt spring in the Lake Winnipegosis Salt Flats Ecological Reserve. Similar discussions will be held respecting the Stephens Lake ASI;
- Ongoing discussions will be held with Manitoba Conservation PAI representatives to provide Manitoba Hydro with the permanent right to access, use and maintain the right-of-way for the line;
- Construction within enduring features will be conducted in the winter, under frozen conditions, to protect site-specific features, such as organic deposits;
- No off-right-of-way activities, including construction of access trails or establishment of new borrow sources, will be conducted within any of the unique terrain and soil features crossed by the line;
- Off-right-of-way activities will maintain a 100 m buffer distance from unique terrain and soil features identified in;

- Excavated soils will be stored at designated work/spoil areas and will be fully replaced on the footprint of the excavation in the reverse order they were excavated;
- Movement of equipment within unique terrain and soil features will be limited to minimize terrain disturbance; and
- Existing access routes should be utilized and machinery will not operate outside of the Project areas within unique terrain and soil features.

During construction, an EnvPP for the the line will be used to manage work in proximity to designated protected areas and in lands under consideration for the PAI.

Mobile construction camps will be required during construction of the Bipole III line. The mobile construction camps will not be located in any designated protected areas or areas under consideration by the PAI. Designated protected areas and areas under consideration by the PAI will be identified in the construction EnvPP. In terms of areas for consideration under the PAI, Manitoba Hydro has maximized the portion of the route that follows existing linear facilities. Construction effects on lands for consideration under the PAI are anticipated to be negative, moderate in magnitude, Local Study Area in geographic extent, short-term in duration, and therefore not significant.

Operation

The locations of designated protected areas and lands under consideration for the PAI will be identified in a Project-specific operation EnvPP for the line. Adverse effects during operations on lands under consideration under the PAI are anticipated to be negative, small in magnitude, Local Study Area in geographic extent, medium-term in duration and therefore not significant.

Infrastructure

Construction

The Bipole III line will cross existing roads, railway lines, natural gas/oil pipelines and a water aqueduct. Agencies responsible for infrastructure crossed by the transmission line (i.e., HBR, CPR, CNR, GWWD, Trans Canada Pipeline, MIT and MTS) have been consulted at various stages of Project planning. Results of reviews to date are provided below.

Review of the Project with TransCanada Pipelines Limited (TCPL) occurred at the alternative route evaluation stage prior to the selection of a preferred route for the line. Feedback was provided in order to assess the risk of mutual interference between a transmission line route and TCPL transmission pipeline. The alternative route options (and consequently the resultant selected preferred route) cross TCPL main lines running east-west, as well as two lines running north-south. Issues raised by TCPL included potential interference due to conductor-to-ground fault on the powerline and the potential for risk of DC interference on the powerline towers from TCPL's cathodic protection system. TCPL indicated that a special study would have to be conducted to determine what mitigation measures would be required to ensure the safe operation of the pipelines. The study will be conducted following the detailed design of the transmission line. With respect to the alternative options reviewed, it is expected that the interference would be completely mitigated at all crossings under all options; however, the option with the minimum number of crossings would provide the minimum mitigation cost (TCPL pers. comm., 2009).

Discussions took place with Omni-Trax representatives responsible for the HBR railway line from The Pas to Churchill during the preliminary preferred routing stage. Issues of potential concern expressed by Omni-Trax officials related to safety constraints during Project construction (e.g, towers potentially falling over), scheduling of transmission operations and maintenance activities, and access issues affecting their operations. Omni-Trax has a standard accommodation policy for working with utilities on their proposed developments. Their application process for dealing with rail cable crossings of their rights-of-way typically involves reviews and approvals of engineering design drawings. No other approvals are required under legislation. Once approved by the railway company, maintaining communication with Omni-Trax representatives is important with regard to scheduling of activities (i.e., where and when) for construction of the Project (Omni-Trax Canada Inc., pers. comm. 2010).

A review of the preferred route alignment was conducted by Transport Canada according to their navigation standards and the potential to affect registered aerodromes. The review conducted confirmed that the final preferred route would not adversely affect any of the registered operations. No float plane bases were identified in proximity to the preferred route. One private airstrip was identified on a north-south alignment in proximity to the preferred route in the RM of Hanover (approximately 2.0 km to the north of the route in SE19-7-4 EPM). Due to the proximity and orientation of the route to the private airstrip, there is potential for interference from the construction of the line. Discussions will occur with the operator of the private airstrip with respect to the potential for adverse effects on operations. Possible mitigation can include realignment of the airstrip or the installation of aviation markers on the line. The other closest private airstrip is the Lyncrest Airfield located within approximately 1.6 km of the route, in the RM of Springfield west of PTH 101 and southwest of the Riel Converter Station site. The operators of these two airfields will be informed regarding construction schedules for the line.

There are 14 communication towers within 4.8 km of the centre line of the route. Most of these are concentrated in four different areas along the final preferred route, including near Brunkild, Osborne (both in the RM of Macdonald), Ste. Agathe (in the RMs of Macdonald and Ritchot) and near the Riel Converter Station site (in the RM of Springfield). In addition, there is one radar tower site located in the Lakeview Community Pasture, within 0.8 km of the final preferred route, on the west side of the north-south road allowance, south of Langruth, in the RM of Alonsa.

The right-of-way for the Bipole III line parallels other linear rights-of-way (i.e., roads, rail, drains) and existing transmission lines to the extent that system reliability criteria and engineering design are not violated. Parallel opportunities between the preferred route and other existing linear infrastructure occur in several areas, including the following:

- A 25 km (approximately) stretch of PR 280 between Pukatawakan Lake and Orr Lake;
- A 35 km (approximately) stretch of PR 280 east between the crossing of the South Moskowot River and Assean River;
- A 7.5 km (approximately) stretch along PTH 6 south of Ponton;
- A 80 km (approximately) stretch of the HBR line between PTH 6 south of Ponton and Dyce Lake and a second shorter 16 km (approx.) stretch along the northwestern edge of the Tom Lamb WMA between Mawdesley and Clearwater lakes;
- A municipal drain through the RM of Macdonald (Drain 11-A for approximately 25 km); and
- The Cooks Creek Diversion (for approximately 5.8 km) in the RM of Springfield.

Parallel opportunities also occur with several existing transmission lines, including the following:

- A 7.5 km (approximately) stretch of 230 kV transmission line (P8G) south of Ponton;
- A 60 km (approximately) stretch of the newly constructed Wuskwatim 230 kV transmission line (H75P) between Dyce Lake and Clearwater Lake;
- A 45 km (approximately) stretch of 230 kV transmission line F27P south of The Pas to the junction of PTH 10 and 60;
- A 1 km (approximately) stretch along 230 kV transmission line D14S south of St. Claude in the RM of Grey;
- A 6.0 km (approximately) stretch along 230 kV transmission line R49R adjacent to the Cooks Creek Diversion in the R.M. of Springfield; and

- Along a 15 km (approximately) stretch of the existing right-of-way for a 500 kV ac transmission line (D602F) through the RM of Springfield to the site for the Riel Converter Station.

Reviews of potential effects and appropriate mitigation measures involving infrastructure are subject to standard Manitoba Hydro procedures for contact and consultation with responsible authorities or other companies, and mitigable in all cases. Manitoba Hydro will adhere to all applicable design specifications related to infrastructure crossings, including any special requirements or mitigative measures.

Measures to mitigate or minimize the effects of Project-related impacts include the following:

- Agencies responsible for infrastructure crossed by the transmission line (i.e., HBR, CPR, CNR, GWWD, Trans Canada Pipeline, MIT, MTS) will be consulted. Confirmation of any necessary permits and approvals or design measures for construction will be made during the detailed design stage of the Project;
- Infrastructure crossed will be identified on the Project-specific construction EnvPP;
- The above agencies will also be notified with respect to construction schedules for the transmission lines to minimize disruption to operations;
- Municipal authorities responsible for drains will be notified of clearing and construction schedules; and
- Local protocols and by-laws, including maintaining adequate buffers will be respected where possible.

Anticipated effects on infrastructure from construction are considered to be negative, small in magnitude, Project Site/Footprint in geographic extent, short-term in duration, and therefore not significant.

Operation

To mitigate or minimize the potential effects of operations on infrastructure:

- Agencies responsible for infrastructure crossed by the transmission line (i.e., HBR, CPR, CNR, GWWD, Trans Canada Pipeline, MIT, MTS) will be notified with respect to operations and maintenance schedules for the transmission line to minimize disruption to operations; and
- The locations of infrastructure crossed by the line will be identified in a Project-specific operations and maintenance EnvPP.

Given these mitigation measures, operational effects to infrastructure are expected to be negative, small in magnitude, Project Site/Footprint in geographic extent, medium-term in duration, and therefore not significant.

Agricultural Land Use/Productivity

Construction

Concerns with respect to potential impacts of the line on agricultural practice were raised during the EACP (Chapter 5). Soil productivity is discussed in Section (8.2.1.4). In terms of the final preferred route, there is some limited agricultural production to the east of The Pas. Apart from this, agricultural activities generally occur in the area south of Mafeking (north of the Town of Swan River) to the Riel Converter Station site, east of the City of Winnipeg.

Concerns raised with respect to the line during the EACP were potential impacts on field operations, livestock, and health and safety. Impacts on field operations included removal of agricultural lands from production, field severances, inconvenience and increased costs to farming, working around towers, weed control, interference with irrigation systems and restricted aerial spraying. Concerns were also raised with respect to property damage (farm machinery, fences, etc.), displacement of residences/farm buildings and/or farm shelterbelts, health and safety concerns, including human and livestock. Human health and safety issues are discussed under Personal, Family and Community Life. Rural residences and shelterbelts are discussed under Land Use.

The route selection process for the line sought to minimize the impact of the line on agricultural land use/productivity by identifying agricultural factors as a routing issue, and by using half-mile alignments wherever possible to limit interference with agricultural operations. Based on comments provided by landowners during the EACP, Manitoba Hydro altered the alignment of the preferred route for the Bipole III line to remove approximately 47.5 km of diagonal routing through intensively cropped areas to minimize potential impacts. Diagonal line placement remains in areas with limited annual cropping and where no or limited agricultural use for hay and pasture prevail as line placement has limited impact on these operations.

Based on some landowner comments, Manitoba Hydro also altered the alignment of the line at least 38 m into the field from the edge of the road allowance south of PTH 16, and 33 m from the edge of the road allowance north of PTH 16. In-field placement will not lead to new field boundaries whereas placement at the quarter, one-third or half mile lines may lead to new field boundaries. Subject to detailed engineering analysis, tower location (tower "spotting") will be used, where feasible, to reduce potential negative effects, and location preferences identified in the course of the SSEA process (including more detailed pre-construction evaluation of the selected right-of-way) will be included in the engineering analysis and, where technically and economically feasible, incorporated in the structure placement decision.

The agricultural portion of the route for the Bipole III line is approximately 585 km in length. The final preferred route, compared to the alternatives, crosses the least amount of intensively farmed land, is the shortest in length and tower placement has the lowest impact on agriculture. Approximately 230 km of the route will be on an in-field alignment, removed from road allowances and field edges, while approximately 250 km will be on a diagonal alignment and approximately 105 km is on a half mile line alignment. Field severances will affect approximately 245 km of the line. In agricultural Manitoba, approximately half of the final preferred route for the line crosses through cultivated land, while the remaining portion crosses uncultivated pasture land, native hay land and wetlands (Bipole III Agriculture Technical Report).

The final preferred route was selected to avoid displacing or passing within close proximity to farm accessory building (i.e., within 100 m) to the maximum extent possible. There are 27 barns within 270 m of the right-of-way for Bipole III. The closest barn is approximately 75 m from the right-of-way, while 15 additional barns are less than 150 m from the right-of-way. An additional four barns are between 150 and 200 m, while seven are between 201 and 270 m from the right-of-way. The closest large farmstead outbuilding is approximately 115 m from the right-of-way, while 11 additional buildings are less than 200 m from the right-of-way.

Final decisions respecting the location of the transmission line towers and determination of compensation for the impact of the towers on agricultural operations are normally made during the course of property acquisition. This facilitates post-licensing completion of field surveys and detailed design activity necessary to confirm physical and technical considerations which may affect structure placement and design. This also enables Manitoba Hydro Property Department staff to discuss site-specific circumstances and related compensation or tower placement preferences with landowners. As noted above, wherever feasible, tower placement will be selected to minimize impacts on agricultural operations and productivity.

Construction of the line in agricultural Manitoba during the summer months will have a greater impact on cultivated crop production as damage to crops and soils are more likely to occur. If construction activities result in physical damage (i.e., crop loss, ruts, etc.), Manitoba Hydro will pay compensation to the affected landowners or have physical damages restored.

With respect to aerial spraying, crop spraying patterns can be affected by a variety of site-specific physical influences or obstructions ranging from the shape of a field under cultivation to the presence of rural residences or shelterbelts. The presence of a transmission line can restrict aerial spraying patterns depending on the location relative to a field or to other physical constraints. Manitoba Hydro considers impacts on aerial spraying operations on a site-specific basis where owners or operators can demonstrate that the presence of the line will adversely affect the cost and/or feasibility of aerial spraying or alternative ground applications.

With respect to interference with irrigation systems, Manitoba Hydro considers impacts on a site-specific basis. Final decisions respecting locating the transmission line towers to minimize possible impacts are normally made during right-of-way acquisition. As with aerial spraying, this allows the completion of field surveys and detailed design activities to confirm physical and technical considerations that may affect structure placement. Manitoba Hydro Property Department staff will then be able to discuss tower placement with affected landowners including possible use of irrigation systems in the future. Consideration will be given to proper tower placement on all lands with irrigation potential as many parcels are being added to lands that are being irrigated every year.

In terms of potential induction because of the line paralleling metal fences, issues will be identified during the property acquisition phase and will be mitigated through proper grounding. Mitigation of potential effects such as security of fencing for livestock during construction will be assured by adherence to the construction EnvPP and by compliance with all relevant government legislation and regulations.

Construction of the Bipole III line, in terms of lower quality agricultural lands, was viewed by some during the EACP as having a potential positive effect as clearing of these lands will enhance production and yields. Clearing of bush and scrub in poorer quality agricultural lands may also be a positive effect in terms of livestock production.

Manitoba Hydro compensates for impacts to agriculture through its Property Compensation program. Compensation for establishing easements across private property recognizes that residual impacts on agricultural practices will remain after mitigation measures have been applied. Manitoba Hydro's Property Compensation program is discussed in Chapter 3.

Given these mitigation measures, during construction of the line, potential effects on agricultural land use/productivity are anticipated to be negative, small in magnitude, Project Site/Footprint in geographic extent, short-term in duration, and therefore not significant.

Operation

In terms of operations, Manitoba Hydro recognizes that some landowners and farm operators may continue to have concerns with the effects of the line on agricultural productivity. Any concerns will be responded to through regional and local customer service offices. Similarly, compensation will be paid for any physical damages that may occur during operations and maintenance of the line although these activities are generally scheduled to occur when crops are off the fields. Compensation would also be paid for any physical damages if Manitoba Hydro requires emergency access to the transmission line.

Regarding effects on livestock operations in the vicinity of the line, based on Manitoba Hydro experience, operations should be unaffected by the line. Electric and Magnetic Fields (EMFs) and health effects are outlined under Personal, Family and Community Life. In terms of EMF and livestock, research has not shown that static fields associated with dc transmission lines such as Bipole III adversely affect livestock.

During operations, the potential effects to agriculture are anticipated to be negative, small in magnitude, Project Footprint/Site in geographic extent and medium-term in duration given the ongoing presence of the line, and are therefore considered not significant.

Keewatinoow Converter Station and Associated Facilities (Including Construction Camps, Construction Power Station, Construction Powerline, 230 kV ac Collector Lines, and Ground Electrode and Line)

Land Tenure and Residential Development

There are no issues of concern with respect to the construction or operations of the Keewatinoow Converter Station and associated facilities from a land tenure and residential development perspective as there are no privately-owned lands or residences in the area. No adverse effects are anticipated.

Private Forestlands (Shelterbelts and Managed Private Woodlots)

There are no issues of concern with respect to the construction or operations of the Keewatinoow Converter Station and associated facilities from a private forestlands perspective as there are no shelterbelts or managed private woodlots in the area. No adverse effects are anticipated.

Aboriginal Lands (Reserve Lands and Treaty Land Entitlements)

Construction

The Keewatinoow Converter Station site and sites/routes for the associated facilities are not located on and do not cross any existing First Nation Reserve lands or Federal lands. The Keewatinoow Converter Station site has been identified as a TLE (July 2011) by

Fox Lake Cree Nation. Manitoba Hydro will acquire the property rights for the Keewatinoow Converter Station and associated facilities from the Crown (excluding mineral rights). Ongoing discussions with Fox Lake Cree Nation with respect to these facilities and the TLE at the Keewatinoow Converter Station site will continue. Other Aboriginal interests are discussed further under Domestic Resource Use.

The potential for effects on Aboriginal lands during construction are anticipated to be negative, small in magnitude, Local Study Area in geographic extent, short-term in duration, and are not expected to be significant.

Operation

Manitoba Hydro will acquire the property rights for the Keewatinoow Converter Station and associated facilities from the Crown (excluding mineral rights). Effects are anticipated to be no negative, small in magnitude, Project Study Area in geographic extent, medium term in duration, and therefore not significant.

Designated Protected Areas and Protected Areas Initiative (Areas of Special Interest, Enduring Features)

Construction

There are no issues with construction of the Keewatinoow Converter Station and associated facilities from the perspective of designated protected areas or the PAI. With the exception of portions of the collector lines and construction powerline, the sites for these facilities are currently located in the Churchill WMA. Manitoba Conservation has indicated (G. Suggett, pers. comm. 2010) that Manitoba Hydro's Water Power Reserve, which is located southwest of the site for the converter station, as well as the area identified for the Bipole III infrastructure will be excluded from the Churchill WMA as the Province moves forward with plans to increase the protection status of the WMA. No adverse effects are anticipated during construction.

Operation

There are no issues with operations of the Keewatinoow Converter Station and associated facilities from the perspective of designated protected areas or the PAI as the portion of the Churchill WMA in which these facilities are located is expected to be removed from the WMA. No adverse effects are anticipated during operations.

Infrastructure

Construction

The sites for the Keewatinoow Converter Station and construction camps do not affect any existing infrastructure. Traffic and transportation issues are addressed under Services. The existing Kelsey to Limestone (KN36) 138 kV transmission line and its 31 km extension to provide construction power to the construction power station involves crossing infrastructure. This includes an existing crossing of PR 280, a new crossing of PR 290, and crossing the HBR line to Churchill. The 230 kV collector line right-of-way crosses the HBR rail line to Churchill at two points (at Limestone and Avery) and an abandoned portion of rail line extending to the northeast past the Conawapa Generating Station site. One of the 230 kV collector lines will extend from an existing 230 kV switchyard at Long Spruce Generating Station to the new 230 kV switchyard site to be located at the site of the new Keewatinoow Converter Station for a distance of approximately 55 km. The southern portion of this route crosses other linear infrastructure, including PR 290, as well as other existing Manitoba Hydro transmission lines.

Measures to mitigate or minimize the effects of construction-related impacts include the following:

- Agencies responsible for infrastructure crossed by the transmission line (i.e., HBR, MIT) will be consulted to confirm if any necessary permits and approvals or design measures for construction will be made during the detailed design stage of the Project;
- These agencies will also be notified with respect to construction schedules for the transmission lines to minimize disruption to operations;
- The locations of infrastructure crossed will be identified in a Project-specific construction EnvPP; and
- Where possible, local protocols and by-laws will be respected, including maintaining adequate buffers.

Given the presence of other existing infrastructure in the area, including hydro-related (i.e., proximity to other hydro-related works within Manitoba Hydro's Water Power Licence and Water Power Reserve areas), the anticipated effects for construction are considered to be negative, small in magnitude, Project Footprint/Site in geographic extent, short-term in duration, and therefore are not expected to be significant.

Operation

Agencies responsible for infrastructure crossed by the collector lines will be notified of operations schedules. Infrastructure crossed by the lines will be identified in operations EnvPP. Potential effects from operations activities on infrastructure are expected to be negative, small in magnitude, Project Site/Footprint in geographic extent, medium-term in duration, and therefore not significant.

Agricultural Land Use/Productivity

As there are no agricultural activities in this region of Manitoba, the Keewatinoow Converter Station and associated facilities will not affect agricultural land use/productivity. No adverse effects are anticipated.

Riel Converter Station & Associated Facilities

Land Tenure and Residential Development

Construction

The property required for the construction of the Riel Converter Station (excluding mineral rights) has been obtained by Manitoba Hydro for the development of the Riel Station (Chapter 3). Other private properties and residences adjacent to or in the immediate vicinity of the Riel site have been purchased through negotiated agreements as part of the development of the Riel Station. No effects are expected on land tenure and residential development during construction as a result of the development of the Riel Converter Station.

Manitoba Hydro will be acquiring a full section of land (640 ac) for the Riel ground electrode with the ground electrode ring sited at the centre of the property. That portion of the ground electrode site will be permanently removed from the land base. The two dwellings and lands in the section will be purchased through negotiated agreements by Manitoba Hydro. It is anticipated that the dwellings, once purchased, will be removed from the properties and put up for sale. Most of the remaining land outside the site of the electrode ring within the section can remain in agricultural production.

Construction-related impacts associated with the ground electrode potentially involve nuisance effects, including noise, vibration and dust. The ground electrode site is located in an area with residential development on neighbouring lands (i.e., an area of rural residential development is located in the section of land just to the west of the site). These effects are discussed in Personal, Family and Community Life.

The scale of construction for the ground electrode will be substantially smaller than the initial development of the Riel Station. Effects on the acquired properties of the ground electrode site are expected to be negative, small in magnitude, Local Study Area in geographic extent, short-term in duration, and therefore not significant. To minimize potential effects, Manitoba Hydro is proposing routing the ground electrode line on existing road allowances and other rights-of-way.

Operation

The property required for the operation of the Riel Converter Station (excluding mineral rights) has been obtained by Manitoba Hydro for the development of the Riel Station (Chapter 3). Other private properties and residences adjacent to or in the immediate vicinity of the Riel Site have been purchased through negotiated agreements as part of the development of the Riel Station. No effects are expected on land tenure and residential development during operations.

Effects from the operation of the ground electrode site are expected to occur on an infrequent basis and only when required. The extent of the effects from the electrode line will be minimized by routing it along existing road allowances and other rights-of-way.

Measures to mitigate or minimize the effects of Project-related impacts include the following:

- Operations activities will be carried out in a manner that takes care to avoid any unnecessary disturbance and to protect the rural landscape surrounding work activity sites; and
- Activities will be conducted to prevent any unnecessary damage outside the required Project Site/Footprints and other disturbed/developed areas.

Anticipated effects on land tenure and residential development during operations are considered to be negative, small in magnitude, Project Site/Footprint in geographic extent, medium-term in duration, and therefore not significant.

Private Forestlands (Shelterbelts, Private Managed Woodlots)

Construction

The construction of the Riel Converter Station and ground electrode will affect two private forestlands in terms of shelterbelts. Effects are anticipated to be negative, moderate in magnitude, Project Site/Footprint in geographic extent, short term in duration, and therefore not significant. No issues of concern are anticipated with respect to the route for the ground electrode line from a private forestlands perspective given that it will be routed along road allowances and existing rights-of-way. No adverse effects are currently anticipated.

Operation

The operations of the Riel Converter Station will not affect private forestlands. No adverse effects are expected. Effects of the ground electrode during operations are considered to be negative, moderate in magnitude, Project Site/Footprint in geographic extent, medium-term in duration, and are not considered significant.

Aboriginal Lands (Reserve Lands and Treaty Land Entitlements)

The construction and operations of the Riel Converter Station will not affect any existing Reserve Lands or TLE lands. No adverse effects are anticipated. In the case of the ground electrode site, only private and/or municipal lands are involved. No adverse effects on Aboriginal lands during construction or operations are anticipated.

Designated Protected Areas and Protected Areas Initiative (Areas of Special Interest, Enduring Features)

The construction and operations of the Riel Converter Station, ground electrode and electrode line will not affect any designated protected areas or lands for consideration under the PAI. No adverse effects are anticipated.

Infrastructure

Construction

Potential construction-related impacts from the development of the Riel Converter Station on area infrastructure will be principally confined to the area drainage systems and Deacons Reservoir. Traffic and transportation is discussed under Services.

The development of the Riel Converter Station is not expected to adversely affect area infrastructure facilities. Site development and access for the converter station will be subject to provincial review and approval with respect to development restrictions affecting the PR 207 control zone. Construction-related effects are expected to be mitigable in all cases and are considered negligible.

No adverse effects on the surrounding land drainage systems are anticipated due to the development of the Riel Converter Station, as water in this area that currently drains through the Bibeau system will continue to do so. The development of the site will not alter the land drainage characteristics of the surrounding region.

Construction-related activities at the Riel site are not expected to have any adverse effects on water quality associated with the City of Winnipeg's Deacon Water Supply

Reservoir. Contamination issues with respect to dust control, site-related surface drainage, groundwater and wastewater treatment were avoided or mitigated through adherence to standard environmental protection guidelines for construction as part of initial site development under the Riel Reliability Improvement Project.

The development of the ground electrode and electrode line is not expected to adversely affect area infrastructure. Similarly, no adverse effects on surrounding land drainage systems are anticipated from the development of the ground electrode and associated line. Potential related effects will be mitigated through proper site planning and final design parameters. Effects from construction of the ground electrode and electrode line on infrastructure are considered to be negligible.

Operation

As with construction of the Riel Converter Station, operation concerns could potentially involve drainage systems and Deacons Reservoir. Project related effects will be mitigated through proper site planning and final design parameters, and through adherence to standard operating procedures and protocols for operations (e.g., oil spill containment assessment procedures, fire suppression). Potential effects from normal operations are expected to be negligible.

Effects from the operations of the ground electrode and electrode line on area infrastructure are considered to be negligible. Potential effect will be mitigated through adherence to standard operating procedures and protocols.

Agricultural Land Use/Productivity

Construction

The property required for the construction and operation of the Riel Converter Station (excluding mineral rights) has been obtained by Manitoba Hydro for the development of the Riel Station (Chapter 3). There will be no effects on agricultural productivity as a result of the construction of the Riel Converter Station. No adverse effects are anticipated.

Manitoba Hydro will be acquiring a full section of land (640 ac) for the Riel ground electrode with the ground electrode ring sited at the centre of the property. That portion of the ground electrode site will be permanently removed from the land base. Most of the remaining land outside the site of the electrode ring within the section can remain in agricultural production. Manitoba Hydro will pay compensation to the property owner for the lands taken out of agricultural production by the ground electrode or the electrode line through its Landowner Compensation Policy (Chapter 3). During construction, potential effects on agricultural productivity are anticipated to be negative, small in magnitude, Project Site/Footprint in geographic extent, short-term in duration and therefore not significant.

Operation

The property required for the operation of the Riel Converter Station (excluding mineral rights) has been obtained by Manitoba Hydro for the development of the Riel Station (Chapter 3). There will be no effects on agricultural land use as a result of the operations of the Riel Converter Station. No adverse effects are anticipated.

With respect to the ground electrode, potential effects on agricultural land use/productivity are anticipated to be negative, small in magnitude, Project Site/Footprint in geographic extent, medium-term in duration and therefore not significant.

8.3.1.4 Summary of Residual Environmental Effects and Significance

Table 8.3-1 provides a summary of residual effects related to land use for the Project and includes the identification of anticipated residual effects with respect to the VECs by Project component, their direction, magnitude, geographic extent, duration, and a determination of their significance during construction and operations respectively. Aesthetics and access effects are discussed under Personal, Family and Community Life and Domestic Resource Use respectively.

In terms of land use, construction of the Bipole III line and the Riel ground electrode will result in residual effects on private forestlands and agricultural land use/productivity because of the loss of private forestlands and agricultural lands. In addition, construction of the Riel ground electrode will result in the loss of two residences. There is one residence within 75 m of the Bipole III right-of-way which Manitoba Hydro is prepared to purchase if the owner so desires.

With respect to land use, during operations, the residual effects in terms of the loss of private forestlands and agricultural land use/productivity will remain. In addition, the physical presence of the facilities will be a residual effect on residences in proximity to the line. The presence of these facilities will alter the landscape for as long as they are in operation.

Table 8.3-1: Residual Environmental Effects Summary - Land Use

VEC	Project Component	Phase	Residual Effects	Assessment[1]
Land Tenure & Residential Development	HVdc Transmission Line	Construction	Possible loss of one residence within 75 m of the ROW through purchase	Direction – Negative Magnitude – Small Geographic Extent – Project Site/Footprint Duration – Short-term **Overall – Not Significant**
		Operations	Physical presence of the line	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term **Overall – Not Significant**
	Riel Ground Electrode & Line	Construction	Loss of two residences through purchase	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Short-term **Overall – Not Significant**
		Operations	Physical presence of facilities	Direction – Negative Magnitude – Small Geographic Extent – Project Site/Footprint Duration – Medium-Term **Overall – Not Significant**
Private Forestlands	HVdc Transmission Line	Construction & Operations	Loss of private woodlots/shelter belts	Direction – Negative Magnitude – Moderate Geographic Extent – Project Site/Footprint Duration – Short to Medium-Term **Overall – Not Significant**
	Riel Ground Electrode	Construction & Operations	Loss of private woodlots/shelter belts	Direction – Negative Magnitude – Moderate Geographic Extent – Project Site/Footprint Duration – Short to Medium-Term **Overall – Not Significant**
Aboriginal Lands (Reserve Lands & TLE)	HVdc Transmission Line	Construction & Operations	Physical presence of facilities; Increased access	Direction – Negative Magnitude – Small Geographic Extent – Project Site/Footprint Duration – Short to Medium-Term **Overall – Not Significant**
	Keewatinoow Converter Station & Associated Facilities	Construction & Operations	Physical presence of facilities; Increased access	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Short to Medium-Term **Overall – Not Significant**

VEC	Project Component	Phase	Residual Effects	Assessment[1]
Designated Protected Areas and PAI	HVdc Transmission Line	Construction	Impairment of unique terrain and soil features	Direction – Negative Magnitude – Moderate Geographic Extent – Local Study Area Duration – Short-Term **Overall – Not Significant**
		Operations	Physical presence of line; increased access	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term **Overall – Not Significant**
Infrastructure	HVdc Transmission Line	Construction & Operations	Physical presence of facilities	Direction – Negative Magnitude – Small Geographic Extent – Project Site/Footprint Duration – Short to Medium-Term **Overall – Not Significant**
	Keewatinoow Converter Station & Associated Facilities	Construction & Operations	Physical presence of facilities	Direction – Negative Magnitude – Small Geographic Extent – Project Site/Footprint Duration – Short to Medium-Term **Overall – Not Significant**
Agricultural Productivity	HVdc Transmission Line	Construction & Operations	Loss of Agricultural productivity	Direction – Negative Magnitude – Small Geographic Extent – Project Site/Footprint Duration – Short to Medium-Term **Overall – Not Significant**
	Riel Ground Electrode & Line	Construction & Operations	Loss of Agricultural productivity	Direction – Negative Magnitude – Small Geographic Extent – Project Site/Footprint Duration – Short to Medium-Term **Overall – Not Significant**

Note:

1. Expected residual effects (i.e., effects after mitigation) of the Project on each VEC are assessed using the regulatory significance evaluation approach and methods defined in Chapter 4, Section 4.2.10. Where feasible, regulatory significance is assessed for each non-negligible expected residual effect based on its expected direction, magnitude, geographic extent and duration (as each term is defined in Section 4.2.10); if an adverse residual effect is evaluated to be potentially significant, other factors are also considered (frequency, reversibility, ecological importance and societal importance). Scientific uncertainty is noted where it may materially affect the assessment.

8.3.1.5 Follow-up

The environmental assessment conducted for the Project identified site-specific land use situations where mitigative measures will be required. These site-specific situations will be included in EnvPPs, both for construction and operations prepared specifically for the Project.

A listing of Environmentally Sensitive Sites (ESSs) associated with the Project, including a description of the ESS, the potential environmental effect and mitigation measures to be followed at these areas/sites will be documented in the Project-specific EnvPPs. Some of these situations may require that areas be flagged in the field to ensure construction crews are able to distinguish boundaries and locations. Sites/areas identified from a land use perspective will include: residences, farm buildings, private managed woodlots, shelterbelts, infrastructure crossed (i.e., roads, railway lines, pipelines, drains), communication facilities, designated protected areas and lands under consideration for the PAI.

8.3.2 Resource Use

8.3.2.1 Potential Effects and Key Topics

The range of issues/concerns and related impacts in terms of resource use will vary for the different Project components and for the specific areas being studied (i.e., northern versus southern Manitoba). Transmission lines and facilities have the potential to impact domestic and commercial resource harvesting (including fishing, hunting, trapping, gathering of medicinal and other plants, berries and fuel wood, wild rice harvesting, outfitting, mining, forestry, recreation and tourism)by Aboriginal people and others. This can occur through a direct impact on the resource as a result of temporary noise and activity related disturbances, and habitat loss. It can also occur through undesired access to resources adjacent to or along the rights-of-way.

Due to the minimal amount of habitat loss resulting from a transmission line right-of-way, potential Project effects during operations primarily relate to the potential for improved access in some areas along the rights-of-way. Increased access can also be a positive effect when access to a resource is improved. Although the issue of increased access is discussed independently below, it is considered under each of the VECs.

For some resource uses such as recreation and tourism, aesthetics can be a concern. Aesthetics is discussed under Personal, Family and Community Life. The following section focuses on the effects in terms of the potential direct impact on a resource from the various Project components.

8.3.2.2 Valued Environmental Components

The selection of VECs initially involved a scoping of potential issues pertinent to the Project. The rationale for the selection of the VECs was based on the following: regulatory; the EACP (including Key Person Interviews); ATK; expert judgement, and other similar projects. Chapter 4 describes the approach to environmental assessment, including the rationale for VEC selection. The following VECs were selected to assess Project effects on resource use:

- Commercial forestry (Productive Forestland, High Valued Forest Sites, Research & Monitoring Sites);
- Commercial fishing;
- Mining/Aggregates;
- Trapping;
- Wild rice harvesting;
- Recreation and Tourism; and
- Domestic resource use.

8.3.2.3 Environmental Effects Assessment and Mitigation

The following section summarizes the resource use effects assessment for the Project. The existing environment (Chapter 6) provides an overview of resource use to assist in the identification of potential environmental effects as a result of the Project. Potential effects of the Project on resource use and the various components are outlined below in terms of the phases of Project development. Mitigation measures are identified to minimize potential negative effects from the Project. Residual effects are identified and assessed for their significance. Follow-up actions are identified to ensure mitigation measures are implemented and monitored for their effectiveness.

HVdc Transmission Line

Increased Access

The issue of increased access along transmission line rights-of-way was raised during the EACP for the Project by resource users and leadership in Aboriginal communities, particularly in northern Manitoba. For construction of transmission lines, Manitoba Hydro uses existing highways, municipal and forestry roads, trails and man-made linear features where possible, thereby minimizing the need to develop new access routes to the right-of-way. Access is required along the right-of-way and will be restricted to the right-of-way as much as possible, with deviations from the right-of-way limited to natural terrain features such as rock outcrops, excessively steep slopes, and where ingress and egress to stream crossings are logistically challenging and/or environmentally risky.

As outlined under Land Use, paralleling existing linear facilities will lessen the opportunities for increased access. Paralleling opportunities for the Bipole III route and other existing linear infrastructure (i.e., roads, railway lines,) occurs in several areas. Paralleling opportunities also occur with several existing transmission lines. The route for the Bipole III line also parallels or is in close proximity to forestry roads through the area from Partridge Crop Lake, west of Pikwitonei, to Halfway Lake, north of Wabowden. There is existing access in this area through winter and all weather roads that service Pikwitonei and Thicket Portage.

With respect to the Bipole III line, the issue of increased access is not expected to be an issue in agricultural Manitoba. In northern Manitoba, the relatively remote location of the right-of-way in some areas will limit access, particularly during the spring and summer months. Concerns with increased access relate to increased harvesting activities leading to a decrease in the animal and plant populations for resource users, as well as increased chances of vandalism on cabins and traps in the case of trapline holders. In several instances, during the EACP, communities expressed an interest in increasing access in terms of trapping, hunting and gathering for their own community members, but restricting access from those outside of the community.

Where the issue of increased access potential is important to a community in relation to managing potential negative impacts on the environment, an Access Management Plan will be prepared prior to construction of the line. The plan(s) will identify access management objectives, the approach during both construction and operations, the means of communicating the plan to various affected parties, and a monitoring component.

Commercial Forestry

Construction

Potential effects on commercial forestry for the Project are divided into three categories: productive forestland, high valued forest sites, and research and monitoring sites. The northern portion of the Project Study Area is referred to by Manitoba Conservation as the Non-Commercial Forest Zone because of the existing environmental limitations and its distance from markets (Bipole III Forestry Technical Report). The area is dominated by non-forest and conifer land cover classifications. Broadleaf dominant stands are non-existent and mixedwood classes only make up 15% of the Project Site/Footprint forested land area. Forest stands are characterized by trees of small diameter and short stems that have limited economic value. Given the remoteness of this zone and the distance to any processing facilities (The Pas), it is highly unlikely that it will be economically feasible to salvage any wood fibre from within the Non-Commercial Forest Zone, other than for domestic purposes.

Productive Forestland

Productive forestland forms the basis for all forest management planning for Manitoba Conservation, Forestry Branch and the forest industries that use the resources. It is the basis from which Manitoba Conservation determines sustainable harvest levels for Crown lands, including Forest Management License (FML) areas allocated to the forest industry. Where the land use on productive forestland changes from forest management to an alternative use, such as a transmission line, the affected lands are withdrawn from the productive forestland base. Loss of productive forestlands affects sustainable harvest levels, reduces the amount of productive forestlands within FML areas and the available amount of standing timber. Important measurable parameters for the effects assessment for the productive forestland include the Annual Allowable Cut (AAC), area allocated under (FMLAs), and standing volumes of timber. The measurable parameters to assess the effects of the Project on Productive Forestland includes the AAC levels (m^3/yr), area allocated under FMLAs (ha), and volume of standing timber (m^3).

Sustainable Harvest Levels (Annual Allowable Cut)

Manitoba Conservation determines sustainable harvest levels, represented as AAC, by FMU. It considers all Crown-owned productive forestland that is classified for forest management purposes. When determining the sustainable AAC levels, Manitoba Conservation Forestry Branch takes into consideration numerous environmental and operational factors to ensure sustainable levels of resource utilization are not exceeded. AACs are also reflective of the age class distribution of the forest stands across the productive forest area and their calculation may be periodically influenced by large wild fire events.

The Project will remove productive forestland from the land base. Mean annual increment (MAI), a forest productivity unit that describes the potential capacity/expected growth of a particular forest type through to the rotation age of a stand, is used to estimate the effect on AAC levels. MAI is expressed as m^3/ha/year and, when multiplied by the total area removed by the Project, provides an indication of potential effects to AAC (m^3/yr) without the consideration of other operational/forest practice limitations (i.e., operability, forest succession, etc.) Values are summed by softwood and hardwood to the FMU, Forest Section (FS) and FML levels.

The effects of the Project on AAC, by FMU and FS, are very small, as shown in Table 8.3-2. In terms of volume reductions, the highest effect is on the softwood AAC in the Nelson River FS and on hardwood in the Mountain FS. Percentage wise, all effects on AAC at the FS level (softwood and hardwood) are fractions of 1.0% with the exception of the softwood AAC in the Churchill River FS (FMU 74), where the effect equates to 1.5% of the existing. Of note is that Manitoba has no timber commitments in FMU 74.

Project effects on the AAC are lost when placed in context with the likely error inherent in AAC calculations of plus or minus 10% (East, pers. comm. 2011). A marginal reduction in the hardwood annual harvest level may be realized in FMU 10 where the AAC is currently fully committed to FML #3 and Timber Sale Agreement holders.

Table 8.3-2 Bipole III Project Effect on Annual Allowable Cut Levels by FMU

Forest Section	FMU	AAC1 Net Merchantable[2] (m^3/yr)		Project Effect (m^3/yr)		Project Effect (%)	
		Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood
Aspen Parkland	1	1,010	24,530	0.175	4.097	0.017	0.017
	2	410	18,870	0.023	0.509	0.006	0.003
	4	1,410	21,050	0.004	0.103	0.000	0.001
	5	550	19,210	0.588	14.950	0.107	0.078
Subtotal		3,380	83,660	0.790	19.659	0.023	0.023
Mountain	10	1,730	112,290	22.136	223.604	1.280	0.199
	11	20,480	138,870	67.756	151.552	0.331	0.109
	12	93,350	118,130	106.662	60.458	0.114	0.051
Subtotal		115,560	369,290	196.554	435.614	0.170	0.118
Sask River	52	33,540	31,090	21.549	9.083	0.064	0.029
	54	15,830	1,410	73.387	8.877	0.464	0.630
	55	39,980	13,660	211.380	24.270	0.529	0.178
Subtotal		89,350	46,160	306.316	42.230	0.343	0.091
Highrock	61	51,250	19,400	30.938	3.901	0.060	0.020
Churchill	74	3,060	0	45.732	0.955	1.495	0
Nelson River	83	246,710	93,040	136.373	28.121	0.055	0.030
	84	217,560	72,420	222.090	42.002	0.102	0.058
	85	156,220	46,690	207.419	70.156	0.133	0.150
	87	164,630	46,740	93.086	16.297	0.057	0.035
	88	14,560	8,720	201.319	32.943	1.383	0.378
Subtotal		799,680	267,610	860.287	189.519	0.108	0.071
Grand Total	All	1,062,720	786,120	1,440.617	691.878	0.136	0.088

Notes:
1. AAC based on old inventory (FRI).
2. Net Merchantable volumes do not consider operational constraints.

Forest Management License Areas

Forest Management Licenses are awarded by the Province to forest companies with specific quantities of productive forestland, capable of supporting AAC levels that can supply the fibre requirements of manufacturing facilities. Manitoba commits such long-term, sustainable land use designation to the investing industry under the Forest Management License Agreement. The agreement stipulates a limit of productive forestland withdrawal from the license area over 10 year periods. Where the land withdrawal limit is exceeded, Manitoba must provide alternative sources of equal quality/cost resources and/or compensate the company for the withdrawals and any investments the company may have upon those lands.

The Project intersects the FML areas of Tolko Industries Ltd. (FML #2) and Louisiana Pacific Canada Ltd. (FML #3). The effect of the Project on FML #2 and #3 regarding productive forestland withdrawal are shown in Table 8.3-3. The productive forestland effects on an FMU and FML basis are minimal amounting to a maximum of 0.45% in FMU 55. As a percentage, over the three FMUs in the Saskatchewan River FS, the withdrawal amounts to 0.23%. In terms of area affected at the FML level, reductions will amount to 1,165 ha and 465 ha for Tolko Industries Ltd. (FML #2) and Louisiana Pacific Canada (FML #3) respectively. The aforementioned areas equate to 5.4% of the FML #2 allowable withdrawal limit (21,420 ha or 0.5%) within the 10-year period 2009 to 2019. For FML #3, the Project related reduction amounts to 28.3% of the allowable withdrawal limit (1950 ha or 0.5%) within the 10-year period 2004 to 2014. These effects have to be taken in context with other productive forestland withdrawals occurring on the FMLs and within these time frames. On their own, the effect of productive forestland withdrawal from FML areas is minimal.

Table 8.3-3: Bipole III Project Effects on Forest Management License Areas

FML	Forest Section	FMU	Pre-Project Productive Forestland (ha)	Productive Forestland Withdrawal (ha)	Productive Forestland Withdrawal (%)
Tolko Industries Limited FML #2	Nelson River	83	286,902	141	0.05
		84	215,036	210	0.10
		85	174,159	214	0.12
		87	206,426	89	0.04
	Sub-Total Nelson R.		882,523	654	0.07
	Highrock	61	87,748	51	0.06
	Sub-Total Highrock		87,748	51	0.06
	Saskatchewan River	52	57,215	33	0.06
		54	76,271	163	0.21
		55	50,113	225	0.45
	Sub-Total Saskatchewan R.		183,599	421	0.23
	Mountain	12	40,426	39	0.10
	Sub-Total Mountain		40,426	39	0.10
	Total Tolko Industries Limited - FML #2		1,194,296	1,165	0.10
LP Canada Ltd. FML #3	Mountain	10	165,530	248	0.15
		11	180,273	217	0.12
		12	10	0	0.00
	Sub-Total Mountain		345,813	465	0.13
	Total LP Canada Ltd. - FML #3		345,813	465	0.13
	TOTAL ALL		1,540,109	1,640	0.11

Source: Manitoba Conservation, 2011.
Note:
1. GIS data error related; FML #3 does not officially extend into FMU 12.

Standing Timber

The Project Footprint area will be cleared of all trees. The volume of wood standing on productive forestland distributed over all age classes is considered under standing volume. The forest resource inventory, which classifies the productive forestland into six cutting (maturity) classes (0-5), is used in quantifying standing volume. The Forest Section specific Stand Stock Volume Tables (SSVT) provide hardwood and softwood gross merchantable volumes (m^3/ha) for each type aggregate in cutting classes 3 to 5 (immature to over-mature). The total softwood and hardwood volumes/ha within these type aggregates were then multiplied by their respective areas to derive the total hardwood and softwood volumes affected.

Type aggregates within immature cutting classes (1 and 2) are not represented in the SSVT. For type aggregates in these cutting classes, MAI was used to ascertain their contribution toward total volume loss. In accordance with the procedures outlined in the Forest Damage Appraisal and Valuation (FDA&V) guidelines (Manitoba Conservation, 2002), the MAI value, appropriate to the subtype, site and FS, within which the type aggregate is located, is assigned. The total gross merchantable softwood and hardwood volumes for a type aggregate are then calculated by multiplying the MAI value with its mid-age of the cutting class and area. Volumes are finally summed for all cutting classes, by hardwood and softwood to the FMU and FS levels. The total volume of timber found on productive, Crown-owned forestland and intersected by the Project is taken into account in the FDA&V process. Type aggregates within cutting class 0 are considered recently disturbed sites (e.g. harvest, fire, etc.) and are considered to have no associated standing timber volume.

Effects on standing timber volumes in those FMUs intersected by the Project are shown in Table 8.3-4. The effect on standing timber over the entire Project Area/ Footprint within the commercial forest zone equates to approximately 88,600 m^3 of softwood, 37,900 m^3 of hardwood for a combined total of 126,600 m^3. This represents an estimated 0.1% of the total standing in the affected FMUs. The volume of timber found on the Crown-owned portion of the Project footprint will be used in the FDA&V assessment to determine financial compensation due to Manitoba Conservation.

The calculation of the sustainable harvest levels (AAC) and withdrawals from the FMLAs is the responsibility of Forestry Branch. The AACs will be adjusted when they are periodically recalculated for specific FMUs. Similarly, where required, amendments will be made to harvest levels on an FMU and FS basis. Where the opportunity exists, Manitoba Conservation may replace area lost from FMLAs with new areas as per the FMLAs. Alternatively, if area withdrawals exceed the periodic limits set forth in the FMLAs, then the Province must compensate the FML holder.

Table 8.3-4: Bipole III Project Effect on Standing Timber on Crown Land

FMU	Pre-Project Standing Timber Gross Merchantable[1] (m3)			Project Effect on Standing Timber Gross Merchantable (m3)			Project Effect (%)		
	Softwood	**Hardwood**	**Total**	**Softwood**	**Hardwood**	**Total**	**Softwood**	**Hardwood**	**Total**
1	128,966	621,173	750,139	2	245	248	0.00	0.04	0.03
2	50,967	552,753	603,720	0	41	42	0.00	0.01	0.01
4	160,351	696,935	857,286	0	21	21	0.00	0.00	0.00
5	92,142	778,752	870,893	12	955	966	0.01	0.12	0.11
10	1,486,580	4,017,594	5,504,173	243	8,273	8,516	0.02	0.21	0.15
11	2,845,759	3,400,322	6,246,081	4,157	8,123	12,280	0.15	0.24	0.20
12	7,346,246	3,734,744	11,080,990	8,552	3,332	11,884	0.12	0.09	0.11
52	2,118,823	938,554	3,057,377	1,403	659	2,062	0.07	0.07	0.07
54	1,274,538	167,369	1,441,907	2,384	466	2,849	0.19	0.28	0.20
55	2,298,715	581,664	2,880,378	14,028	1,888	15,916	0.61	0.32	0.55
61	3,425,883	1,091,532	4,517,415	3,539	353	3,891	0.10	0.03	0.09
74	487,622	52,895	540,517	1,912	79	1,991	0.39	0.15	0.37
83	14,447,942	4,498,548	18,946,490	9,996	2,182	12,178	0.07	0.05	0.06
84	13,459,202	4,119,344	17,578,546	12,817	2,736	15,554	0.10	0.07	0.09
85	9,774,590	2,888,710	12,663,301	13,964	5,302	19,266	0.14	0.18	0.15
87	8,661,174	2,294,057	10,955,231	5,966	1,076	7,042	0.07	0.05	0.06
88	1,600,461	443,127	2,043,588	9,651	2,198	11,849	0.60	0.50	0.58
Grand Total	69,659,961	30,878,072	100,538,033	88,627	37,928	126,555	0.13	0.10	0.12

Note:

1. Gross Merchantable Volume does not consider operational constraints or cull factors. Gross Merchantable volume was used in the FDA&V.

High Value Forest Sites

Forestry Branch requires that all commercially harvested forest sites be regenerated to specific forest renewal standards (Manitoba Conservation, 2001). Silvicultural treatments that are implemented to achieve the forest renewal standards require considerable investments of time and resources. Such sites are therefore considered high value forest sites under Manitoba Conservation's FDA& V Policy (Manitoba Conservation, 2002).

Forest harvesting activities have occurred within many of the FMUs intersected by the Project. The highest concentrations of high value forest sites, in proximity to the Project footprint, are located in FMUs 83, 84 and 85 in the Nelson River FS. Of the 8,072 ha within the Project's local study area, 81% are located within the Nelson River FS between Partridge Crop Lake and Ponton.

Reforestation of harvest areas is performed through natural or assisted regeneration. Forestry Branch and the forest industries have identified harvest areas, regenerated through tree planting or site scarification, as high value sites. The locations of these silviculture sites are recorded and tracked by the Forestry Branch and the FML holders within a GIS environment. The data was acquired from the various organizations, compiled and overlain with the footprint to determine the locations and extent of effects. The spatial area of high value sites affected is compared to the total area found within the Project Local Study Area.

Of the 8,072 ha of high value forest sites found within the Project local study area (4.8 km buffer around the preferred route), 126 ha (1.6%) will be directly affected and therefore lost. Although considerable in area, it is small (0.4%) relative to the almost 30,000 ha reported reforested by the two FML holders Tolko Industries Ltd. and Louisiana Pacific Canada Ltd. within the five year period April 2001 to March 2006 (Manitoba Conservation, 2006).

Although recognized as important with significant financial investments, the effects on high value forest sites are limited to the construction phase of the Bipole III Project and will be limited to the extent of the Project footprint. The projected losses and the permanency (life of the Project) of the effects are accounted for in the FDA&V process and under loss of productive forestland.

Research and Monitoring Programs

Manitoba Conservation, Manitoba's forest industry, the Canadian Forest Service (CFS) and other federal government agencies, have established forest research and monitoring programs across Manitoba's forested areas. Their investment of time and resources, and continued contribution of research/monitoring data, warrant the identification of research and monitoring sites in terms of Commercial Forestry. Site-specific digital information has been obtained from the various agencies and entered into the Project database. This data was used during the site selection process for the Project as features/constraint information, ensuring that these sites would be avoided. Those in proximity to the Project Footprint have been documented, including their precise location and required buffers, to enable their continued protection.

As a result of considerations during the routing process, no research and monitoring sites are directly affected by the Bipole III line. Three research and monitoring sites are located in close proximity to the Project Site/Footprint. These sites are listed as environmentally sensitive sites and are to be included in all Project-related EnvPPs. They will be safeguarded under the mitigation measures prescribed below.

Summary of Forestry Assessment

Construction Phase

The potential direct and indirect effects of clearing the line include mechanical damage and scorching adjacent vegetation while clearing and burning debris, localized infestations of white spotted sawyer beetle as a result of debris accumulations, the spread of DED through improper disposal of elm wood, increased risk of wildfires as a result of debris burning and improved public access, localized sunscald to some species, micro-site climatic changes immediately adjacent to the right-of-way, spread of non-native plant species, localized altered drainage patterns and forest fragmentation.

An EnvPP will be developed for the construction phase of the Project which will identify all ESSs and specify mitigation measures to be applied. These include:

- Where possible and practical, clearing and construction activities will be limited to frozen ground conditions;
- The removal of stumps will be limited where possible;
- As much as possible, Project-related activities will be limited to the Project Site/Footprint;
- Where practical, all merchantable timber will be salvaged;
- Where demand exists, an opportunity for local salvage of fuelwood will be provided to local communities;
- Debris from clearing will not be pushed into standing timber;
- Debris piles will be placed on mineral soil where possible and well removed from the right-of-way edge to avoid scorching adjacent vegetation;

- Burn piles will be monitored to ensure all fires are extinguished prior to spring breakup;
- Cleared woody debris will be disposed of to prevent infestations of sawyer beetles;
- All elm wood will be immediately burnt, chipped or disposed of at designated disposal sites to prevent the spread of DED;
- All equipment will be thoroughly washed before being transported to the clearing/construction site to minimize the spread of non-native plant species;
- All hazard trees (on and off right-of-way) will be removed at the time of clearing and construction;
- All disturbed sites that are not required for the operations and maintenance phase of the Project (e.g. borrow pits, access trails, marshalling yards) will be rehabilitated;
- On-site supervision of all activities will be provided during construction;
- As soon as is practical, all forest lands used temporarily (e.g. borrow pits, marshalling yards, access routes, etc.) during the construction phase of the Project will be rehabilitated and return them to the productive forest base;
- Manitoba Hydro compensate Manitoba Conservation for the effects on productive forestlands as specified in the FDA& V Policy (Manitoba Conservation 2002);
- All high value forest sites within 500 m of the Project Site/Footprint will be considered ESSs and included in the construction, operations and maintenance, and decommissioning EnvPPs; and
- All high value forest sites located adjacent to the Project Site/Footprint will be safeguarded from damage (e.g. errant equipment) during all phases of the Project.

Given these mitigation measures, construction effects to forestry are assessed as negative, small in duration, Project Footprint/Local Study Area in geographic extent, short-term in duration, and therefore not considered significant.

Operation

The potential direct and indirect effects of operating the Bipole III line include increased risk of wildfires as a result of improved access, localized sunscald to some species, blow-down, micro-site climatic changes immediately adjacent to the right-of-way and the spread of non-native plant species.

An EnvPP will be developed for the operations phase of the Project. It will identify all ESSs and specify mitigation and protection measures to be applied. Specific mitigation measures to minimize operations related environmental effects to forest resources include:

- Where possible, operations activities will be conducted during frozen ground conditions;
- Project related activities will be limited as much as possible to the Project Site/Footprint, including designated access routes;
- All equipment will be washed before being transported to the Project site to minimize the spread of non-native plant species; and
- Conduct regular patrols to identify and remove hazard trees to minimize the risk of forest fires.

Given these mitigation measures, operational effects on forestry are expected to be negative, small in magnitude, Project Footprint/Local Study Area in geographic extent, medium-term in duration, and not considered significant.

Commercial Fishing

Construction

The line crosses few water bodies where commercial fishing occurs. However, a number of commercially fished waters do lie within the Project Site/Footprint. Most commercially fished water bodies are larger lakes, but also include medium to large rivers such as the Burntwood, Saskatchewan and Overflowing rivers. Bait fishing occurs on two water courses crossed by the line, the Saskatchewan River and the Red River.

Potential impacts to fishing as a result of constructing the line include:

- Negative impacts to fisheries as a result of habitat degradation;
- Impacts to surface water quality as a result of erosion or pollutants; and
- Increased access to and exploitation of fish resources.

Potential impacts to habitat and water quality will be negligible with mitigation implemented at water courses crossings. The presence of a large workforce during construction can lead to an increase in fish harvest from water bodies along the transmission line. The line follows, or is in close proximity to existing linear facilities through much of its length and therefore access to remote water bodies will not be increased. Where access becomes an issue to a community it will be managed through development of an Access Management Plan. Therefore, the impact of construction of the line on commercial and bait fishing is expected to be negative, small in magnitude, Project Footprint/Local Study Area in geographic extent, short-term in duration, and therefore not significant.

Operation

As noted under Construction, there are few water bodies within the right-of-way where commercial fishing occurs. As with construction, potential impacts to habitat and water quality will be negligible with mitigation implemented at water courses. The line follows, or is in close proximity to existing linear facilities through much of its length and therefore access to remote water bodies will not be increased. Where access becomes an issue to a community it will be managed through development of an Access Management Plan. Therefore the impact from operations of the line on commercial and bait fishing are negative, small in magnitude, Project Footprint/Local Study Area in geographic extent, medium term in duration, and are therefore are not expected to be significant.

Mining/Aggregates

Construction

Route selection has minimized the potential effects on mineral interests to the extent possible. In terms of the Bipole III line, additional liaison with the Mining Association, principally-affected companies and the Mines Branch resulted in the final preferred route being adjusted to avoid crossing numerous mining claims affecting three principal claim areas in the Thompson Nickel Belt area east of PTH 6 from Halfway Lake down to Wabowden and Gormley Lake. However, the final preferred route for the line still crosses several commercial mineral leases and mining claims, particularly through the Thompson and Wabowden areas.

The final preferred route crosses five mining claims, involving two different companies, and nine mineral license areas involving five separate companies. No known operating mine sites and other properties are crossed by final preferred route for the line. One mine property (a quarry site for talc) is located in proximity (approximately 1.0 km) to the north of the final preferred route southwest of Ponton (Iskwasum Lake). An additional mineral prospect property (for copper) was identified in the Farewell Lake/Cormorant Lake area, approximately 1.6 km north of the final preferred route. Potential issues relate to disruption and disturbance associated with crossing any existing access roads to a mineral property/site and maintaining adequate clearance distance from the site.

The line also crosses nine commercial quarry lease areas involving five different companies, several aggregate deposits of varying potential economic quality and is located in proximity to existing sand and gravel pits. Potential concerns relate to the ability to develop the quarry lease areas and deposits for commercial extraction and/or the potential for interference with operations of the quarry or aggregate deposit. One of the quarry leases, located to the west of Stephens Lake, is held by Manitoba Hydro.

To mitigate effects on mining/aggregates and ensure Project-related impacts are minimal, applicable legislation, regulations and guidelines will be adhered to and Project-specific mitigation measures will be outlined in the construction EnvPP. Measures to mitigate or minimize the effects of Project-related impacts will and include the following:

- Mineral claim and licence holders crossed by the final preferred route will be provided with information regarding clearing and construction schedules to minimize potential interference with exploration activities and Manitoba Hydro will work with mining interests and holders to address any outstanding issues;
- In instances where a potential adverse effect exists with quarry or aggregate operations, additional possible mitigation measures will include placement of towers to lessen/avoid interference with operations (i.e., quarries, pits) at those locations; and
- Manitoba Hydro will consult with the affected stakeholders (operators) as part of the easement negotiation phase of the Project to avoid adverse intereference from the transmission line with any future plans.

Given these mitigation measures anticipated adverse effects during construction are expected to be negative, small in magnitude, Project Site/Footprint in geographical extent, short-term in duration and therefore not significant.

Operation

No adverse effects are expected from operations of the line on any existing mines, properties, or quarry operations. The provision of increased access through the right-of-way could potentially result in increased mineral exploration activity. However, there are many other considerations that would contribute to commercial mineral development including the nature of the mineral resource itself, market conditions, and regulatory controls. Any increase in access opportunities is unlikely to affect mineral development.

Operations of the line could have an adverse effect on future exploration activities for individual company mining claim or lease holdings through disruption or interference with electro-magnetic surveys used to search for mineral anomalies. The potential for induction effects from the line is discussed further under Personal, Family and Community Life.

To mitigate effects on mining/aggregates and ensure Project-related impacts are minimal, applicable legislation, regulations and guidelines will be adhered to and mitigation measures will be outlined in a Project-specific operations EnvPP. Measures to mitigate or minimize the effects of Project-related impacts include the following:

- Holders of mineral claims and licences crossed by the line will be provided with information regarding operations and maintenance schedules to minimize potential interference with exploration activities; and
- Quarry operators in proximity to the line will be provided information regarding operations and maintenance schedules to minimize potential interference with operations.

Given these mitigation measures, anticipated adverse effects are negative, small in magnitude, Project Site/Footprint in geographical extent, and medium-term in duration, and therefore considered not significant.

Trapping

Construction

The final preferred route for the Bipole III crosses 45 registered traplines (Bipole III Resource Use Technical Report). Registered trapline holders were contacted through the EACP for the Project. Construction activities may temporarily displace wildlife from areas in proximity to the right-of-way. Manitoba Hydro has a Trapper's Notification/Compensation Policy in place for registered trapline holders (www.hydro.mb.ca). Mitigative measures which are part of the notification policy are outlined below. In terms of compensation, the program is intended to provide compensation to holders of registered traplines whose lines are affected by the construction of transmission facilities 115 kV or greater. Prior to construction, a compensation amount will be determined with eligible holders of registered traplines for the disturbance during the period of construction. Compensation would also be paid for any damage to equipment, buildings and trails uses for trapping during construction activities.

Applicable legislation, regulations and guidelines will be adhered to. Measures to mitigate or minimize the effects of project-related impacts will include the following:

- Prior to construction activities, registered trapline holders will be notified as to the schedule for construction activities; and
- Trapline holders will be notified to remove trapping equipment as required.

Given these mitigation measures and the duration of construction activities in any one area the effects are anticipated to be negative, small in magnitude, Project Footprint/Local Study Area in geographic extent, short-term in duration and therefore considered not significant.

Operation

During operations, Manitoba Hydro will follow-up with individual registered trapline holders to address any remaining Project-related concerns. As well, some trappers may benefit from improved access to their traplines. Anticipated effects are expected to be small in magnitude, Project Footprint/Local Study Area in geographic extent, medium-term in duration, and therefore not significant.

Recreation and Tourism (Lodges, Outfitting, Fishing, Hunting, Recreation Sites/Trails)

Construction

The route selection process sought to minimize the effect of the final preferred route on recreation and tourism developments and activities. The route, where feasible, was selected to avoid displacing or passing within close proximity to lodges, cottage subdivisions, cabins/remote cottages and recreation sites/trails.

There are no lodges in immediate proximity to the route for the Bipole III line. The closest lodge to the final preferred route is Trapper Don's Lodge & Outfitting Service located in the RM of Mountain (South) along PTH 20, approximately 2.3 km east of the route. Services offered by Trapper Don's that could potentially be affected include: guiding, fishing and hunting (for non-resident black bear and whitetail deer in Game Honting Areas (GHA) 14/14A [both of which are crossed by the final preferred route]).

There are three additional lodges within 10 km of the final preferred route for the line whose activities may be potentially affected – Carpenter's Clearwater Lodge (approximately 4.5 km from the route on the south shore of Clearwater Lake) offering guiding, fishing services and hunting for waterfowl, and Simon Nabess Wayside Park [& Nootin Resort] and Cormorant Lake Lodge (both approximately 8.0 km from the route on Cormorant Lake). Activities offered by these two operators include: guiding, fishing services and hunting (for non-resident bear in GHA 7 and 8 [GHA 8 is crossed by the preferred route], resident moose, waterfowl, upland game bird and non-resident deer). Construction access is also expected to use existing access points and/or linear routes wherever possible to minimize new disturbance.

Twenty GHAs are intersected by the final preferred route for the line and the 4.8 km (3.0 mile) wide Local Study Area. Ninety-nine outfitters are operating in these GHAs. In terms of outfitting, winter construction, which is planned for the northern part of the transmission line, is concentrated in months in which outfitting activity (e.g., big game hunting) is limited by closed hunting seasons. This will minimize potential effects.

Outfitters in the area have been apprised about the Project through the EACP. A few outfitters raised concern about the effect of the Bipole III line on outfitting. Manitoba Hydro reviewed individual concerns and evaluated the locations of outfitter values/investments relative to the proposed preferred route, and concluded that considerable separation exists.

Many of the water courses crossed by the line are fished recreationally. Potential impacts to sport fishing as a result of constructing the line include:

- Negative impacts to fisheries as a result of habitat degradation;
- Impacts to surface water quality as a result of erosion or pollutants; and
- Increased access to and exploitation of fish resources.

Potential impacts to habitat and water quality will be negligible with mitigation implemented at water courses crossings. The presence of a large workforce during construction can lead to an increase in fish harvest from water bodies along the transmission line. The line follows, or is in close proximity to existing linear facilities through much of its length and therefore access to remote water bodies will not be increased. Existing sport fishing regulations would be sufficient to address any changes in fishing pressured. Where access becomes an issue to a community it will be managed through development of Access Management Plans.

No cottage subdivisions are in close proximity (within 0.8 km) to the final preferred route. The route does cross through three quarter-sections of Crown-encumbered land where two remote cottages and one recreational lot are located (i.e., SE14-33-21WPM – RM of Mountain; SE1-31-19WPM – RM of Mossey River; and SE13-24-13WPM – RM of Alonsa). The final preferred route for the line crosses through five quarter-sections of Crown-encumbered land where four campgrounds and one fish camp are located (SW3-38-24WPM – RM of Mountain; SW34-33-21WPM – RM of Mountain; SW33-25-13WPM – RM of Alonsa; SW34-20-11 WPM – RM of Alonsa; SW6-31-18 WPM – RM of Mossey River).

The final preferred route crosses the Grass River which is a designated canoe route. The crossing point along the Grass River was reviewed with Manitoba Conservation Regional representatives. No concerns were raised with the crossing point on the Grass River. The route crosses the Middle Track and Hayes River designated canoe route at two locations, southeast of Little Cormorant Lake and east of The Pas on the Saskatchewan River. Other designated canoe routes crossed by the final preferred route include: Mossey River (part of the Waterhen Country canoe route) in the RM of Mossey River; and the Rat River (as part of the Rat River canoe route) in the RM of Ritchot. The route also crosses the Red River between the RMs of Macdonald and Ritchot, which is a designated Heritage River under the Canadian Heritage Rivers System.

The Bipole III line is located adjacent to or crosses a number of designated snowmobile trails in the vicinity of communities, including: west of Ponton at PTH 6; south of The Pas to the junction of PTH 10 and 60, north of Overflowing River and west of Dawson Bay; north of Cowan in the RM of Minitonas; southeast of Rossendale in the RM of North Norfolk; west and south of St. Claude and south of Elm Creek in the RM of Grey; northeast of Brunkild in the RM of Macdonald; south and east of Ste. Agathe in the RM of Ritchot; southeast of Niverville in the RM of Hanover; and east of Landmark and Dufresne in the RM of Tache.

Adventure travel and eco-tourism (ATE) activities within the Project Study Area are limited. The activities present are primarily focused on various outdoor recreation pursuits, guided canoe trips, wildlife viewing excursions, nature interpretation, Aboriginal traditional experiences, and local festivals and historical trips. Rivers Run Wild is one operator that offers canoe trips throughout a number of northern rivers which include the Limestone, Hayes, and Churchill Rivers. The Limestone River is located in the vicinity of the final preferred route.

To mitigate effects to recreation and tourism, applicable legislation, regulations and guidelines will be adhered to, and Project-specific mitigation measures will be outlined in the construction EnvPP. Measures to mitigate or minimize the effects of Project-related impacts include the following:

- Lodge owners and recreational resource users, including Crown land encumbrance holders, and snowmobile associations will be notified in advance as to the schedule for clearing and construction;
- Information signs and the placement of warning markers will be used to identify the right-of-way where it intersects with a recreational trail;
- Care will be taken to protect the natural landscape surrounding work activity sites; construction activities will be conducted to prevent any unnecessary damage outside the required rights-of-way and other disturbed/developed areas (e.g., borrow pits);
- If site-specific issues of concern arise, mitigation may be possible through minor route adjustments or maintaining a buffer of trees between a site/trail and the transmission line right-of-way; and
- Where access becomes an issue to a community, it will be managed through development of an Access Management Plan.

Given these mitigation measures, in general, construction-related effects on recreation and tourism are considered to be negative, small in magnitude, Project Footprint/Local Study Area in geographic extent, short-term in duration, and therefore not significant.

Operation

As noted above, there are no lodges in proximity to the route for the Bipole III line. The closest lodge is located approximately 2.3 km east of the route. Given the distance and the extent of tree cover that the route crosses through, the transmission line should not be readily visible to the lodge operation. There are three additional lodges within 10 km of the route.

Many of the water courses crossed by the line are fished recreationally. Potential impacts to sport fishing as a result of operations of the line include:

- Negative impacts to fisheries as a result of habitat degradation;
- Impacts to surface water quality as a result of erosion or pollutants; and
- Increased access to and exploitation of fish resources.

Potential impacts to habitat and water quality will be negligible with mitigation implemented at water courses crossings. Increased access can lead to an increase in fish harvest from water bodies along the transmission line. The line follows, or is in close proximity to existing linear facilities through much of its length and therefore access to remote water bodies will not be increased. Existing sport fishing regulations would be sufficient to address any changes in fishing pressured. Where access becomes an issue to a community it will be managed through development of an Access Management Plan.

Operations have less potential for disturbance to recreation and tourism than construction activities. The most effect on recreation and tourism during the operations phase is the permanent physical presence of the line. The line will be a net addition to the landscape and any adverse effect will be incremental in nature, particularly in areas where other infrastructure facilities are present. Measures to mitigate Project-related effects include the following:

Adherence to measures outlined in the Project-specific EnvPP for operations will tend to protect the same environmental qualities that are valued for outdoor recreation purposes. Measures to mitigate or minimize the effects of Project-related impacts include the following:

- Work permits from Manitoba Conservation will be obtained for all project activities occurring on provincial Crown lands;
- Prior to operation and maintenance activities, the snowmobile associations will be notified of the proposed work schedules;
- Information signs and the placement of warning markers will be used to identify the right-of-way where it intersects with a recreational trail; and
- Care will be taken to protect the natural landscape surrounding work activities.

Given these mitigation measures, anticipated effects may be considered to be negative, small in magnitude, Project Footprint/Local Study Area in geographic extent, medium-term in duration and therefore considered not significant.

Wild Rice Harvesting

Construction

The final preferred route for the line crosses in proximity to two lakes/creeks identified for commercial harvesting of wild rice, ranging from approximately 100 to 300 m distant respectively. An unnamed lake has a development license in Sections 28 and 34, Township 49, Range 25 WPM east of PTH 10 and Plummers Marsh. One other lake, Montreal Lake located southeast of The Pas (Sections 28, 29 and 34, Township 55, Range 25 WPM and Section 23, Township 56, Range 25 WPM) has a production license. The adverse effects on wild rice harvesting operations expected to occur during construction are associated with the potential for increased access to the resource. Depending on the availability of access, the level of resource harvesting may increase. Where access becomes an issue to a community it will be managed through development of an Access Management Plan.

To mitigate effects to wild rice harvesting and ensure Project-related impacts are minimal, applicable legislation, regulations and guidelines will be adhered to. Given this mitigation anticipated effects on wild rice harvesting from construction activities are considered negative, small in magnitude, Project Footprint/Local Study Area in geographic extent, short-term in duration and therefore not significant.

Operation

During operations, increased access by the presence of the right-of-way could have an indirect effect of contributing to over-harvesting of the resource by other resource users. Where access becomes an issue to a community it will be managed through development of an Access Management Plan. Effects are anticipated to be negative, small in magnitude, Project Footprint/Local Study Area in geographic extent, medium term in duration, and therefore not significant.

Domestic Resource Use

Construction

The importance of domestic resource use in the Project Study Area to Aboriginal people was identified by a number of First Nation communities, Northern Affairs Communities (NACs) and the Manitoba Metis Federation (MMF). During construction, there is potential to have an effect on domestic resource harvesting (e.g., hunting, fishing, plant and berry harvesting). Trapping is discussed above. Effects can arise through direct impact on the resource as a result of Project construction or through undesired access to resources by other parties. These concerns were raised by some communities through the ATK process, which included workshops and self-directed studies, as well as through the EACP (Chapter 5).

A portion of the final preferred route is located in the Fox Lake Resource Management Area (RMA) and the Fox Lake Traditional Territory.[4] The process for engagement with Fox Lake Cree Nation in relation to the Project is described in Chapter 5. Approximately 226 km of the Bipole III transmission line is located within the Split Lake Resource Management Area (SLRMA). Approximately 15 km of the Bipole III transmission line is also located in the broader Split Lake Resource Area, just outside the SLRMA.[5] The process for engagement with TCN in relation to the Project is described in Chapter 5. The Bipole III line also crosses through the Cormorant RMA. The boards of the RMAs will be expected to provide recommendations to the Province regarding the line prior to a license being issued. In addition, the Crown has an obligation arising from Section 35

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[4] The Fox Lake Resource Management Area and the Fox Lake Traditional Territory are defined in the 2004 Impact Settlement Agreement (ISA) between Fox Lake Cree Nation, Manitoba Hydro, and Manitoba. Portions of the Fox Lake Traditional Territory overlap with the Split Lake Resource Management Area.

[5] The Split Lake Resource Area and the Split Lake Resource Management Area are defined in the 1992 NFA Implementation Agreement. Portions of the Split Lake Resource Area overlap with the Fox Lake Resource Management Area.

of the Constitution, to consult with Aboriginal communities regarding the potential impact of the Project on the exercise of Treaty and Aboriginal rights.

In terms of domestic hunting, it is anticipated that wildlife/game species sensitive to disturbance may move away from sources of disturbance during construction of the line which may impact domestic harvesting levels in the area. This movement is anticipated to be short-term in duration, with the majority of mammal populations returning to the area once construction has been completed. Disturbance to game will be mitigated through conducting construction during off seasons for hunting (e.g., winter) which this is consistent with construction plans for the northern portions of the line, and the desired approach for the southern portions of the line.

With respect to mammals, another concern expressed by resource harvesters was the removal of prime hunting areas. Removal of habitat is expected to be limited to a relatively small amount of moose, elk, boreal woodland caribou, barren-ground and coastal caribou, marten and beaver habitat (Bipole III Mammals Technical Report and the Bipole III Caribou Technical Report). The removal of habitat is not expected to affect the overall health of mammal populations and, as noted above, species that require forest cover may become displaced due to clearing of the right-of-way, while species which use rights-of-way for grazing and travel may persist and/or move into the area once construction has concluded.

In terms of domestic hunting and fishing, resource harvesters raised the issue of increased access to hunting and fishing areas, and the effects on desired wildlife and fish species. There were a variety of perspectives regarding the effects of increased access on wildlife and fish. Some resource harvesters felt that the development of the right-of-way and construction access trails may benefit resource users through increased access to resource use areas and, thus, improving their chance of an increased harvest. However, some were of the opinion that greater access increased the risk of theft, vandalism and potential reduction of their harvest due to others accessing the resource base.

Nineteen traditional plant harvesting locations were identified along the final preferred route for gathering food and medicines, and for harvesting plants and trees for cultural and other purposes. From the self-directed studies, general botanical resource areas have also been identified along the route. Potential effects include the disruption or loss of plant species and communities important to Aboriginal people (as identified through the ATK process).

Plant species/communities have been considered important as these areas are used for gathering plants for medicinal, cultural and spiritual purposes. More than 80 species of traditional value were noted as being used through the ATK process. During plant surveys conducted for Swan Lake First Nation, approximately 95% of the greater than

200 species identified are known as medicinal plants or have other uses by the community (Reeves 2011).

Nineteen locations that are used for traditional plant gathering and berry picking will be affected by the final preferred route. The total area potentially affected within the transmission line right-of-way for traditional plant harvesting and gathering is approximately 760 ha. Fox Lake Cree Nation, TCN, Long Plain First Nation, Swan Lake First Nation, Wuskwi Sipihk First Nation, and the MMF have also identified general plant harvesting areas along the route. However, no calculations for areas of these sites are available.

As with domestic hunting and fishing, construction of the transmission line has the potential to increase access. This can result in a potential loss of important plant species and communities to Aboriginal people through pressure on the resource by non-community members. It can also increase access to resource areas. Although mitigation measures have been identified below to reduce the potential effect of construction activities in these areas, there is the likelihood that a loss of some plant communities important to Aboriginal people will occur within the right-of-way.

Domestic forest resource utilization is limited primarily to the personal use of fuelwood and, to a limited extent, the production of lumber for personal needs. The preferred fuelwood species are birch, ash and tamarack, which are not commercially utilized species. Pine and aspen are used to a lesser extent. Dead and dry standing trees are often preferred over live trees, as they can be burnt in the year of harvest. Fuelwood is often salvaged from commercial harvest and salvage sites, which reduces the overall demand on the forest resource and makes use of some of the woody debris that may otherwise be left behind. The estimated combined domestic annual utilization, from Timber Permits and estimated First Nation fuelwood gathering, is less than 8,400 m^3/yr for all of the Forest Management Units (FMUs) overlain by the Project.

A review of the ATK forestry values identified nine areas that are adjacent to or overlain by the Project Site/Footprint. Four of these sites are commercial timber harvest areas under authority of Tolko Industries Ltd. 1997- 2009 Forest Management Plan. Another five sites include fuelwood gathering areas, access trails and a domestic timber harvesting area intersected by the Project Site/Footprint. Project-related construction activities may temporarily restrict access to some areas for domestic timber resource use activities for safety reasons. The Project will not interfere with the collection of wood products from the forest for craft purposes.

In addition to site specific forestry values, the ATK and EACP processes identified the following forestry interests/concerns pertinent to the Project Study Area:

- Communities have traditionally and continue to gather fuelwood for heating purposes;
- Communities would like the timber that is cleared from the Project Site/Footprint provided to them to be used as fuelwood or sold;
- Concern that cleared timber is not utilized;
- Concern that areas are not reforested;
- Members gather wood for artistic/craft purposes;
- The disposal of organic matter by burning;
- Provincial timber allocation practices; and
- Concern over the use of herbicides for right-of-way maintenance.

The following mitigation measures have been identified to reduce effects on domestic resource use during construction:

- Construction and site decommissioning activities in northern Manitoba will be carried out during the winter months;
- Where construction and site decommissioning activities do not occur during winter months, disturbances will be minimized in areas of plants used by Aboriginal people as identified through the ATK process;
- Whenever possible, existing trails, roads and cut lines will be used as access routes;
- Access controls adjacent to PTH 6 and other access points from main roads will be applied, including ditching and access road retirement;
- Hunting and fishing by Project personnel will be prohibited, and firearms restricted in work camps;
- Understory stratums will be maintained during construction and site decommissioning activities;
- Manitoba Hydro will work with individual communities that have identified important resource use sites that are in close proximity to the Project Site/Footprint to minimize potential effects;
- Where demand exists, cleared timber that is not otherwise practically salvageable, will be made available to communities for fuelwood. Manitoba Conservation is responsible for timber allocation on Crown lands. Within those areas under FMLs,

the Licensee has the first right to all merchantable timber under license. Manitoba Hydro will endeavour to salvage merchantable where practical to do so; and

- Where the issue of increased access is important to a community (i.e., effect of increased access to areas deemed important for domestic resource use), Manitoba Hydro will work with directly affected communities to prepare Access Management Plans prior to construction of the line.

Based on the mitigation measures provided, effects on domestic resource use during construction are anticipated to be negative, moderate in magnitude, Project Footprint/Local Study Area in geographical extent, short-term in duration, and therefore is not considered significant.

Operation

Operations of the line may result in an increase in access to domestic resource use areas. In northern Manitoba, right-of-way use is anticipated to be most intensive during winter months, during which people may use the right-of-way for recreational purposes. Potential access is likely to be less during the spring, summer and fall in northern Manitoba given the terrain.

The operations of the line may result in a benefit to resource users (e.g., hunter and fishers) through increased access to resource use areas. The increased access to previously more remote areas may result in improved hunting and fishing. However, there is also the potential for improved access to resource use areas to result in increased pressure on the resource base if more people frequent an area. In addition, there could be an increase in disturbance to wildlife/game populations along the right-of-way. This may result in a low level of avoidance by game and furbearers sensitive to repeated disturbance to these areas, and thus a possible negative effect to hunting in the area.

There is the potential for operations of the line to negatively affect plants valued by Aboriginal people. Effects include the loss of plant species/communities as a result of the use of maintenance equipment outside of winter months, as well as the use of herbicides to control undesirable species. As a result of plant loss, Aboriginal people may have to travel further from current traditional areas to locate sites supporting favorable plants for food and medicine.

Measures to mitigate or minimize potential effects during operations include:

- Maintenance activities will be carried out during the winter months to minimize surface damage, rutting and erosion;

- Where maintenance activities do not occur during winter months, soil and vegetation disturbance will be minimized in areas of plants used by Aboriginal people as identified through the ATK process;
- Understory stratums will be maintained during maintenance activities;
- Existing access roads and trails will be used to the extent possible;
- Manitoba Hydro will work with individual communities and resource users who have identified important sites that are in close proximity to the line regarding ways to reduce pressure on the resource base caused by operations; and
- Where the issue of increased access is important to a community (i.e., effect of increased access to areas deemed important for domestic resource use), Manitoba Hydro will work with directly affected communities to prepare Access Management Plans prior to operation of the line.
- Herbicide use is discussed in Section 8.2.1.2. Given the above mitigation measures, operational effects to domestic resource use are anticipated to be negative, moderate in magnitude, Project Site/Local Study Area in geographic extent, medium-term in duration, and not considered significant.

Keewatinoow Converter Station and Associated Facilities (Including Construction Camps, Construction Power Station, Construction Powerline, 230 kV AC Collector Lines, and Ground Electrode and Electrode Line)

Commercial Forestry

The northern portion of the Project Study Area is referred to by Manitoba Conservation as the Non-Commercial Forest Zone because of the existing environmental limitations and its distance from markets. As such, there are no issues of concern with respect to the construction or operations of the Keewatinoow Converter Station and associated facilities from a commercial forestry perspective. No adverse effects are anticipated.

Commercial Fishing

There is no commercial or bait fishing in the Keewatinoow Converter Station area. No adverse effects are anticipated during construction or operations.

Mining/Aggregates

The development of the proposed Keewatinoow Converter Station and associated facilities will not have an adverse affect on any mining claims and mineral leases.

Identified borrow source locations have been identified by Manitoba Hydro as potential granular sources for Project use during construction. Ongoing discussions with respect to use of the borrow sources will continue with Fox Lake Cree Nation. In March 2011, Manitoba Hydro submitted quarry lease applications to the Mines Branch for the identified source locations. Following construction, the borrow pits will be reclamated in accordance with applicable legislation and regulations. The operations of the proposed Keewatinoow Converter Station and associated facilities will not have an adverse affect on any mining claims and mineral leases.

Trapping

Construction

Construction activities could temporarily affect trapping in the area of the proposed Keewatinoow Converter Station and associated facilities. There is one registered trapline in the area (Trapline 5 of the Limestone RTL) that is directly affected. The routes for the 230 kV ac northern collector lines and construction powerline will cross two registered traplines in the Split Lake RMA and one in the Fox Lake RMA. Under Manitoba Hydro's Trapper's Notification/Compensation Policy, compensation will be paid to the registered trapline holder for the period of construction. Compensation would also be paid for any damage to equipment, buildings and trails uses for trapping during construction activities.

Measures to mitigate or minimize the effects of Project-related impacts include the following:

- Ongoing discussions with directly affected registered trapline holders will continue to establish mutally acceptable measures to deal with any issues;
- Prior to construction activities, registered trapline holders will be notified as to the schedule for clearing and construction activities; and
- Trapline holders will be notified to remove trapping equipment as required.

Given these measures, anticipated effects are considered negative, small in magnitude, Project Footprint/Local Study Area in geographic extent, short-term in duration and therefore not significant.

Operation

During operations, Manitoba Hydro will follow-up with the registered trapline holders to address any remaining Project-related concerns. Anticipated effects are expected to be small in magnitude, Project Footprint/Local Study Area in geographic extent, medium-term in duration, and therefore are not considered to be significant.

Wild Rice Harvesting

There are no issues of concern with respect to the construction or operations of the Keewatinoow Converter Station and associated facilities from a wild rice harvesting perspective. No adverse effects are anticipated.

Recreation and Tourism

Construction

Construction activities for the development of the Keewatinoow Converter Station and associated facilities are not expected to result in adverse effects on lodges and outfitters. There are no lodges in the area and no outfitter allocations are located in the immediate area. The closest outfitter utilizes an area west from Long Spruce Generating Station and extends to the area around Kettle Generating Station.

Goose Creek, immediately adjacent to the Keewatinoow Converter Station site, is recreationally fished and supports brook trout. Potential impacts to sport fishing from construction of the Keewatinoow Converter Station include habitat degradation, impacts to water quality and increased access and exploitation of the fish resources. The ground electrode line crosses Goose Creek and Swift Creek, both of which support brook trout and recreational fisheries, and the collector lines and borrow areas are in close proximity to watercourses used for recreational fishing. Potential impacts to habitat and water quality will be negligible with mitigation implemented at the converter station site and water courses.

Goose Creek is currently readily accessible from the Conawapa Road, and therefore the construction of the converter station will not increase access. However, there will be an increase in people during construction and the potential for increased harvest. Existing sport fishing regulations in addition to restrictions to fishing by contractors will be sufficient to address any changes in fishing pressured. Therefore, the impact of construction of the Keewatinoow Converter Station and facilities negative, small in magnitude, Project Footprint/Local Study Area in geographic extent, short-term in duration, and therefore are not expected to be significant.

Operation

Operations activities for the Keewatinoow Converter Station and associated facilities are not expected to result in adverse effects lodges or outfitter allocations as none are located in the immediate area. As noted under construction, the closest outfitter utilizes an area west from Long Spruce Generating Station and extends to the area around Kettle Generating Station.

The ground electrode line crosses Goose Creek and Swift Creek, both of which support brook trout and recreational fisheries, and the collector lines are in proximity to watercourses that are used for recreational fishing. Potential impacts to sport fishing as a result of operations include:

- Negative impacts to fisheries as a result of habitat degradation;
- Impacts to surface water quality as a result of erosion or pollutants; and
- Increased access to and exploitation of fish resources.

Potential impacts to habitat and water quality will be negligible with mitigation implemented at water courses crossings as outlined in Section 8.2.3. Increased access can lead to an increase in fish harvest from water bodies along the ground electrode line. Existing sport fishing regulations would be sufficient to address any changes in fishing pressured. Effects on sport fishing from the operations and maintenance of the Keewatinoow Converter Station and associated facilities are expected to be negative, small in magnitude, Project Footprint/Local Study Area in geographic extent, medium-term in duration, and therefore not expected to be significant.

Domestic Resource Use

The Keewatinoow Converter Station, construction power station, northern ground electrode and electrode line, as well as portions of the collector and construction power lines are located in the Fox Lake RMA and the Fox Lake Traditional Territory.[6] The process for engagement with Fox Lake Cree Nation in relation to the Project is described in Chapter 5. The Keewatinoow Converter Station and related facilities are also located in the broader Split Lake Resource Area, just outside the Split Lake RMA.[7] The process for engagement with Tataskweyak Cree Nation in relation to the Project is described in Chapter 5.

As noted above, the boards of the RMAs through which the Keewatinoow Converter Station and associated facilities are located will be expected to provide recommendations to the Province regarding the Project prior to a license being issued. In addition, the Crown has an obligation arising from Section 35 of the Constitution, to consult with

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[6] The Fox Lake Resource Management Area and the Fox Lake Traditional Territory are defined in the 2004 Impact Settlement Agreement (ISA) between Fox Lake Cree Nation, Manitoba Hydro, and Manitoba. Portions of the Fox Lake Traditional Territory overlap with the Split Lake Resource Management Area.

[7] The Split Lake Resource Area and the Split Lake Resource Management Area are defined in the 1992 NFA Implementation Agreement. Portions of the Split Lake Resource Area overlap with the Fox Lake Resource Management Area.

Aboriginal communities regarding the potential impact of the Project on the exercise of Treaty and Aboriginal rights.

Fox Lake Cree Nation has raised concerns about the effects of the Keewatinoow Converter Station and associated facilities on domestic resource use. As noted in Chapter 5, two background papers, one which was drafted by Manitoba Hydro with Fox Lake Cree Nation's participation, input and review, and the second summarizing only Fox Lake's perspective are included with the Bipole III Aboriginal Knowledge Technical Report.

Construction

Construction of the Keewatinoow Converter Station and associated facilities will remove land from use for as long as the facilities are in-service. During construction, there will also be an increase in people in the area and, as a result, there is a potential for increased harvest of wildlife and fish. The loss of important plants and plant communities important is non-mitigable and has been identified as a residual effect. As a result of plant loss, Aboriginal people may have to travel further to find sites supporting suitable quality plants. Mitigative measures to minimize potential effects will include the following:

- Keewatinoow camp rules will prevent Project personnel from having firearms on site and limit them from exiting the site to harves resources;
- Development and implementation of the Keewatinoow Access Management Plan in conjunction with Fox Lake Cree Nation. This will allow existing resource users to access the Keewatinoow construction area as appropriate and safe; and
- Development and implementation of environmental reclamation and rehabilitation measures.

Effects from construction on domestic resource use are considered negative, moderate in magnitude, Project Footprint/Local Study Area in geographical extent, short-term in duration, and therefore is not considered significant.

Operation

There is the potential for improved access to resource use areas to result in increased pressure on the resource base if more people frequent an area. In addition, there could be an increase in disturbance to wildlife/game populations in the area which may result in a low level of avoidance by game and furbearers sensitive to repeated disturbance to these areas, and thus a possible negative effect to hunting in the area.

Maintenance activities for the northern ground electrode site and lines may cause the loss of valued plants and plant communities. Crushing of vegetation from the use of heavy equipment for ground maintenance activities can result in the damage and loss of plant species and communities important to Aboriginal people. As a result of plant loss, Aboriginal people may have to travel further to find sites supporting suitable quality plants.

Measures to mitigate or minimize potential effects during operations include:

- Manitoba Hydro will work with Fox Lake Cree Nation to reduce pressure on the resource base;
- Maintenance activities will be carried out during the winter months to minimize surface damage, rutting and erosion;
- Where maintenance activities do not occur during winter months, soil and vegetation disturbance will be minimized in areas of plants used by Aboriginal people;
- Understory stratums will be maintained during maintenance activities;
- Existing access roads and trails will be used to the extent possible; and
- Development and implementation of the Keewatinoow Access Management Plan for operations in conjunction with Fox Lake Cree Nation.

Based on the mitigation measures, effects during operations are expected to be negative, moderate in magnitude, Project Footprint/Local Study Area in geographic extent, medium-term in duration and therefore not significant.

Riel Converter Station & Associated Facilities

Commercial Forestry

There are no issues of concern with respect to construction and operations of the Riel Converter Station and associated facilities from a commercial forestry perspective. No adverse effects are anticipated.

Commercial Fishing

There is no commercial or bait fishing at the Riel Converter Station or its associated facilities and therefore are no effects are anticipated.

Mining/Aggregates

There are no issues of concern with respect to the construction or operations of the Riel Converter Station and associated facilities from a mining/aggregates perspective. No adverse effects are anticipated.

Trapping

There are no issues of concern with respect to the construction or operations of the Riel Converter Station and associated facilities from a trapping perspective. No adverse effects are anticipated.

Recreation and Tourism

There are no issues of concern with respect to the construction or operations of the Riel Converter Station and associated facilities from a recreation and tourism perspective. No adverse effects are anticipated.

Wild Rice Harvesting

There are no issues of concern with respect to the construction or operations of the Riel Converter Station and associated facilities from a wild rice harvesting perspective. No adverse effects are anticipated.

Domestic Resource Use

There are no issues of concern with respect to the construction or operations of the Riel Converter Station and associated facilities from a domestic resource use perspective. No adverse effects are anticipated.

8.3.2.4 Summary of Residual Environmental Effects and Significance

Table 8.3-5 provides a summary of residual effects related to resource use for the Project and includes the identification of anticipated residual effects with respect to the VECs by Project component, their magnitude, extent, duration, and a determination of their significance.

In terms of resource use, construction of the Bipole III line will result in residual effects on commercial forestry, commercial fishing, mining, trapping, wild rice harvesting, recreational fishing and hunting, wild rice harvesting and domestic resource use. In terms of commercial forestry, the residual effect is related to loss of productive forestlands. This will continue through operations of the line. In terms of fishing, hunting and trapping, the residual effect is the loss/degradation of habitat and temporary displacement of wildlife. With respect to plants and plant communities of importance to Aboriginal people, the residual effect is the loss of plants.

With respect to the Keewatinoow Converter Station and associated facilities, there will be a residual effect during construction with respect to trapping, recreational fishing, as well as domestic resource use. With respect to trapping and hunting, the residual effect is the loss of habitat and the temporary displacement of wildlife. As with the Bipole III line, there will be a loss of plants and plant communities of importance to Aboriginal people. Construction and operations of the Riel Converter Station and associated facilities will not result in any residual effects in terms of resource use.

With respect to resource use, the main residual effect during operations is the physical presence of the facilities and the potential for increased access. The presence of these facilities will alter the landscape for as long as they are in operation. With some resource uses (i.e., commercial fishing, trapping, some recreation activities, wild rice harvesting and some domestic resource uses), the presence of the facilities and, in particular, the transmission lines may have a positive residual effect in terms of increased access to undertake resource use activities.

Table 8.3-5: Residual Environmental Effects Summary - Resource Use

VEC	Project Component	Phase	Residual Effect	Assessment[1]
Commercial Forestry	HVdc Transmission Line	Construction & Operations	Loss of Productive Forestlands	Direction – Negative Magnitude – Small Geographic Extent – Footprint/Local Study Area Duration – Short to Medium-Term **Overall – Not Signficant**
Commercial Fishing	HVdc Transmission Line	Construction & Operations	Habitat Degradation; Physical presence of the line; Increased access	Direction – Negative Magnitude – Small Geographic Extent – Footprint/Local Study Area Duration – Short to Medium-Term **Overall – Not Significant**
Mining /Aggregates	HVdc Transmission Line	Construction & Operations	Interference with exploration; Physical presence of the line	Direction – Negative Magnitude – Small Geographic Extent – Project Site/Footprint Duration – Short to Medium-Term **Overall – Not Significant**
Trapping	HVdc Transmission Line	Construction & Operations	Temporary displacement of wildlife; Increased access	Direction – Negative Magnitude – Small Geographic Extent – Footprint/Local Study Area Duration – Short to Medium-Term **Overall – Not Significant**

VEC	Project Component	Phase	Residual Effect	Assessment[1]
	Keewatinoow Converter Station & Associated Facilities	Construction & Operations	Temporary displacement of wildlife; Increased access	Direction – Negative Magnitude – Small Geographic Extent – Footprint/Local Study Area Duration – Short to Medium-Term **Overall – Not Significant**
Recreation and Tourism	HVdc Transmission Line; Keewatinoow Converter Station & Associated Facilities	Construction & Operations	Habitat loss/degradation; Temporary displacement of wildlife; Physical Presence of the line; Increased Access	Direction – Negative Magnitude – Small Geographic Extent – Footprint/Local Study Area Duration – Short to Medium-Term **Overall – Not Significant**
Wild Rice Harvesting	HVdc Transmission Line	Construction & Operations	Physical presence of the Line; Increased Access	Direction – Negative Magnitude – Small Geographic Extent – Footprint/Local Study Area Duration – Short to Medium-Term **Overall – Not Significant**
Domestic Resource Use	HVdc Transmission Line	Construction & Operations	Loss of plants; temporary displacement of wildlife; Habitat loss/degradation; Physical presence of the Line; Increased Access	Direction – Negative Magnitude – Small/Moderate Geographic Extent – Footprint/Local Study Area Duration – Short to Medium-Term **Overall – Not Significant**
	Keewatinoow Converter Station & Associated Facilities	Construction & Operations	Loss of plants; Temporary displacement of wildlife; Habitat loss/degradation; Increased access	Direction – Negative Magnitude – Moderate Geographic Extent – Footprint/Local Study Area Duration – Short to Medium-Term **Overall – Not Significant**

Note:

1. Expected residual effects (i.e., effects after mitigation) of the Project on each VEC are assessed using the regulatory significance evaluation approach and methods defined in Chapter 4, Section 4.2.10. Where feasible, regulatory significance is assessed for each non-negligible expected residual effect based on its expected direction, magnitude, geographic extent and duration (as each term is defined in Section 4.2.10); if an adverse residual effect is evaluated to be potentially significant, other factors are also considered (frequency, reversibility, ecological importance and societal importance). Scientific uncertainty is noted where it may materially affect the assessment.

8.3.2.5 Follow-up

The environmental assessment study conducted for the Project identified site-specific resource use situations where mitigative measures will be required. These site-specific situations will be included in EnvPPs, both for construction and operations, and prepared specifically for the Project.

A listing of ESSs associated with the Project, including a description of the ESS, the potential environmental effect and proposed mitigation measures to be followed at these areas/sites will be documented in the EnvPPs. Some of these situations may require that areas be flagged in the field to ensure construction crews are able to distinguish boundaries and locations. Sites/areas identified from a resource use perspective will include: locations of high valued forest sites, and research and monitoring sites, recreational sites/trails, including snowmobile trails and other trails crossed or in the vicinity of the line. In addition, where the issue of increased access is of concern to a community, Access Management Plans for construction and operations will be prepared in consultation with the directly affected community.

8.3.3 Economy

8.3.3.1 Potential Effects and Key Topics

The range of issues and related impacts in terms of economic opportunities will vary for the different Project components. Transmission line construction activities typically result in modest economic benefits in the Project Study Area through employment and business opportunities. In northern Manitoba, construction activities for the Bipole III line and ac collector lines are expected to occur primarily in the winter months, and hence job and business opportunities are short-term in duration. Construction of the Bipole III line in agricultural Manitoba may occur at any time of the year if this is unavoidable due to schedule constraints. With respect to the Converter Stations, construction activities will be on-going from the commencement of construction to commissioning of the stations and associated facilities. However, the workforce for converter stations and associated facilities typically peaks in the third year of construction and has a ramping up period at the beginning of construction and dwindles off prior to commissioning.

8.3.3.2 Valued Environmental Components

The selection of VECs initially involved a scoping of potential issues pertinent to the Project. Based on a preliminary listing, a screening was undertaken to identify the potential effect of the Project on each VEC, which included professional judgement and past experience with other similar projects. Comments and issues identified by stakeholders during the EACP and ATK studies, as well as Key Person Interviews were also considered (Chapter 4). One VEC was identified for inclusion in the economic environmental assessment for the Project — Economic Opportunities (jobs and business opportunities, training, and enduring benefits).

8.3.3.3 Environmental Effects Assessment and Mitigation

The following summarizes the effects assessment for the Project in terms of economic opportunities (job opportunities, business & training opportunities, and enduring benefits). The existing environment (Chapter 6) provides an overview of the economy in the Project Study Area to assist in the identification of potential effects, both positive and negative, as a result of the Project. Potential effects of the Project on the economy and in particular possible Project-related economic opportunities, which is considered a VEC (Chapter 4, Approach to Assessment), are outlined below in terms of the various phases of Project development. Positive effects are outlined along with mitigation measures to minimize potential negative effects from the Project. Negative residual effects are identified and assessed for their significance. Follow-up actions are identified to ensure mitigation measures are implemented and monitored for their effectiveness.

HVdc Transmission Line and ac Collector Lines

Construction

Construction activities for the Bipole III and ac collector lines will include personnel of varying skill levels. Economic benefits could arise directly from contracting and other business opportunities and employment opportunities, and indirectly through the provision of goods and services to the construction workforce.

Construction of the Bipole III line will require five years to complete. Construction for the northern portion of the line, along with the collector lines will occur during the winter months. Construction of the line in southern Manitoba may occur at any time of the year if conflict is unavoidable due to schedule constraints. Manitoba Hydro will pay compensation for crop damages in agricultural Manitoba if summer construction is unavoidable.

Actual workforce numbers will be decided by contract negotiations, methods of clearing and construction, and sequencing of clearing and construction for the lines. Based on other transmission line projects in northern Manitoba, the workforce for clearing and construction is seasonal in nature as these activities will likely occur in the winter months from November to April. It is anticipated that clearing and construction of the northern portion of the Bipole III line will be divided into four segments, the northern most three of which are planning to proceed concurrently over the period from 2012 - 2015. The fourth segment and any uncompleted portions from the first three segments will be constructed in the period from 2014 – 2017. The southern section of the line will also be divided into four segments and will occur in the period of 2014 – 2016.

Clearing activities for transmission lines involve a range of skills which are generally less specialized than the construction phase. Although the number of jobs will fluctuate, jobs for clearing may be in the range of 15 to 40 per transmission line segment. Although the numbers will fluctuate throughout the period of construction, total positions per segment for the Bipole III line is expected to range between 10 and 200 workers at peak periods.

The 230 kV ac collector lines will require less time to construct individually but, with several lines involved, it is expected that the clearing and construction will occur over four winter seasons from 2012 – 2013 through to 2015 – 2016. Clearing and construction for the ac collector lines will occur during the winter months. Workforce requirements are expected to range from 20 to 150 persons over the period of clearing and construction.

Total transmission line employment (Project-direct in Manitoba) including the Bipole III line, the ac collector lines and construction powerline is estimated to total 4,819 person-years during the construction phase of the Project (Bipole III Economic Impact Assessment Technical Report). In Manitoba, labour income is estimated to be $201.7 million, while tax revenue for all levels of government is estimated to be approximately $131.9 million.

Clearing and construction of the transmission lines will be subject to a collective agreement (the Transmission Line Agreement) which will allow Manitoba Hydro to include hiring preferences in the tender specifications. Through the contracting process, Manitoba Hydro expects the Contractor to actively promote the participation of Manitoba business, Northern Manitoba business and Northern Manitoba Aboriginal business for the Project. In addition, the Contractor in selecting persons (other than supervisory personnel) to be employed on the Project who meet the Contractor's requirements in training, experience and other qualifications for the work to be performed, shall give preference to Aboriginal and local residents.

Communities in the vicinity of the line will experience indirect benefits through the purchase of meals, gasoline and accommodations by the Contractors when work is being done. Incidental purchases of repairs and parts for construction vehicles and equipment, as well as the purchase of some materials required for construction will also produce some economic benefits in nearby communities.

Manitoba Hydro developed an extensive pre-project training initiative for the Wuskwatim and proposed Keeyask Projects that is called the Hydro Northern Training and Employment Initiative (HNTEI). With respect to HNTEI, which is discussed in Chapter 6, although it was developed for other projects and not Bipole III, the initiative has trained Northern Aboriginals in jobs that are applicable to the construction of the Project.

As discussed in Chapter 3, Manitoba Hydro has developed a Community Development Initiative (CDI) for the Bipole III Project which will provide direct benefits to communities in the vicinity of the Project. It is anticipated that approximately 60 communities will be eligible for the CDI, including First Nations, community councils, rural municipalities, and towns and villages. CDI funds are to be used to support community development projects that benefit a broad segment of the community. Payments to eligible communities will begin upon receipt of regulatory approvals for the Project and will continue for 10 years, with the potential for renewal.

Effects on economic opportunities from construction of the lines are considered positive, small/moderate in magnitude, short-term in duration and Project Study Area in terms of geographic extent. The positive effects are considered to be potentially significant.

Operation

Workforce requirements during operations of a transmission line generally involve Manitoba Hydro operations and maintenance personnel and contractor staff as required. For operations and maintenance for the Bipole III line and the ac collector lines, the average annual workforce requirement (average over the life expectancy of the Project) is estimated to be 11.5 persons. It is expected that workforce requirements will gradually move up to this level prior to the first major maintenance of the lines which is anticipated to occur between commissioning the lines and a period of eight years in operation. Of the total, it is expected that two to three persons would be Manitoba Hydro staff and the remainder would be contract staff and would likely consist of two patrollers, two linemen, 0.5 helicopter pilot and seven heavy equipment operators.

Maintenance activities could consist of limited, short-term contracts for brush clearing to maintain the transmission line rights-of-way. These opportunities could be periodically available to local communities.

Effects on economic opportunities from operations of the line are considered positive, small in magnitude, Project Study Area in geographic extent, medium-term in duration, and therefore are not significant.

Keewatinoow Converter Station (including the Ground Electrode and Electrode Line)

Construction

Over the duration of construction, employment associated with the development of the Keewatinoow Converter Station is estimated to total approximately 920 person years not including contractor supervisory and management staff or Manitoba Hydro staff.

Two types of contracts will likely be used for construction of the Keewatinoow components excluding the transmission lines. Some components will involve letting of conventional construction contracts with on-going supervision by Manitoba Hydro. These are expected to apply to site preparation work and related infrastructure for the construction power station, the construction camp and the Keewatinoow Converter Station. More technically complex components such as the converter transformers, the value groups and ancillary facilities, and 230 kV ac switchyard equipment are expected to be designed and manufactured off-site.

The conventional contracts generally involve a substantial component of general labour and construction trades, and will offer a variety of employment opportunities. Contracts related to the assembly and installation of the HVdc and 230 kV as switchyard equipment will substantially involve highly specialized workers, many of whom will be involved in both the off-site manufacture of equipment and its on-site assembly and installation. Local employment opportunities will be less significant for these contracts.

Employment opportunities will generally be based on the hiring preferences defined in the Burntwood Nelson Agreement (BNA).[8]

These will be available to qualified individuals and will include construction and service jobs in:

- Catering and security (for both the camp and construction sites) extending for the duration of the construction schedule;
- Site and camp development (labourers, operators and teamsters for clearing, grubbing, excavation and earthmoving) extending for a period of approximately four months;
- Foundation preparation (labourers, carpenters, and steelworkers for construction of building, structure and equipment foundations) extending for a period of approximately four months; and
- Buildings and services development (labourers, carpenters, electricians and pipefitters for construction of camp).

Some of these activities (e.g., catering and general construction and maintenance) may also offer business opportunities. Under the BNA (Section 2.9), if Direct Negotiated Contracts (DNCs) are negotiated with a Northern Aboriginal business for activities, the business can directly hire northern Aboriginal residents for their workforce. Once the supply of qualified northern Aboriginal workers has been exhausted, employment opportunities must be filled using a job-order process (Section 12.1.1.3 of the BNA) according to the following sequence:

- Northern Aboriginal residents of the Churchill-Burntwood-Nelson (CBN) area which under Section 12.1.1.3 of the BNA is a sub-region of the Northern region to which special hiring preferences apply;

[8] Work at the Keewatinoow site will be covered by a collective bargaining agreement known as the Burntwood-Nelson Agreement (BNA), which is intended to ensure labour stability (i.e. no strikes or lock-outs during construction) and provide cost-competitive wages and benefits. All jobs filled through the job order process will be covered by this agreement which, among other things, sets out wages, employee benefits, work hours, overtime pay and specifies the job referral process, hiring preferences, trainee/apprenticeship ratios, the lay-off process and the grievance process. The BNA is negotiated by the Hydro Project Management Association, which represents Manitoba Hydro and contractors, and the Allied Hydro Council, which represents the construction unions. Parties to the negotiation process have to agree on and approve the conditions of employment (e.g., the hiring preference, referral and hiring system, and on-the-job training provisions) for the project. All contractor employees covered under the BNA will be required to become a union member once they are hired to work on the Project, if they are not already union members.

- Northern residents (unionized);
- Northern Aboriginal person; and
- Northern resident.

Exclusions to these hiring provisions include Manitoba Hydro and contractor supervisory positions.

The workforce estimates for the Keewatinoow construction power station are estimated to peak at about 55 workers excluding Manitoba Hydro senior contract supervisory staff during the approximately one year construction term. This will taper off to one Manitoba Hydro supervisor once the station is in-service.

The workforce for Keewatinoow construction will be in the order of 250 through mid-2013, until installation of the construction power substation is complete — tentatively scheduled for October 2013. This estimate excludes senior contractor supervisory and management staff, Manitoba Hydro staff, camp operations staff and positions related to transmission line construction. Manitoba Hydro and contractor supervisory staff are expected to be in the order of 20% of the estimates.

Major construction is expected to commence in late 2013 and continue through September 2017. The workforce during this period will peak in excess of 300 in late 2013 and early 2014, and taper gradually down to less than 100 by late 2016. Through to completion of construction in late 2017, the total will decline from about 55 to 30, as the emphasis shifts from construction to commissioning. The construction workforce will wind down entirely by mid-2018.

The workforce required for the Long Spruce switchyard upgrades is in the order of 11 workers in the first quarter of 2015, increasing to approximately 19 in the last quarter of 2015/first quarter of 2016 including Manitoba Hydro staff. This tapers off to approximately 10 until the upgrades are commissioned, tentatively scheduled for the fall of 2016. The Henday switchyard expansion will be in the order of 16 in the first two quarters of 2014, increasing to approximately 27 in the fourth quarter. In the first quarter of 2015, the workforce is expected to be in the order of 11 increasing to approximately 18 in the second quarter, and deceasing to approximately 9 or less until the expansion is commissioned, tentatively scheduled for the fall of 2016. Construction workers are anticipated to be housed in trailers in the Town of Gillam. Construction of the Keewatinoow ground electrode and line will involve letting of conventional construction contracts with on-going supervision by Manitoba Hydro. Construction of the electrode line will occur in the winter of 2015 and will involve a workforce ranging from 20 to 50 persons including Contractor supervisory staff.

Effects on economic opportunities from construction of the Keewatinoow Converter Station and associated facilities are considered positive, moderate in magnitude, short-term in duration and Project Study Area in geographic extent. The positive effects are considered to be potentially significant.

Operation

It is currently estimated that 42 Manitoba Hydro staff will be employed at the Keewatinoow Converter Station with perhaps 30 on-site on a daily basis. In addition, there will be perhaps 30 contractor staff present during station maintenance periods. These estimates include maintenance of the Keewatinoow ground electrode. Typical employment opportunities will include staff positions for power supply workers (multi-skilled), operators, electrical and mechanical technicians, and maintenance utility workers. Manitoba Hydro has established initiatives to provide Aboriginal people with the opportunity to enter training programs related to such careers and gain employment with Manitoba Hydro.

Effects on economic opportunities from operations of the Keewatinoow Converter Station and associated facilities are considered positive, small in magnitude, Project Study Area in geographic extent, medium-term in duration, and therefore not significant.

Riel Converter Station & Associated Facilities (Ground Electrode and Electrode Line)

Construction

Over the duration of construction, employment associated with the development of the Riel Converter Station is estimated to total approximately 640 person years not including contractor supervisory and management staff, or Manitoba Hydro staff. As with the Keewatinoow Converter Station, two types of contracts will likely be used. Some components will involve letting of conventional construction contracts with on-going supervision by Manitoba Hydro. More technically complex components such as the converter transformers, the value groups and ancillary facilities, and the converter building are expected to be constructed on the basis of Engineering Procurement Construction (EPC) contracts.

The conventional contract arrangements will generally involve a relatively small component of general labour and construction trades and related employment opportunities. The EPC contracts will involve a more substantial component of highly specialized workers, many of them involved both in off-site manufacture of equipment and in on-site assembly and installation.

Preliminary workforce estimates indicate that from project commencement in September 2012, the Riel-related workforce will ramp up gradually from about 50 people in late 2012 to peak at about 260 in the first quarter of 2014. It will continue at a relatively high level, tapering down to about 150 by the end of 2015, and to less than 100 by the beginning of 2016. It will continue to decrease gradually, tapering off to only about 15 by mid-2017 as the emphasis shifts from construction to commissioning. Construction of the Riel ground electrode and electrode line will involve letting of conventional construction contracts with on-going supervision by Manitoba Hydro.

Construction of the Riel ground electrode and electrode line will involve letting of conventional construction contracts with on-going supervision by Manitoba Hydro. Construction of the feeder line will occur in 2016 - 2017 and will involve a workforce ranging from 20 to 50 persons including Contractor supervisory staff.

Effects on economic opportunities from construction of the Riel Converter Station and associated facilities are considered positive, small in magnitude, Project Study Area in terms of geographical extent, short-term in duration, and therefore not significant.

Operation

Once completed and fully commissioned, the Riel Converter Station will be operated 24 hours a day, year round, and will have permanent Manitoba Hydro personnel on-site performing regular operation, maintenance and inspection duties. Total operations and maintenance staff has been estimated at 45 persons including the Riel ground electrode.

Effects on economic opportunities from operations of the Riel Converter Station are considered positive, small in magnitude, Project Study Area in geographic extent, medium-term in duration, and therefore not significant.

8.3.3.4 Summary of Residual Environmental Effects and Significance

Table 8.3-6 provides a summary of residual effects related to economic opportunities during construction and operations for the Project by component. The table includes the identification of anticipated residual effects with respect to the VEC by Project component, their importance, magnitude, extent, duration, frequency, and a determination of their significance.

With respect to economic opportunities, and jobs in particular, the main residual effect of the Project will be job skills acquired through employment and training which may be applied to other employment opportunities. Similarly, contractors will benefit from participation in the Project and local businesses will benefit from spending because of the Project. Effects of the Project during construction and operations in terms of economic opportunities are considered to be positive. With respect to construction of the Bipole III and ac collector lines, as well as the Keewatinoow Converter Station and associated facilities, these positive effects are considered to be potentially significant.

Table 8.3-6: Residual Environmental Effects Summary - Economy

VEC	Project Component	Phase	Residual Effect	Assessment[1]
Economic Opportunities	HVdc Transmission Line & ac Collector Lines	Construction	Job skills through employment may be applied to other employment opportunities; Contractors, employees and local businesses benefit	Direction – Positive Magnitude – Small to Moderate Geographic Extent – Project Study Area Duration – Short-Term **Overall – Potentially Significant**
		Operations	Local businesses may benefit.	Direction – Positive Magnitude – Small Geographic Extent – Project Study Area Duration – Medium-Term **Overall – Not Significant**
	Keewatinoow Converter Station & Facilities	Construction	Job skills through employment may be applied to other employment opportunities; Contractors, employees and local businesses benefit	Direction – Positive Magnitude – Moderate Geographic Extent – Project Study Area Duration – Short-Term **Overall – Potentially Signficant**
		Operations	Local businesses may benefit	Direction – Positive Magnitude – Small Geographic Extent – Project Study Area Duration – Medium-Term **Overall – Not Significant**
	Riel Converter Station & Facilities	Construction	Job skills through employment may be applied to other employment opportunities; Contractors, employees and local businesses benefit	Direction – Positive Magnitude – Small Geographic Extent – Project Study Area Duration – Short-Term **Overall – Not Significant**
		Operations	Local businesses may benefit	Direction – Positive Magnitude – Small Geographic Extent – Project Study Area Duration – Medium-Term **Overall – Not Sigificant**

Note:
1. Expected residual effects (i.e., effects after mitigation) of the Project on each VEC are assessed using the regulatory significance evaluation approach and methods defined in Chapter 4, Section 4.2.10. Where feasible, regulatory significance is assessed for each non-negligible expected residual effect based on its expected direction, magnitude, geographic extent and duration (as each term is defined in Section 4.2.10); if an adverse residual effect is evaluated to be potentially significant, other factors are also considered (frequency, reversibility, ecological importance and societal importance). Scientific uncertainty is noted where it may materially affect the assessment.

8.3.3.5 Follow-up

Manitoba Hydro typically conducts monitoring of employment and business outcomes associated with the development of its new facilities. The objectives of monitoring are to track employment and business outcomes and to track the effect of a project on labour income resulting from direct employment.

In terms of employment, data collected during construction generally include total employment opportunities available including the amount (i.e., total person hours, number of hires and employees, and average duration of work on the Project) and type (i.e., job classification) of work available. For the Project, data collected will be divided into the various project components and will be collected throughout each year of construction. Construction of the Project will also present direct and indirect business opportunities. Monitoring of business outcomes for the Project will provide data on direct expenditures by project component throughout each year of construction.

Monitoring income levels provides a good indication of the direct economic impact of the Project, as well as the potential magnitude of indirect and induced economic impacts associated with ripple and consumer effects. In addition, income level affects the general standard of living of individuals and families in that it is a determinant of access to basic human needs including housing, food and clothing. Monitoring of income levels can, therefore, provide a general indication of a project's contribution to the overall standard of living. Direct taxes paid reflect incremental revenue sources generated for government as the result of a project. The incremental revenues, in turn, contribute to societal programs and general well-being. Monitoring of income levels for the Project will occur by project component throughout each year of construction. Taxes paid will reflect the actual and/or estimated payments to government associated with the Project. Examples include provincial sales tax, payroll tax, corporate capital tax and fuel tax.

8.3.4 Services

8.3.4.1 Potential Effects and Key Topics

The range of issues/concerns and related impacts in terms of services will vary for the different Project components. Community-based services (emergency, health and social) are critical to meeting a wide range of human needs. Potential effects on community-based services will only occur in Project Study Area communities in close proximity to the various project components. Given the location of the northern Project components, community-based services are extremely important as is transportation infrastructure. In terms of the Bipole III line, community services are of lesser importance given the smaller magnitude of the workforce and the use of mobile construction camps. Similarly, with the Riel Converter Station and associated facilities, transportation infrastructure is important whereas community services are of lesser importance given the magnitude of the workforce and proximity to the City of Winnipeg.

8.3.4.2 Valued Environmental Components (VECs)

The selection of VECs initially involved a scoping of potential issues pertinent to the Project. Based on a preliminary listing, a screening was undertaken to identify the potential effect of the Project on each VEC, which included professional judgement and past experience with other similar projects. Comments and issues identified by stakeholders during the EACP and ATK processes, as well, Key Person Interviews were also considered (Chapter 4). Two VECs were identified for inclusion in the services assessment for the Project. These are:

- Community services (emergency, health and social); and
- Travel and transportation (traffic, transportation services).

8.3.4.3 Environmental Effects Assessment and Mitigation

The following summarizes the effects assessment for the Project in terms of services (community services such as emergency, health and social services, and travel and transportation including traffic and transportation services). The existing environment (Chapter 6) provides an overview of the services in the Project Study Area to assist in the identification of potential effects as a result of the Project. Potential effects of the Project on services and, in particular community services, and travel and transportation, which are considered VECs, are outlined below in terms of the various phases of Project development. Mitigation measures to minimize potential negative effects from the Project are outlined, and residual effects are identified and assessed for their significance. Follow-up actions are identified to ensure mitigation measures are implemented and monitored for their effectiveness.

HVdc Transmission Line

Community Services

Construction

Construction workers for the line may be housed in mobile construction camps or, where feasible and practical, in suitable accommodations available in local communities.

Mobile camps are generally located along the right-of-way as the various construction activities proceed and are removed from local communities. There is the potential that construction activities could result in increased pressure on local community, health and emergency response services. Through the KPI process, Regional Health Authorities and RCMP detachments advised that they have the capacity to handle potential temporary increases in demands for health, emergency and policing services should they be required (Bipole III Project Socio-Economic Data Baseline Report). Numerous health facilities are located in proximity to the final preferred route. Given the relative short-term duration of construction activities in any one area along the route, effects are anticipated to be negative, small in magnitude, Project Study Area in geographic extent, short-term in duration, and therefore not significant.

Operation

Manitoba Hydro conducts inspections of transmission lines annually once they are operational. The annual patrol is conducted either by ground or by air, and is completed once per fiscal year on every span in the transmission system. Non-scheduled patrols, by ground or air, may be conducted should unexpected information requirements be identified. Operations effects on community services from the Bipole III line are expected to be negative, small in magnitude, Project Study Area in geographic extent, medium-term in duration, and therefore not significant.

Travel and Transportation

Construction

Construction-related impacts associated with travel and transportation for the development of the line will generate additional traffic on an extensive area of the Provincial Road network (Bipole III Transportation Technical Report). Three types of traffic are anticipated to occur – local traffic, workforce traffic and shipping of materials. Local traffic includes workers travelling to towns, etc.; construction support services (delivery of food and equipment to mobile camps); delivery of concrete from local concrete batching plants; and delivery of fuel to work sites. Traffic impacts in the vicinity of the Keewatinoow and Riel Converter Stations are considered under those components. Although a number of roads will be used for the construction of the Bipole III line outside of the vicinity of the Keewatinoow and Riel Converter Stations, the effects are expected to be insignificant. This is due, in part, to the use and temporary nature of mobile construction camps which are expected to reduce the number of trips on the surrounding road network.

Roads likely to notice an increase in traffic will be those used to transport materials for all major components of the Project. This would include roads between the Riel site, the northern transmission line segments and Keewatinoow (PTH6, PR391, PR280). Portions of other roads not in the vicinity of the Riel site and the Keewatinoow Converter Station site likely to experience increased truck movements to varying degrees during construction are PTH10, PTH50, PR248, PR261, PR268, PR271, PR287, PR364, PR373, PR384 and PR596. However, only PTH10, between PTH60 and PR268, is likely to carry volumes in excess of its existing design capacity. One section of PTH10 currently exceeds its design capacity. MIT is planning to update older sections of PTH10 as part of the Manitoba Highway Renewal Plan. If this is done prior to construction of the Bipole III line, the design capacity of that section of PTH10 would likely not be exceeded.

Given that future road works are planned along PTH10, the construction phase of the Bipole III line is short-term in duration, and that the traffic volumes are only marginally above the design capacity, no additional works on PTH10 or other PRs are required for the construction of the line.

Navigable Waters Protection Act (Transport Canada)

Overhead transmission lines are of potential interest to Transport Canada under the *Navigable Waters Protection Act* (NWPA). The principle aim of The NWPA is to ensure unimpeded navigation on navigable waters. Section 5(1)a of The NWPA is included in the Law List Regulation of CEAA. However, the NWPA was amended in March of 2009 and now has sections 5(2) and 5(3) dealing with navigability. It is assumed the potential navigability issues under these sections still are considered under the CEAA Law List Regulation.

Hydro transmission lines are considered for their impact to navigation under the NWPA. Manitoba Hydro will be adhering to all CSA clearance guidelines for the construction and operation of all transmission lines for the Project and as such believes that there will be no significant impact to navigation in accordance with Sec 5(3) of the NWPA. All stream crossings will be clear span with sufficient clearance for navigation as required by the CSA guidelines.

Manitoba Hydro will be submitting the locations and site review of all crossings (over 350) on the preferred HVdc route for review to the Winnipeg office of Transport Canada. This material is not included with this document due to the volume of material which is specific to Transport Canada's needs in reviewing the Project.

Effects on travel and transportation from the construction of the Bipole III line are considered to be negative, small in magnitude, Project Study Area in geographic extent, short-term in duration and therefore not significant. No mitigative measures are required.

Operation

Traffic effects generated for the operations of the Bipole III line are anticipated to be negative, small in magnitude, Project Study Area in geographic extent, medium-term in duration, and therefore not significant.

Keewatinoow Converter Station & Associated Facilities (Including Construction Camps, Construction Power Station, Construction Powerline, 230 kV AC Collector Lines, and Ground Electrode and Electrode Line)

Community Services

Construction

Construction of the Keewatinoow Converter Station and associated work would take place in two stages. First, site development and infrastructure construction would take place from October 2012 through April 2014. Second, main facilities construction would commence in September 2013 and end in July 2017. During the first stage of construction, the start-up camp workforce would consist of approximately 350 workers. Once the main camp has been constructed, the workforce could peak at up to 500 workers.

Fox Lake Cree Nation has raised concerns about the effects of the Keewatinoow Converter Station and associated facilities on community services and traffic. As noted in Chapter 5, two background papers, one which was drafted by Manitoba Hydro with Fox Lake Cree Nation's participation, input and review, and the second summarizing only Fox Lake's perspective are included with the Bipole III Aboriginal Knowledge Technical Report.

Emergency Medical and Ambulance Services

Start-up Camp

During main camp construction, when workers are housed at the 'start-up' camp, there will be an ambulance and a fire truck at the camp. Only minor injuries could be dealt with on site. Workers with moderate and serious injuries would have to be brought to the Gillam hospital for emergency care. The Gillam Hospital will likely experience an increase in its emergency caseload, although it is not possible to specify the size and characteristics (e.g., injury severity or frequency) associated with this increase. This situation should be manageable, however, since existing emergency services at the Gillam hospital are not currently strained.

Main Camp

Once constructed, the main construction camp will have a first-aid building and its own ambulance, which should largely eliminate the requirement to use the Gillam ambulance service. This will limit the need to use Gillam Hospital emergency services to cases consisting of severe and/or multiple injuries. The hospital should be able to handle these cases with its existing resources.

Additional demands on Gillam emergency medical and ambulance services will be reduced or addressed by the following measures:

- Ambulance services and a fire truck will be provided at the 'start-up' camp; and
- A coordination system will be established between the camp, Gillam, and other emergency services in the area (e.g., Henday Converter Station).

Additional requirements for medical appointments by construction workers will be accommodated at the Gillam Hospital; although, given the prospect of longer waiting times for appointments, additional medical staff (physician/nurse) may be needed. Therefore, the Burntwood Regional Health Authority would have to evaluate whether this is warranted and feasible.

Policing Services

Emergency police services in Gillam are currently sufficient to meet the needs of the community and surrounding area. A large influx of population to the RCMP's detachment service area will strain current resources, which would be the case for both the 'start-up' camp and the larger main camp. This strain could be associated with the increased likelihood of the following incidents:

- Vehicle accidents associated with Project-related traffic: that is, workers and transport trucks driving to and from Gillam;
- Impaired driving by workers travelling to and from Gillam;
- Problematic worker interaction incidents in Gillam; and
- Emergency calls to attend to specific issues at the construction camp. This would likely be a more substantial issue once the main construction camp (with more workers and a lounge) was built.

These issues are more likely to create difficulties for the RCMP in the case of multiple concurrent calls (e.g., if resources need to be dispatched to Ilford, Fox Lake (Bird) and the camp concurrently). Given the multiple potential sources of increased requirements for police services associated with the construction of the Keewatinoow Converter

Station, existing police resources may not be sufficient to meet the needs of the detachment's service area.

Additional demands on Gillam's police services will be reduced or addressed by the following measures:

- Visits to Gillam by workers during their leisure time will be reduced during both the 'start up' and main camp stages;
- Workers will be provided transportation to and from the construction site to avoid the use personal vehicles;
- Training camp security personnel will deal with issues of impaired driving and intoxication;
- Camp behaviour and disciplinary policy will be established to discourage workers from engaging in inappropriate behaviours; and
- Rigorous enforcement for impaired driving will be implemented between the construction camp and Gillam, carried out in coordination with security personnel at the camp access gate.

If required, the RCMP would likely assign additional staff.

Housing

As discussed in Chapter 6, the Harmonized Gillam Development (HGD) committee, which was established in 2007, is made up of representatives from Fox Lake Cree Nation, the Town of Gillam, Manitoba Hydro and the Province of Manitoba. It provides a forum for Gillam stakeholders to meet and discuss issues of mutual interest or concern. The HGD committee initiated a Gillam Land Use Planning process to consider existing and future development needs of the Town of Gillam. The first stage of the planning process concluded that there is sufficient land in Gillam to satisfy the estimated needs of all parties for the next 20 years. Potential housing effects associated with the Project include those related specifically to Project workers (generally at the supervisory level) who might choose to live in Gillam. In terms of construction workers, the vast majority are not expected to have an interest in living in Gillam due to one or a combination of the following factors:

- A daily commute to and from the work camp of about two hours;
- Reduced "off" time due to long work days and daily commuting time;
- Increased cost of living since room and board are free at work camp, and Manitoba Hydro is considering providing off-site housing allowance to existing residents only; and

- Due to its variety of services, living in Gillam might likely be preferable to families. However, the short duration of most jobs would make it impractical to relocate one's family to the region.

For these reasons, it is unlikely that workers will choose to live in Gillam very few, Keewatinoow Converter Station construction workers would likely choose to live in Gillam. Manitoba Hydro staff and supervisory staff of contractors that have longer duration contracts would be the most likely to live in Gillam. However, even members of this group would not likely be strongly motivated to live in Gillam. During construction of the Wuskwatim Generating Station, Manitoba Hydro staff and supervisory personnel all chose to live at the project site, despite Thompson being closer to the Wuskwatim project site than the Keewatinoow construction camp would be to Gillam and Thompson being substantially larger, with a greater variety of services, than Gillam. The attractiveness of living in Gillam is further reduced due to Manitoba Hydro's intentions to have higher quality accommodations available for the senior management group at the Keewatinoow construction camp.

At the most, a very small number of workers might choose to live in Gillam with Manitoba Hydro employees being the most likely to do so. Gillam should be able to readily absorb a small number of additional workers and their families without creating undue strain on the town and its services. In terms of housing, no mitigative measures are required.

Effects on community services on Gillam from the construction of the Keewatinoow Converter Station and associated facilities are considered negative, moderate in magnitude, Project Study Area in geographic extent, short-term in duration and therefore are considered potentially significant.

The main concern with respect to community services is infrequent but moderate pressure during construction, beyond the construction site area and beyond the Local Study Area. The potential effect is reversible as it will end following construction. Hence, based on the mitigative measures and ongoing monitoring and adaptive management planning recognizing the potential negative effects, it is expected that the residual effects will not be significant as this term is defined in Chapter 4 for the purposes on this environmental assessment.

Operation

In terms of operations, it is currently estimated that 42 Manitoba Hydro staff will be employed at the Keewatinoow Converter Station with perhaps 30 on-site on a daily basis. In addition, there will be perhaps 30 contractor staff present during station maintenance periods.

Effects on community services from the operations of the Keewatinoow Converter Station and associated facilities are considered negative, small in magnitude, Project Study Area in geographic extent, medium-term in duration and therefore not significant.

Travel and Transportation

Construction

Potential construction-related impacts associated with travel and transportation for the development of the Keewatinoow Converter Station and associated facilities will be principally confined to the area highways and railway systems. Shipping of construction materials to the site by road will originate from Winnipeg, via PTH 6, PTH 10, PTH 39, PR 391, PR 280, PR 290 and the Conawapa access road. All of these roads are classified as RTAC (allowing for the heaviest Gross Vehicle Weights [GVW]) with the exception of PR 280 and PR 290 which are rated as A1 loading (B1 routes allow the lightest loads). Trucks can exceed the weight limits set by the Province by applying for and receiving an overweight truck permit (the cost is based on the damage the overweight load is expected to cause). Local construction-related vehicular traffic will be confined effectively to PR 290 and the Conawapa access road. Loaded trucks required to travel on the existing Conawapa access road to the construction site are not subject to provincial weight restrictions as the road does not fall under MIT jurisdiction. Weight restrictions are likely governed by existing bridge and culvert loading (Bipole III Transportation Technical Report).

Construction material (e.g., aggregate, concrete) and equipment deliveries will be most frequent during site preparation and installation of site foundations over the course of site construction. During this period, trucked granular and other material sources (i.e., concrete aggregate, stone) and equipment deliveries for the converter station will occur on a regular basis and will be most frequent during site preparation and installation of site foundations. These materials will be hauled and/or placed by semi-truck or rock truck for durations ranging from one month to 18 months depending on the type of material (e.g., concrete aggregates hauled over 18 months). The majority of material sources for Keewatinoow will be sourced and shipped from Winnipeg. Some material (e.g., concrete) will be batched on-site using cement shipped directly to the site from out of Province. Other material sources and equipment (i.e., reinforcing steel, electrical systems) will be sourced and shipped from either Winnipeg or out of province/country.

It is expected that rail deliveries of equipment and materials for the Keewatinoow Converter Station will be required during the construction period. The items to be shipped by rail over Years one to four of the construction period include: converter transformers (14); station service (3); and dc smoothing reactor coils (7). All equipment would be sourced and shipped in or out of province/country. Weights of materials to be shipped by rail range from approximately 15.8 MT for the station service equipment to 256 MT for the converter transformers (per unit). Some of the electrical system components to be transported by rail for Keewatinoow exceed the weight limits of the CN Rail network (Bipole III Transportation Technical Report).

Further discussion between Manitoba Hydro, CN Rail, and Omni-Trax (owners of Hudson Bay Railway), suppliers of heavy duty rail cars, and the manufacturers of the identified components will be required on the logistics of transporting these items. The deliveries would involve slow moving trains on the HBR main line and would be subject to advance scheduling notice and coordination with Omni-Trax officials to ensure the impact on day to day operations, particularly passenger rail operations, are minimized. No related adverse effects on usage of the HBR main line are expected.

Measures to mitigate or minimize the effects of Project-related impacts include the following:

- Manitoba Hydro will consult with appropriate agencies and government authorities (e.g., MIT, HBR, and the Town of Gillam) and will comply with all relevant government regulations and by-laws;
- Manitoba Hydro will notify the appropriate agencies and infrastructure operators as to the schedule for equipment and material deliveries during the period of construction;
- Level railway crossing safety would be ensured through the presence of flagpersons and appropriate warning devices; and
- All related movements will be subject to regulations governing load restrictions and transport of dangerous goods.

Traffic Effects

The development of Keewatinoow Converter Station will result in an increase in traffic along the road between Gillam and Fox Lake (Bird), and concerns have been raised regarding a potential increase in accidents and related strain on emergency services in Gillam.

Workers travelling to and from Gillam

The development of Keewatinoow Converter Station will lead to an increase in worker related traffic on PR 280 and PR 290 between Gillam and Fox Lake (Bird). Some workers would travel to Gillam during their leisure time, to access bars, restaurants, hotels, the liquor vendor, recreational facilities and other amenities. The number of visits made cannot be predicted. While it is anticipated that the majority of workers at

Keewatinoow will not have access to a personal vehicle, the number of worker trips into Gillam might still be consequential.

Additional worker related traffic on PR 280 and PR 290 will arise from transferring construction workers between the Gillam airport and the Project site. A shuttle service will be established for this purpose which would reduce the number of trips required. This service would be coordinated with the current Grey Goose bus service operating between Thompson and Gillam and the scheduled Calm Air airline service routes (Manitoba Hydro 2011).

Truck Traffic

Truck traffic operating between Gillam and Fox Lake (Bird) en route to the converter station construction site is expected to be relatively low. The same is true for truck traffic originating in other locations (e.g., Thompson, Winnipeg) [Bipole III Transportation Technical Report]. The vast majority of shipments related to materials and equipment for the converter station would move through the Henday Rail Yard (less than one trip per day on average).

Additional Traffic

Some additional traffic in the region may also be associated with worker and truck traffic travelling to and from Thompson. This traffic will travel along PR 280 to PR 290 and is therefore not expected to travel further along PR 280 to Gillam.

Additional traffic generated from all sources identified above (workers, truck and additional traffic) during peak construction activities at Keewatinoow has been estimated to be approximately 20% to 30% higher on PR 280, and more than double the trips on PR 290 (Bipole III Transportation Technical Report). Although the increases during peak construction are substantial, the total daily volume would still be within the daily design capacity of each road. The total traffic volumes on the access road are also estimated to be substantial, particularly in terms of truck traffic associated with hauling raw materials between granular sources in the area and the Keewatinoow site. No capacity concern exists with the access road.

The increased traffic volumes could put local drivers at greater risk of being involved in an accident. There were a total of 210 collisions along PR 280 and 12 collisions along PR 290 between 1994 and 2006. Collisions during the summer and fall months (September, October and November) were most frequent, accounting for 59% of all collisions over the 13 year period. The majority of collisions caused property damage (62%), followed by non-fatal injuries (36%) and three fatalities (1%) over the 13 year period. Based on the estimated traffic volumes and the number of collisions during the 13 year period, an estimate of collision rates on PR 280 (southwest of Split Lake), PR 280 (between Gillam and PR 290) and PR 290 is below 1.5 collisions per million vehicle kilometers of travel (MVKT), which is a generally acceptable collision rate. PR 280, northwest of PR 290 has a rate ranging between 1.7 and 2.0 MVKT depending on the section of the road.

With respect to reducing worker travel to and from Gillam, a number of features are already incorporated into planning for the Project, including the following:

- Having a lounge and recreational facilities at the main camp;
- Restricted use of company vehicles for leisure activities;
- Length of shifts and shift rotation will serve to limit worker trips to Gillam;
- Workers will be prohibited from using Manitoba Hydro vehicles to travel to Gillam for recreational purposes;
- Controlling entry and exit through a staffed security gate; and
- Operating a shuttle to transfer incoming and outgoing workers from and to Gillam.

It is still likely, however, that some workers will visit Gillam, either for recreational, medical, or for other purposes. Accordingly, the following mitigation measures aimed at decreasing the risk of accidents are warranted:

- Ongoing monitoring and communication of road and weather conditions will be carried out at the construction camp;
- Ongoing awareness initiatives will be issued to remind workers of safe-driving habits; and
- Traffic signage along the access road.

The following mitigation measures are aimed at reducing the incidence of impaired driving:

- Rigorous enforcement of consequences at camp for incidences of impaired driving; and
- Ongoing awareness initiatives will be issued to remind workers of the ramifications of impaired driving.

If this were an issue, the Gillam RCMP would likely increase surveillance and enforcement to monitor and reduce incidents of impaired driving.

With respect to workers travelling to and from other locations, the vast majority of these are expected to be travelling between Gillam and the airport. Using qualified bus drivers for the shuttle bus service is the best means of mitigating the potential of shuttle bus-related traffic accidents.

Monitoring

A monitoring plan will be implemented, in discussion with First Nations in the vicinity, and will include the following:

- Tracking of vehicles going through the access gate including type of traffic (worker, truck, etc.);
- Tracking of number of vehicle accidents that occur as construction proceeds, through coordination with the Gillam RCMP;
- Tracking of incidents involved in impaired driving, at the security gate and through RCMP incident reports; and
- Implementation of a traffic monitoring program.

Air Travel

Many of the workers travelling to and from the Keewatinoow Converter Station construction site are expected to travel by air via the Gillam Airport. Some aspects of the construction will require specialized trades from Winnipeg and southern population centres. The increase in air travel by workers was experienced during the construction of the Wuskwatim Generation Project recently and will likely be the case for construction of northern Project components. Some of the potential effects with an increase in air travel are:

1. Fewer number of seats for local residents in northern Manitoba communities causing inconvenience; and
2. Inability of the infrastructure at the airport in Gillam to accommodate increased air travel.

The existing infrastructure at the Gillam airport is structurally and functionally sound; the facility can accommodate the existing air travel, and could accommodate an increase in air travel. A number of upgrades have been made in recent months to improve the facility such as improving the runway lighting. However, it was noted that an increase in air traffic might require an increase in staff at the facility and possibly more public parking. Overall, there should be minimal effect on the infrastructure at the airport.

Regarding airline services, Calm Air is the major provider for commercial flights in the region. Calm Air provides daily scheduled air service to Gilliam from Thompson, as well as direct flights between Winnipeg and Gillam on weekdays and Sunday. For the Wuskwatim Generation Project, which has a larger peak workforce than the northern converter station and a similar work schedule, Manitoba Hydro entered into an arrangement with Calm Air to combat the potential problem of reduced number of seats for local residents in the north. Manitoba Hydro funded a charter through Calm Air between Winnipeg and Thompson once per week for the workers which resulted in reduced strain on the existing air service for local residents – a similar approach will be adopted for the Bipole III Project. Overall, it is anticipated that a chartered aircraft dedicated to Manitoba Hydro workers would significantly reduce the occurance of a shortage of seats and delays to passengers on scheduled flights. Furthermore, there is the potential for air carriers to capitalize on the opportunity of increased air travel by providing additional scheduled flight to address the demand.

The following mitigation measures will minimize the effects of the Keewatinoow Converter Station and associated facilities:

- A regular charter service (weekly, bi-weekly or other regular time) will be implemented to accommodate the workforce especially during peak construction periods to ensure that scheduled flights are still available for local residents.

Effects on travel and transportation from the construction of the Keewatinoow Converter Station and associated facilities are considered negative, moderate in magnitude, Project Study Area in geographic extent, short-term in duration and therefore are considered potentially significant.

The main concern with respect to travel and transportation is infrequent but moderate pressure during construction beyond the construction site area and beyond the Local Study Area. The potential effect is reversible as it will end following construction. Hence, based on the mitigative measures and ongoing monitoring and adaptive management planning recognizing the potential negative effects, it is expected that the residual effects will not be significant as this term is defined in Chapter 4 for the purposes on this environmental assessment.

Operation

During operations, the Keewatinoow Converter Station will be operated on a 24-hour basis, seven days a week with a workforce of approximately 42 staff. Staff will be required to travel to the site on a regular basis, as is the current practice for other converter stations. Vehicular movements will be limited to periodic routine operations activities once the station is in-service.

Navigable Waters Protection Act (Transport Canada)

Overhead transmission lines are of potential interest to Transport Canada under the *Navigable Waters Protection Act* (NWPA). The principle aim of the NWPA is to ensure unimpeded navigation on navigable waters. Section 5(1)a of the NWPA is included in the Law List Regulation of CEAA. However, the NWPA was amended in March of 2009 and now has sections 5(2) and 5(3) dealing with navigability. It is assumed the potential navigability issues under these sections still are considered under the CEAA Law List Regulation.

Hydro transmission lines are considered for their impact to navigation under the NWPA. Manitoba Hydro will be adhering to all CSA clearance guidelines for the construction and operation of all transmission lines for the project and as such believes that there will be no significant impact to navigation in accordance with Sec 5(3) of the NWPA. All stream crossings will be clear span with sufficient clearance for navigation as required by the CSA guidelines.

Manitoba Hydro will be submitting the locations and site review of all crossings along the ac collector lines rights-of-way for review to the Winnipeg office of Transport Canada. This material is not included with this document due to the volume of material which is specific to Transport Canada's needs in reviewing the Project.

Given the mitigation provided, effects on travel and transportation from the operations of the Keewatinoow Converter Station and associated facilities are expected to be negative, small in magnitude, Project Study Area in geographic extent, short-term in duration, and therefore not significant.

Riel Converter Station and Associated Facilities (Ground Electrode and Electrode Line)

Community Services

Construction

Preliminary workforce estimates for the Riel Converter Station indicate that from project commencement in September 2012, the Riel-related workforce will ramp up gradually from about 50 people in late 2012 to peak at about 260 in the first quarter of 2014. It will continue at a relatively high level, tapering down to about 150 by the end of 2015, and to less than 100 by the beginning of 2016. It will continue to decrease gradually, tapering off to only about 15 by mid-2017 as the emphasis shifts from construction to commissioning.

Given the proximity of the Riel Converter Station site to Winnipeg, and the relatively small workforce numbers, effects on community services from the construction of the station are considered negative, small in magnitude, Project Study Area in geographic extent, short-term in duration, and therefore not significant. No mitigative measures are required.

Operation

In terms of operations, it is currently estimated that a total of 45 Manitoba Hydro staff will be employed at the Riel Converter Station. Effects on community services from the operations of the Riel Converter Station are considered negative, small in magnitude, Project Study Area in geographic extent, medium-term in duration and therefore not significant.

Travel and Transportation

Construction

Construction labour traffic levels for the Riel Converter Station will involve a peak workforce of 368 persons during the period of maximum construction activities (Year 3). The design capacity of PR 207 and PTH 15, and other local access routes to the site will be reviewed with Manitoba Infrastructure and Transportation (MIT) to ensure that there will be no adverse effects to road integrity. A traffic impact study related to construction of the converter station and associated facilities noted that design capacity does not reflect absolute capacity of a roadway but, rather reflects a capacity established by the road authority that would offer a level of service believed to be acceptable to the average road user during peak traffic conditions. In reality, higher volumes are feasible, especially for relatively short durations. Based on the traffic review, it was determined that traffic likely generated by Project construction (i.e., total trips generated by workers and material delivery) is unlikely to increase base traffic volumes to beyond acceptable design capacity levels. Therefore, no upgrades or contributions to upgrading the provincial road network are considered necessary (Bipole III Transportation Technical Report).

MIT has recently upgraded PTH 15 between PTH 101 and PR207, including the signage of the intersection of PTH 15 and PR207. These works are likely to alleviate concerns with respect to construction traffic associated with the Riel Converter Station and associated facilities, and, in particular, the left turn movement from PTH15 onto PR 207.

Construction-related traffic for the preferred ground electrode site and associated electrode line will utilize municipal roads as necessary. No additional roadwork for the ground electrode site is required for construction, other than some likely on-site gravel access roads.

Construction activity and vehicle movement will be subject to an EnvPP for station construction. Measures to mitigate or minimize the effects of Project-related impacts include the following:

- Manitoba Hydro will notify the appropriate agencies and infrastructure operators as to the schedule for equipment and material deliveries during the period of construction;
- Level railway crossing safety will be facilitated through the presence of flagpersons and appropriate warning devices; and
- All related movements will be subject to regulations governing load restrictions and transport of dangerous goods.

Manitoba Hydro will consult with MIT and the RM of Springfield and will comply with relevant government regulations and by-laws applicable to construction activities and will notify the appropriate agencies and infrastructure operators as to the schedule for equipment and material deliveries during the period of construction.

Effects are anticipated to be negative, small in magnitude, Project Study Area in geographic extent, short-term in duration and therefore not significant.

Operation

Effects from the operations of the Riel Converter Station and associated facilities are expected to occur on an infrequent basis and only when required. Potential related effects will be mitigated through adherence to standard operating procedures and protocols. Effects on traffic and transportation are considered to be negative, small in magnitude, Project Study Area in geographic extent, medium-term in duration, and therefore not significant.

8.3.4.4 Summary of Residual Environmental Effects and Significance

Table 8.3-7 provides a summary of residual effects related to services for the Project and includes the identification of anticipated residual effects with respect to the VECs by Project component, their magnitude, extent, duration, and a determination of their significance. During construction and operations of the various Project components, there will be residual effects in terms of increased stress on community services, as well as travel and transportation at certain periods of time.

Table 8.3-7: Residual Environmental Effects Summary - Services

VEC	Project Component	Phase	Residual Effect	Assessment[1]
Community Services	HVdc Transmission Line	Construction & Operations	Increased stress on community services	Direction – Negative Magnitude – Small Geographic Extent – Project Study Area Duration – Short to Medium-Term **Overall – Not Significant**
	Keewatinoow Converter Station & Associated Facilities[2]	Construction	Increased stress on community services	Direction – Negative Magnitude – Moderate Geographic Extent – Project Study Area Duration – Short-Term **Overall – Potentially Significant** Frequency – Infrequent Reversibility – Reversible **Overall – Not Significant**
		Operations	Increased stress on community services	Direction – Negative Magnitude – Small Geographic Extent – Project Study Area Duration – Medium-Term **Overall – Not Significant**
	Riel Converter Station & Associated Facilities	Construction & Operations	Increased stress on community services	Direction – Negative Magnitude – Small Geographic Extent – Project Study Area Duration – Short to Medium-Term **Overall – Not Significant**
Travel & Transportation	HVdc Transmission Line	Construction & Operations	Increased stress on transportation services	Direction – Negative Magnitude – Small Geographic Extent – Project Study Area Duration – Short to Medium-Term **Overall – Not Significant**
	Keewatinoow Converter Station & Associated Facilities[1]	Construction	Increased stress on transportation services	Direction – Negative Magnitude – Moderate Geographic Extent – Project Study Area Duration – Short-Term **Overall – Potentially Signficant** Frequency – Infrequent Reversibility – Reversible **Overall – Not Significant**
		Operations	Increased stress on transportation services	Direction – Negative Magnitude – Small Geographic Extent – Project Study Area Duration – Medium-Term **Overall – Not Signficant**

VEC	Project Component	Phase	Residual Effect	Assessment[1]
	Riel Converter Station & Associated Facilities	Construction & Operations	Increased stress on transportation services	Direction – Negative Magnitude – Small Geographic Extent – Project Study Area Duration – Short to Medium-Term **Overall – Not Significant**

Notes:

1. Expected residual effects (i.e., effects after mitigation) of the Project on each VEC are assessed using the regulatory significance evaluation approach and methods defined in Chapter 4, Section 4.2.10. Where feasible, regulatory significance is assessed for each non-negligible expected residual effect based on its expected direction, magnitude, geographic extent and duration (as each term is defined in Section 4.2.10); if an adverse residual effect is evaluated to be potentially significant, other factors are also considered (frequency, reversibility, ecological importance and societal importance). Scientific uncertainty is noted where it may materially affect the assessment.
2. The concern is infrequent but moderate pressure on Community Services and Travel & Transportation during construction beyond the construction site are and beyond the Local Study Area. Based on mitigative measures, ongoing monitoring and adaptive management planning recognizing the potential negative effects, it is expected that the residual adverse effects will not be significant as this term is defined in Chapter 4 for the purpose of this environmental assessment.

8.3.4.5 Follow-up

No follow-up monitoring with respect to Services is anticipated for the Bipole III line, Riel Converter Station, ground electrode and electrode line. With respect to the Keewatinoow Converter Station and associated facilities, in term of community services, monitoring will focus on the frequency at which the construction workforce demands on Gillam's emergency services and whether these instances stressed available resources beyond a reasonable limit. This will require tracking and reporting of incidents and response times on a monthly basis from the beginning to the end of construction. Monitoring may also include periodic informal surveys with service provider personnel to gauge whether they believe Gillam's emergency services are sufficient to cope with the demand.

No monitoring is required in the case of housing in Gillam as few, if any workers would choose to live in Gillam. With respect to visitors from the camp, there is some uncertainty concerning the utilization of services by Project construction workers, particularly medical services. Appropriate monitoring processes will be implemented. This will include monitoring of appointment waiting times, as well as specific utilization by Project workers.

- Tracking of vehicles going through the access gate, including type of traffic (worker, truck, etc.);
- Tracking the number of vehicle accidents that occur as construction proceeds, through coordination with the Gillam RCMP; and

- Tracking of incidents involving impaired driving at the security gate and through RCMP incident reports.

8.3.5 Personal, Family and Community Life

8.3.5.1 Potential Effects and Key Topics

Personal, family and community life can be affected by the accumulated effects of a variety of Project-related effects (e.g., physical changes to the land, noise and nuisance effects during construction) and will vary for the different Project components. The lives of individuals, families and communities, and the quality of peoples' lives, are shaped by many factors. Personal, family and community life is generally looked at in terms of economic well-being, physical well-being (e.g., personal health and safety), social well-being (social supports and services) and the environment. The experience of changes will vary for individuals, families and communities as a whole depending on their experience of the effects of the Project. Culture, which is also important particularly in Aboriginal communities, is discussed under Culture and Heritage Resources.

8.3.5.2 Valued Environmental Components (VECs)

The selection of VECs initially involved a scoping of potential issues pertinent to the Project. Based on a preliminary listing, a screening was undertaken to identify the potential effect of the Project on each VEC, which included professional judgement and past experience with other similar projects. Comments and issues identified by stakeholders during the EACP and ATK studies, as well as Key Person Interviews were also considered.

Three VECs was identified for inclusion in the services assessment for the Project. These are:

- Public safety;
- Human health (Noise, Vibration, Dust, EMFs, Herbicides); and
- Aesthetics.

8.3.5.3 Environmental Effects Assessment and Mitigation

The following summarizes the effects assessment for the Project in terms of Personal, Family and Community Life (public safety, human health, aesthetics). The existing environment (Chapter 6) provides an overview of the Personal, Family and Community

Life in the Project Study Area to assist in the identification of potential effects as a result of the Project. Potential effects of the Project on Personal, Family and Community Life and, in particular public safety, human health, and aesthetics, which are considered VECs, are outlined below in terms of the various phases of Project development. Mitigation measures to minimize potential negative effects from the Project are outlined. Residual effects are identified and assessed for their significance. Follow-up actions are identified to ensure mitigation measures are implemented and monitored for their effectiveness.

HVdc Transmission Line

Public Safety

Construction

Concerns related to public safety can arise during construction activities. Public safety is of paramount importance to Manitoba Hydro at all times.

Accidents and malfunctions are discussed in Section 8.4. During the construction period, the right-of-way is considered an active construction site. Access to the right-of-way will be limited to those who need to be there and will be closely monitored as safety is a primary consideration. Anyone coming to the construction site will require an orientation and must check in at the start and end of every day. Appropriate protection measures may include the use of information signs and placement of warning markers to identify the rights-of-way.

Overall, the effect of the Bipole III line on public safety during construction is anticipated to be negative, small in magnitude, Project Site/Footprint in terms of geographic extent, short-term in duration, and therefore not significant.

Operation

As with construction, public safety is of paramount importance during operations of transmission lines. Although travel along the right-of-way will not be encouraged, it can be expected that some travel for varying purposes will occur. Protection measures will include signs regarding the dangers of high voltage transmission lines. Manitoba Hydro requires a formal application from user groups including industries for secondary use of a right-of-way. The application requires the identity of the applicant, purpose for use and identification of equipment to be used on the right-of-way. Manitoba Hydro can deny permission for the requested use for reasons such as safety. In addition, as noted under the section on domestic resource use, Manitoba Hydro will prepare access management plans where the issue of increased access along the right-of-way is of a concern to a community.

Manitoba Hydro undertakes programs designed to inform farmers about safe farm practices in the vicinity of high voltage transmission lines. Information will be made available to farm owners along the route for the Bipole III line.

Overall, the effects of the Bipole III line on public safety during operations are anticipated to be negative, small in magnitude, Project Site/Footprint in terms of geographic extent, medium-term in duration and therefore not significant.

Human Health

Construction

Human health issues during construction include noise, vibration and dust, and consequences of accidental spills or mishandling of hazardous materials such as fuel or solvents, or waste materials/effluents. Accidents and malfunctions are discussed in Section 8.4. A number of construction activities have the potential to elevate noise levels, cause vibration and dust, and hence create disturbances. Construction will involve use of heavy machinery such as bulldozers, excavators, drilling rigs, cranes and concrete trucks. Blasting may be required in certain areas to assist in removing rock to construct tower footings. Manitoba Hydro may use implosives for splicing conductors during construction activities.

Construction activities can result in noise and disturbance to people in the vicinity of the right-of-way. Concerns respecting the potential for nuisance effects including noise, vibration and dust were raised in the course of the EACP for the Project. Avoidance of First Nation Reserve lands, communities and residences was a key factor in the route selection process for the Bipole III line. A portion of the northern part of the route is in areas that are fairly isolated and have limited developments. In these areas, the final preferred route is generally aligned along new right-of-way or adjacent to existing linear facilities. Noise generated during construction activities will be temporary and intermittent, and will typically fall within acceptable provincial noise level guidelines.

The construction EnvPP will contain measures that will reduce potential negative effects. As well, in built-up areas and other areas where noise and vibration may create undue stress, work will be limited to daylight hours.

Based on the risks of exposure and mitigation measures, noise and disturbance effects during construction will be negative, small in magnitude, Local Study Area in geographical extent and short-term in duration in any one area along the final preferred route, and are therefore considered not significant.

Operation

Human health issues during operations primarily concern electic and magnetic fields (EMFs), and noise from the line.

Electric and Magnetic Fields

The issue of EMFs and health effects was raised throughout the EACP for the Project (Chapter 5). EMFs are invisible lines of force surrounding any wire carrying electricity, and are produced by all electric tools and appliances, household wiring and transmission lines. Both electric and magnetic fields diminish rapidly as the distance from the source increases. Transmission lines produce an electric field, a magnetic field and corona. Corona and electric fields can cause electrical effects, the most common of which are audible noise, radio and television interference, and induction on nearby metallic objects. These are discussed below under Noise, Vibration and Dust. Most objects partially block electric fields, including trees, cars and buildings, while magnetic fields are not shielded by these objects. Since magnetic fields are more pervasive, they have been the focus of health research.

Numerous studies have been conducted with respect to health effects and EMFs. National and international scientific agencies responsible for public health have convened multidisciplinary groups of scientists to evaluate the research and to determine if health effects are associated with exposure to EMFs. Such groups include the World Health Organization (WHO) in 2006, the National Radiological Protection Board of Great Britain (NRPB) in 2004 and the International Agency for Research on Cancer (IARC) in 2002. These organizations have concluded that there are no known adverse health effects associated with ac EMFs or with low levels of static EMFs such as those associated with dc transmission lines.

In Canada, the Federal Provincial Territorial Radiation Protection Committee (FPTRPC) has established a Working Group to carry out periodic reviews, recommend appropriate actions and provide position statements that reflect the common opinion of intergovernmental authorities on EMFs. The FPTRPC concluded that "there is insufficient scientific evidence showing exposure to EMFs from power lines can cause adverse health effects such as cancer" (http://www.hc-sc.gc.ca/ewh-semt/radiation/fpt-radprotect/emf-cem-eng.php). In addition, the Manitoba Clean Environment Commission developed a Health and EMF Expert's Consensus Statement on the Human Health Effects of ELF EMF in 2001 which concluded that "The weight of scientific evidence does not support the conclusion that extremely low frequency EMFs such as those produced by power lines are a cause of adverse effects on human health." (http://www.cecmanitoba.ca/resource/reports/Commissioned-Reports-2000-2001-Electirc_Magnetic_Fields_Health_EMF.pdf).

Predicted EMF Levels for the HVdc Bipole III Line

Electric fields from transmission lines are generally measured in kilovolts per metre (kV/m), while magnetic fields are generally measured in milligauss (mG). EMFs have been predicted for the operation of the Bipole III line under typical load, and contingency load conditions using guyed and self-supporting towers (Table 8.3-8 to Table 8.3-11) [Bipole III Environmental and Health Assessment of the DC Electrical Environment Technical Report].

Under normal load conditions (2000 MW), predicted electric field levels at the edge of the right-of-way (33 m) would be approximately 6.6 kV/m under fair weather conditions and 9.5 kV/m under foul weather conditions for self-supporting steel towers. Predicted electric field levels at edge of the right-of-way for guyed towers would be approximately 6.5 kV/m under fair weather conditions and 9.3 kV/m under foul weather conditions. Under normal load conditions, corresponding maximum magnetic fields at the edge of right-of-way would be approximately 51.5 mG for self-supporting towers and 49.8 mG for guyed towers.

Table 8.3-8: DC Electric Field Levels (kV/m) for Bipole III with Self-Supporting Tower

Load Type	Load Conditions	ROW Edge (-33m)	Profile Peak (Within ROW)		ROW Edge (33m)
Normal Load (2000MW)	Fair (kV/m)	-4.4	-16.6	22.4	6.6
	Foul (kV/m)	-9.5	-30.1	30.1	9.5
Contingency Load (2500MW)	Fair (kV/m)	-4.4	-17.0	22.9	6.6
	Foul (kV/m)	-9.5	-30.8	30.8	9.5

Table 8.3-9: DC Electric Field Levels (kV/m) for Bipole III with Guyed Tower

Load Type	Load Conditions	ROW Edge (-33m)	Profile Peak (Within ROW)		ROW Edge (33m)
Normal Load (2000MW)	Fair (kV/m)	-4.3	-16.5	22.2	6.5
	Foul (kV/m)	-9.3	-29.8	29.8	9.3
Contingency Load (2500MW)	Fair (kV/m)	-4.3	-16.9	22.7	6.5
	Foul (kV/m)	-9.4	-30.5	30.5	9.4

Table 8.3-10: DC Magnetic Field Levels (mG) for Bipole III with Self-Supporting Tower

Load Type/Conditions	ROW Edge (-33m)	Profile Peak (Within ROW)	ROW Edge (33m)
Normal Load (2000MW)	51.5 mG	284.0 mG	51.5 mG
Contingency Load (2500MW)	64.7 mG	363.6 mG	64.7 mG

Table 8.3-11: DC Magnetic Field Levels (mG) for Bipole III with Guyed Tower

Load Type/Conditions	ROW Edge (-33m)	Profile Peak (Within ROW)	ROW Edge (33m)
Normal Load (2000MW)	49.8 mG	280.2 mG	49.8 mG
Contingency Load (2500MW)	62.5 mG	358.9 mG	62.5 mG

In the case of the proposed Bipole III line, the studies found that the levels of magnetic fields and electric fields outside the right-of-way of Bipole III are all below limits recommended by provincial, national and international agencies. However, Manitoba Hydro is sensitive to public concerns regarding potential health effects and EMFs and continues to undertake the following actions regarding the issue:

- Monitoring of worldwide research programs on EMFs;
- Participation in and support of on-going health and safety research on local, national and international levels; and

- Maintenance of active communications and provision of technical information to interested parties, including the public and agencies responsible for public and occupational health and the environment.

In addition, Manitoba Hydro continues to conduct measurements of magnetic fields levels to the public on request.

Noise, Vibration and Dust

Concerns respecting the potential for nuisance effects including noise, vibration and dust were raised in the course of the EACP for the Project. This included noise and disturbance concerns with respect to audible noise and electrical interference.

Manitoba Hydro conducts inspections of transmission lines annually once they are operational. The inspections encompass both facilities (right-of-way, right-of-way access, structures and wires) and vegetation conditions. The annual patrol is conducted either by ground or by air, and is completed once per fiscal year on every span in the transmission system. Non-scheduled patrols, by ground or air, may be conducted should unexpected information requirements be identified. Patrols are normally undertaken by snow machine, all-terrain vehicles, light trucks or helicopter, depending on the geographical location and ease of access.

Audible Noise

Operation of a transmission line involves the production of corona discharges which can result in audible noise (AN) and low frequency electrical interference through radio noise (RN). The level of these will vary with time, subject to operating mode and loading conditions of the line and, as well, to final line design, conductor condition, and to external considerations such as meteorological conditions. Modelling with respect to AN and radio interference (RI) levels associated with a representative range of right-of-way configurations, operating scenarios, and loading conditions was conducted for the Bipole III line (Bipole III Environmental and Health Assessment of the DC Electrical Environment Technical Report).

The AN for the Bipole III line was calculated by tower type (self-supporting and guyed) for typical load, contingency load and emergency load scenarios. AN levels are higher for guyed towers than self-supporting towers. In terms of the normal load, levels ranged from 32.9 dBA under foul weather conditions to 38.9 dBA under fair weather conditions for the self-supporting towers to 33.4 dBA under foul weather conditions to 39.4 dBA for fair weather conditions for the guyed towers within the right-of-way (Table 8.3-12 and Table 8.3-13). Levels fall off with increasing distance from the right-of-way. At the edge of the right-of-way, levels fall off to 30.4 dBA under foul weather conditions and

36.4 dBA under fair weather conditions with self supporting towers. Levels at the edge of the right-of-way range from 30.8 dBA to 36.8 dBA for guyed towers.

Provincial guidelines in Manitoba specify maximum one-hour equivalent noise levels for residential and commercial areas of 55 dBA and 45 dBA for daytime and nighttime periods respectively (EDM, 1992). In the case of the Bipole III line, the studies found that the levels of AN and RN outside the right-of-way are all below limits recommended by provincial, national and international agencies. AN will be within the applicable guidelines and standards, and hence no mitigation measures are required.

Table 8.3-12: Audible Noise Levels for Bipole III Self-Supporting Tower

Load Type	Load Conditions (dBA)	ROW Edge (-33m)	Profile Peak (Within ROW)	ROW Edge (33m)
Normal Load (2000MW)	Fair	34.6	38.9	36.4
	Foul	28.6	32.9	30.4
Contingency Load (2500MW)	Fair	34.6	39.0	36.4
	Foul	28.6	33.0	30.4

Table 8.3-13: Audible Noise Levels for Bipole III Guyed Towers

Load Type	Load Conditions (dBA)	ROW Edge (-33m)	Profile Peak (Within ROW)	ROW Edge (33m)
Normal Load (2000MW)	Fair	35.0	39.4	36.8
	Foul	29.0	33.4	30.8
Contingency Load (2500MW)	Fair	35.0	39.4	36.8
	Foul	29.0	33.4	30.8

Radio Noise

The mean radio noise RN estimate for self-supporting and guyed towers along the Bipole III line is 51.51 dB-μV/M. RN levels dissipate with greater distances from the right-of-way. The mean RN was calculated for normal load, and contingency load capabilities. RN values are higher for guyed towers than self-supporting towers. Under typical loading, levels range from 45.4 dB-μV/M (foul weather) to 51.4 dB-μV/M (fair weather) for self-supporting towers at the edge of the right-of-way to 45.5 dB-μV/M (foul weather) to 51.1 dB-μV/M (fair weather) for guyed towers. Table 8.3-14 and Table 8.3-15 outline projected RN values for the Bipole III line (Bipole III Environmental and Health Assessment of the DC Electrical Environment Technical Report). RN will be within the applicable guidelines and standards, and hence no mitigation measures are required.

Table 8.3-14: Radio Noise Levels for Bipole III Self-Supporting Towers

Load Type	Load Conditions (dB-µV/M)	ROW Edge (-33m)	Profile Peak (Within ROW)	ROW Edge (33m)
Normal Load (2000MW)	Fair	46.9	65.2	51.4
	Foul	40.9	59.2	45.4
Contingency Load (2500MW)	Fair	46.8	65.3	51.3
	Foul	40.8	59.3	45.3

Table 8.3-15: Radio Noise Levels for Bipole III with Guyed Towers

Load Type	Load Conditions (dB-µV/M)	ROW Edge (-33m)	Profile Peak (Within ROW)	ROW Edge (33m)
Normal Load (2000MW)	Fair	47.1	65.4	51.5
	Foul	41.1	59.4	45.5
Contingency Load (2500MW)	Fair	47.0	65.5	51.4
	Foul	41.0	59.5	45.4

Other potential radio frequency interference includes interference on other electronic devices. Cell phones receive and transmit radio frequency (RF) signals at frequencies ranging from 850 MHz to 2150 MHz. RN from the Bipole III line will not overlap with signals from cell phones, and hence the line will not interfere with cell phone functioning. Similarly, wireless internet operates at a frequency of 2400 MHz and RN from the Bipole III line will not overlap with signals from wireless internet signals. Hence, the Bipole III line will not interfere with wireless internet.

During the EACP, the issue of interference with Global Positioning System (GPS) units was raised. In terms of GPS units, signals are at a higher level than the RN associated with a dc transmission line such as Bipole III. As such, it is unlikely that the line will interfere with GPS functioning. However, since a GPS signal at ground level is very weak relative to the noise under a transmission line, minor interference could occur. Nationwide Differential GPS (NDGPS) is a GPS system which uses lower frequencies to send correction signals. These lower frequency signals can overlap with RN frequencies from a dc transmission line. The likelihood of interference will depend on the GPS receiver's distance to the line and the distance to the closest NDGPS antenna. A momentary loss of signal is not expected to substantially affect the accuracy of the GPS. RF signals can be blocked by physical objects such as mountains or degraded by reflections off large solid objects. The towers for the Bipole III line do not have a large footprint and are not solid. If the towers did result in some reflections and blocking of RF signals, the impact would be momentarily.

Should interference difficulties be encountered along the transmission line, Manitoba Hydro will identify the interference source, assess and test the signal reception equipment. If interference difficulties are a result of the transmission line, Manitoba Hydro will rectify the difficulties.

Noise and other disturbance effects from operations of the Bipole III line are considered negative, small in magnitude, Local Study Area in geographic extent, medium-term in duration, and are not considered significant. No mitigative measures are required.

Herbicides

Herbicide use to maintain the right-of-way was raised as an issue during the EACP and by Aboriginal communities that participated in the ATK process. Some were concerned about the potential effects of herbicides on plants and wildlife. Herbicide use is discussed in Chapter 3 (Section 3.4.9.4). Potential effects are discussed under Soils and Terrain, Section 8.2.1.

Aesthetics

The presence of a transmission line can influence the visual landscape in urban and rural settings, as well as other sensitive settings. Aesthetics do, to a certain extent, differ according to a person's values and perspectives. An individual's response to visual changes in the landscape and the magnitude of the concern or sensitivity related to a particular viewscape is a function of the type of views involved, as well as the distance, perspective and duration of the view. Aesthetics will depend on:

- The physical relationship of the viewer and the transmission line (distance and site line);
- The activity of the viewer (e.g., living in the area, driving through or sightseeing); and
- The contrast between the transmission line and the surrounding environment.

The route selection process for the Bipole III line sought to avoid site-specific issues of concerns such as residences, First Nation Reserve Lands, communities, lodges, parks, and recreational sites. Although transmission lines are considered essentially permanent features on the landscape, application of routing and mitigation measures can minimize potential effects on visual quality. Mitigation measures can include route adjustment, structure placement, and visual screenings. The latter can include planning vegetation to block views of a transmission line and leaving buffers at sensitive sites such as river and stream crossings.

In the case of the Bipole III line, portions of the northern part of the route for the line cross through lands that are isolated and have limited development. In addition, parts of the route cross through areas where industries such as mining and forestry occur. In these areas, perceived aesthetic effects would be less than areas that have more development. In a number of areas, the final preferred route also parallels existing linear infrastructure (i.e., roads, rail, municipal drains), including: a 23 km (approx.) stretch of PR 280 between Pukatawakan Lake an Orr Lake; a 33 km (approx.) stretch of PR 280 east between the crossing of the South Moskowot River and Assean River; a 7.5 km (approx.) stretch along PTH 6 south of Ponton; an 80.5 km (approx.) stretch of the HBR line between PTH 6 south of Ponton and Dyce Lake and a second shorter 16 km (approx.) stretch along the northwestern edge of the Tom Lamb WMA between Mawdesley and Clearwater lakes; and the Cooks Creek Diversion (for approx. 5.8 km) in the RM of Springfield.

Parallel opportunities also occur with several existing transmission lines, including: a 7.5 km (approx.) stretch south of Ponton; a 59 km stretch of the newly constructed Wuskwatim 230 kV transmission line (H75P) between Dyce Lake and Clearwater Lake; a 43 km stretch of 230 kV transmission line F27P south of The Pas to the junction of PTH 10 and 60; a 1.2 km stretch along 230 kV transmission line D14S south of St. Claude in the R.M. of Grey; a 5.8 km stretch along 230 kV transmission line R49R djacent to the Cooks Creek Diversion in the RM of Springfield; and along a 13 km stretch of the existing right-of-way for a 500 kV ac transmission line (D602F) through the RM of Springfield to the site for the Riel Converter Station. In these areas, the line is a net addition to the landscape.

The Bipole III line will have an aesthetic impact on a number of residences located at varying distances from the line once operational. Without considering dwelling orientation, shelterbelt screening and other location factors, it is generally acknowledged that the closer one is to a line, the more visible it would be. One rural residence is located within 75 m of the route for the Bipole III line. In this instance, Manitoba Hydro will offer compensation in terms of a buy-out should the owners choose to relocate.

In a number of instances, Manitoba Hydro adjusted the route for the Bipole III line in response to concerns about proximity of the line or tower locations (Chapter 7). Subject to detailed engineering analysis, tower location (tower "spotting") has been identified as a potential mitigative measure to reduce adverse effects on sensitive land uses in proximity to the right-of-way. Location preferences identified in the course of the SSEA process and the land acquisition process (including more detailed pre-construction evaluation of the selected rights-of-way) will be included in the engineering analysis and, where technically and economically feasible, incorporated in the structure placement decision. Manitoba Hydro Property Department staff will discuss site-specific circumstances or tower placement preferences with landowners. Wherever feasible, tower placement will be selected to minimize impacts.

Overall, given the location of the line, the aesthetic effect of the Bipole III line is anticipated to be negative, small in magnitude, Local Study Area in geographic extent, medium-term in duration and therefore not significant.

Keewatinoow Converter Station & Associated Facilities

Fox Lake Cree Nation has raised concerns about the effects of the Keewatinoow Converter Station and associated facilities on personal, family and community life, and, in particular, worker interaction and possible gang and drug activities. As noted in Chapter 5, two background papers, one which was drafted by Manitoba Hydro with Fox Lake Cree Nation's participation, input and review, and the second summarizing only Fox Lake's perspective are included with the Bipole III Aboriginal Knowledge Technical Report.

Public Safety

Construction

Public safety is of paramount importance to Manitoba Hydro at all times. Accidents and malfunctions are discussed in Section 8.4. In terms of the construction powerline and ac collector lines, access to the right-of-way will be limited to those who need to be there and will be closely monitored as safety is a primary consideration. Anyone coming to the construction site will require an orientation and must check in at the start and end of every day. Appropriate protection measures may include the use of information signs and placement of warning markers to identify the rights-of-way.

Worker Interaction

Fox Lake Cree Nation members have identified the potential adverse effects of construction worker interaction with vulnerable community members, in particular women and youth, as their greatest concern associated with new major projects being built in their traditional territory. The community's concern is based on their knowledge of what happened during construction of other major projects in the area in the past. Construction workers from these projects would visit Gillam during their leisure time and would come in contact with Fox Lake Cree Nation members who were living in or visiting Gillam, on the streets, in bars, at public facilities and in homes. While many of the contacts were benign, some were problematic resulting in unwanted and/or undesirable social consequences. Fox Lake Cree Nation members continue to experience pain from the consequences of past interaction incidents.

Construction of the Keewatinoow Converter Station and associated facilities will require a sizeable workforce, which will be drawn from a wide geographical area. As station equipment installation tends to involve highly specialized labour, it is likely that a significant proportion of the work force will come from outside of the region. During the first stage of construction of the Keewatinoow Converter Station, which is site development and infrastructure construction, the start-up camp workforce would consist of approximately 150 workers (Chapter 3). These activities are planned to occur between late 2012 and early to mid 2014. The main camp will have a capacity for 550 workers. Peak construction activities are planned to occur starting in late 2013 to early 2017. By mid 2017, the workforce is greatly decreased. The work will be carried out by a combination of contractors and Manitoba Hydro employees, with the majority of work being done by contractors.

Some of these workers can be expected to visit Gillam during their leisure time. This would most likely occur on the evening before their day off and on their day off, but it could also occur after work during the evening of a workday, given the relatively close proximity of the camp (91 km). Gillam would be the preferred location to visit because it is by far the closest community with the types of amenities that workers would be seeking — including bars, a liquor vendor, a liquor store, hotels, restaurants, and recreational facilities. In 2009, Gillam had one bar, one vendor, one liquor store, two hotels, two restaurants, and one multi-purpose recreation complex. It is likely that this range of amenities would continue to be available in the community during the Keewatinoow Converter Station construction. Fox Lake (Bird) is the closest community to the Project; however, it lacks the amenities that construction workers might be seeking and as such, only workers with family or friends in Fox Lake (Bird) are likely to go there.

The next closest community with relevant amenities is Thompson, which is considerably larger than Gillam and offers substantially more of the amenities that would be sought by workers. The trip to Thompson is much longer, however (an estimated 325 km from the work camp), taking about 3 hours one-way and 6 hours round trip. Therefore, Thompson is considered too far from the work camp for an evening trip and represents a substantial distance for a day trip or an evening plus day trip, which would require staying at a hotel. As such, Gillam would be the main choice for evening trips and a more likely choice for day trips. On occasion, workers could choose to travel to Thompson, but trips to Gillam would be much more frequent.

The community of Split Lake is en route to Thompson. Visits to Split Lake would likely be limited to workers with family and friends in the community as Split Lake lacks many of the amenities that workers would be seeking.

While construction workers would likely visit Gillam, the number of visits that would be made is difficult to predict, however, the following perspectives can be provided about the level and timing of visits to Gillam:

- The number of visits would likely vary with the size of the construction workforce. Based on construction workforce estimates, visits would likely increase noticeably during the first year of construction reaching its highest levels in the second year, remaining at high levels for until the fourth year and decreasing noticeably in the fifth year.
- The frequency of visits made by construction workers would likely be higher during the early years of construction when the "start-up" camp is operating than in later years when the fully serviced main camp would be in place. The "start-up" camp would offer fewer on-site amenities than the main camp, making it a less attractive place to stay during leisure time.
- The presence of lounge and recreational facilities at the main camp would likely reduce the number of visits to Gillam by making available leisure opportunities at the campsite. Nevertheless, some workers may want to go elsewhere for entertainment when they have time off.
- Many of the workers will be from outside of the region and arrive by plane or bus. They will not have access to a personal vehicle for trips outside of the camp to Gillam.
- While most visits by construction workers would likely be benign, a proportion of the visits could still result in some worker interaction problems, such as harassment, racist comments, enticement to alcohol and drug use, sale of drugs, physical abuse, unwanted pregnancy and other adverse social effects, some of which could leave psychological and emotional scars with their victims that last for many years. Women and youth are most susceptible to experiencing worker interaction problems. Problematic encounters with construction workers would not necessarily be limited to Fox Lake Cree Nation members. These interactions could extend to other Aboriginal and non-Aboriginal residents of Gillam, including family members of Manitoba Hydro employees living in the community.
- Workers arriving in or leaving Gillam by plane or bus have been identified as a potential source of worker interaction problems. However, these workers would be unlikely to be a source of problems since a shuttle service would be established to transfer workers between the work site and Gillam. This service would be coordinated with the current Grey Goose bus service operating between Thompson and Gillam and scheduled Calm Air airline service routes, minimizing the amount of time spent at the bus depot and the airport.

While the current Gillam RCMP caseload is considered manageable, additional call-outs as a result of interaction issues could strain their capacity.

Worker interaction effects could be mitigated through a combination of two measures:

1. Preventing undesirable interactions from occurring through initiatives targeted at construction workers and community members;
2. Implementation of Cultural Awareness Training for workers that facilitates understanding about the effects of worker interactions of past projects and is clear about the expected behaviour of workers with respect to community residents; and
3. Adressing the incident when such interactions take place.

Given the high degree of uncertainty concerning the extent and specific nature of this problem, monitoring and adaptive management would be very important components of mitigation.

A number of features that would reduce the number of worker visits to Gillam are already incorporated into planning for the Project. These are:

- Having recreational facilities at the main camp;
- Prohibiting public use of the access road and controlling entry and exit through a staffed security gate; and
- Operating a shuttle to transfer incoming and outgoing workers from and to Gillam.
- As well, the Fox Lake Cree Nation Keeyask Adverse Effects Agreement, signed in 2009, contains a number of programs that could be used to address potential worker interaction effects arising from the Keeyask project. These programs have not been fully designed at this time, but include:
  - Funding for A Crisis Center and Wellness Counselling Program in Gillam; and
  - Funding for a program which ismeant to address, through counselling, education and other support, behaviors and attitudes to assist Members to take advantage of Project related opportunities.

Mitigation measures for construction of the the Keewatinoow Converter Station may build on these programs if they are in place when construction begins.

Additional measures have been identified on the basis of Fox Lake Cree Nation knowledge and experience with other projects. On January 26, 2010, the environmental assessment team for the Keeyask Generation Project held a workshop in Gillam with interested members of the Fox Lake Cree Nation. The objective was to examine the nature and extent of worker interaction incidents during construction and to identify what could be done to mitigate construction worker interaction effects. The workshop sought to develop solutions based on Fox Lake Cree Nation's distinctive knowledge of this issue based on past hydroelectric projects. The workshop was well attended and included some participants who had direct experience with worker interaction effects. While the workshop was for the Keeyask Generation Project Environmental Assessment, most of the solutions identified at that workshop are equally applicable to any major project being built in the Gillam region, including the Keewatinoow Converter Station.

Proposed mitigation measures resulting from the workshop were organized into two categories: those targeted at the construction workforce and those targeted at community residents, especially those in vulnerable groups. With respect to the construction workforce, the emphasis was placed on establishing employee screening, camp rules, worker education and cross-cultural training, and developing amenities on-site to encourage workers to remain at camp. For community residents, the emphasis was placed on preparing the community, through training, awareness and alternative activities, to avoid potentially problematic interactions and on providing mechanisms that respond to incidents, including helping victims to cope.

The measures identified represent a range of possibilities for reducing worker interaction problems and coping with incidents that do occur. Ongoing dialogue is required to properly evaluate and implement appropriate measures for the Project. To ensure that progress is made towards their planning and implementation, Manitoba Hydro will continue to work with Fox Lake Cree Nation to identify and implement programs to manage worker influx effects. The Town of Gillam will also be invited to participate as appropriate, either through existing or new forums. Identified measures could be incorporated into the Adverse Effects Agreement that Manitoba Hydro is currently negotiating with Fox Lake Cree Nation for the Keewatinoow Project.

By implementing a comprehensive set of measures, the number of worker interaction incidents would be minimized. These measures would lower the number of Keewatinoow Converter Station construction worker visits to Gillam and the potential for adverse interactions, and would reduce the severity and duration when adverse interactions occur. Nevertheless, some visits would still occur and, therefore, some potential for incidents would still exist albeit at a much lower likelihood.

Considerable uncertainty exists concerning the number of visits by Keewatinoow Converter Station construction workers to Gillam, the types of mitigation measures to be implemented, and the number and types of adverse occurrences. In these circumstances, a monitoring and adaptive management program is necessary. The monitoring program may focus on the number and types of adverse incidents occurring. This would require the tracking and reporting of incidents on a monthly basis from the beginning to the end of construction. Manitoba Hydro will work with Fox Lake to determine the best mechanism for tracking such incidents. The parties could work with local justice and social agencies to gather data. They could also help create a process that would allow the disclosure of incidents in a safe and confidential manner.

Gang and Drug Activities

Concerns have been raised that an influx of construction workers to the Gillam region and increased disposable income of community residents who secure Project construction jobs could lead to increased use of illegal drugs in Gillam while the converter station is being built. There are a number of moderating factors that make the emergence of gangs in the community unlikely:

- Gillam is relatively small in size and therefore is likely to be much less attractive as a place for outside gangs to set up;
- Given the size of Gillam, evidence of gang emergence would be detected very early and made known to the RCMP;
- There are few, if any, places for gang activity to develop and gang members to congregate without being observed;
- The local RCMP detachment is aware of high risk local residents and would likely monitor these individuals if concerns about gang development materialized;
- RCMP members will have a good sense of who is not a local resident and will be in a good position to watch for suspicious activity; and
- The local RCMP detachment staff are likely to monitor locations in and around Gillam where visiting workers could congregate, such as the hotels, liquor store, and restaurants.

Although the prospects of gangs emerging in Gillam are very low, the following mitigation measures have been identified:

- The number of visits to Gillam by construction workers will be reduced (see Worker Influx above); and
- Regular communication will be maintained between Manitoba Hydro and Gillam RCMP regarding gang and drug-related issues at the construction camp.

In terms of construction of the Keewatinoow Converter Station and associated facilities, effects on Public Safety are anticipated to be negative, moderate in magnitude, Project Study Area in geographic extent, short-term in duration, and potentially significant.

The main concern with respect to public safety is with respect to infrequent but moderate worker interaction during construction and beyond the construction site and beyond the Local Study Area. Based on mitigative measures, ongoing monitoring and adaptive management planning which recognizes potential negative effects, it is expected that the residual adverse effects will not be significant, as this term is defined in Chapter 4 for the purposes of this environmental assessment.

Operation

The Keewatinoow Converter Station site will be enclosed within a single continuous perimeter fence, consisting of heavy chain link fabric extending to an approximate height of 2.1 m, with a top guard of at least three strands of barbed wire extending to an overall height of approximately 2.4 m. A remotely controlled gate, operated by the site security staff, will provide primary access from the Conawapa access road. A security building will be located at the primary access gate for security personnel, and will house closed circuit television monitoring equipment, computer equipment, and other systems needed to support site security operations. The station will also have a site lighting system for safety and security purposes. The site lighting system will be designed to provide lighting along the internal roadway network and along the perimeter fence. Given the security measures in place, potential effects to public safety are considered negative, small in magnitude, Project Study Area in geographic extent, medium-term in duration and are not considered significant.

Accidents and malfunctions are discussed in Section 8.4.

Human Health

Construction

During construction of the Keewatinoow Converter Station and associated facilities, human health issues primarily relate to noise, which will be generated from activities such as site preparation, construction power provision, foundation installation, establishing concrete footings, assembling and erecting steel towers and stringing, installation of converter station building and equipment, etc. Other sources of noise from construction will be from haulage of materials and equipment onto the site, the use of heavy machinery/equipment and tools (i.e., excavators, bulldozers/scrapers, dump trucks, cranes, compactors, generators, etc.) on-site. Manitoba Hydro may use implosives for splicing conductors during construction activities.

Noise generated during construction activities will be temporary and intermittent, and will typically fall within acceptable provincial noise level guidelines. Given the relative isolation and limited development of the area surrounding the Keewatinoow Converter Station site and associated facilities, noise and dust levels during construction are not expected to be a concern.

The following mitigation measures will minimize potential effects:

- Discussions with Fox Lake Cree Nation regarding the Keewatinoow Converter Station and associated facilities will continue to be ongoing;
- The converter station site will be watered, as required, to keep dust to a minimum; and
- The potential use of implosives for splicing conductors will require advance notice being given to stakeholders and local authorities (Fox Lake Cree Nation, Manitoba Conservation, the RCMP and the Town of Gillam) at the start of this activity at the converter station site.

Noise and other disturbance effects from construction of the Keewatinoow Converter Station and associated facilities are considered negative, small in magnitude, Local Study Area in geographic extent, short-term in duration and are not considered significant.

Operation

As with the Bipole III line, with respect to the Keewatinoow Converter Station and associated facilities, concerns regarding public health focus on EMFs and noise. AC EMFs have been predicted for the operation of the ac collector lines (Exponent 2001). Under any load conditions, the predicted electric field level at the edge of right-of-way is approximately 0.17 kV/M while the maximum in the right-of-way is 2.93 kV/m. The studies found that the levels of magnetic fields and electric fields outside the right-of-way of the ac collector lines are all below limits recommended by provincial, national and international agencies. The EMFs associated with the Keewatinoow Converter Station are not expected to cause field levels outside of the station site to be significantly elevated except where the transmission lines cross the site boundary.

With respect to the Keewatinoow ground electrode, it will be designed to operate at a continuous current of 2,000 A and a higher current of 2,200 A (design option 1). Another design option evaluated by Teshmont was continuous current of 2,500 A and 60 days of operation at 2,750 A. The higher short-term loadings in design option 1 were assumed for all modeling. The magnetic field level above the ground electrode will be less than 1,000 mG at 1 m except where the feeder line enters the ground where it will be higher but still far below the ICNIRP exposure guideline level.

The static magnetic field level for a current flow on the electrode line of 2,200 A would rise to about 1,200 mG and the electric field level to less than 0.8 kV/m. The step potentials during monopolar operation have been projected to be 5-9 V/m (Teshmont, 2010, 2011) and these levels would not pose a risk to humans or animals on or off site.

As with the Bipole III line, dc EMFs will surround the electrode line, while only dc magnetic fields will occur above the ground electrode as the earth will shield the dc electric field. The field levels associated with the operation of the electrode and feeder line will be well below levels recommended by the ICNIRP (Exponent 2001).

With respect to the ac collector lines, the median AN levels at the edge of the right-of-way are estimated to be 12.1 dBA during fair weather and 27.1 dBA during foul weather. Provincial guidelines in Manitoba specify maximum one-hour equivalent noise levels for residential and commercial areas of 55 dBA and 45 dBA for daytime and nighttime periods respectively (EDM, 1992). The calculated levels of RN at 15 m from the outermost conductor of the Henday to Keewatinoow K64H line is 51.6 dB-μV/M. At 15 m from the outermost conductor of the construction powerline which is routed on the opposite side of the right-of-way, the RN level is 44.4 dB-μV/M. These levels are below the Industry Canada standard for RN for a 230 kV transmission line which is 53 dB-μV/M (Industry Canada, 2001). RN will be within the applicable guidelines and standards, and hence no mitigation measures are required. In the case of the ac collector lines, the studies found that the levels of AN and RN outside the right-of-way are all below limits recommended by provincial, national and international agencies.

Operations of the ground electrode, electrode line, and ac collector lines are not anticipated to result in negative effects in terms of noise, vibration and dust. Manitoba Hydro will conduct an inspection of the electrode line annually once it's operational. Non-scheduled patrols may be conducted should unexpected information requirements be identified. No mitigative measures are required.

The principal source of continuous noise from the operation of the Keewatinoow Converter Station will be the operation of the transformer units. The maximum sound level generated is expected to be limited to 55 dBA when measured at any point on the site property line. Other sources of noise will include workers during regular inspection and maintenance once the converter station is in operation. As noted above, given the location of the site, operational noise levels are not expected to be a concern. Worker exposure to high noise levels is the cause of noise induced hearing loss, and can also affect the ability of a person to work safely. Workplace noise requirements are governed by Part 12 of Manitoba's *Workplace Safety and Health Regulation (M.R. 217/2006)*. This regulation requires employers to ensure that workers are not exposed to noise levels that may induce hearing loss. As an employer, Manitoba Hydro will conduct a noise exposure assessment of the Keewatinoow Converter Station site in accordance with CAN/CSA Standard-Z107.56-06, *Measurement of Occupational Exposure to Noise.*

A new workplace must be designed and constructed so that the continuous noise level generated is not more than 85 dBA, or if not able to meet this standard is kept as low as reasonably practicable with the use of sound control measures. Based on noise level readings recorded at Dorsey Station, noise levels are not anticipated to be above this threshold level.

If further noise exposure assessments following construction indicate that employees are exposed to levels above 85 dBA, sound control measures will be used where possible to reduce the noise levels below this threshold, and involve engineering or administrative controls that eliminate, control, or reduce noise exposure, and may include the following:

- Replacing, changing or eliminating equipment that contributes to excessive noise levels. This can include arranging equipment in a manner that blocks sound or increases the distance between a sound source and a worker;
- Changing a building or structure, which could include sound dampening of walls and installation of sound barriers;
- Changing operations or work processes;
- Equipment that will be installed for the project will be selected to minimize the potential to create noise exposure levels in excess of acceptable volume and intensity limitations. The level of audible sound inside buildings will not exceed 70 dBA in areas where personnel are permitted during operation;
- Hearing protection will be provided by Manitoba Hydro and worn by all employees where workers may be exposed to high sound levels;
- Manitoba Hydro will also post the sound levels that employees will encounter within the various areas of the site, to inform and remind workers of where the use of hearing protection is required; and
- In accordance with Workplace Safety and Health regulations, audiometric testing will be provided for these workers.

While audible noise levels arising from station equipment operation will be subject to final design and equipment selection, they will comply with applicable provincial regulations and guidelines.

Given this mitigation, noise and other disturbance effects from operations of the Keewatinoow Converter Station and associated facilities are considered negative, small in magnitude, Local Study Area in geographic extent, medium-term in duration and not significant.

Aesthetics

Construction

Aesthetic effects of the Keewatinoow Converter Station and associated facilities are addressed under operation.

Operation

There are no communities or residences in proximity to the Keewatinoow Converter Station site and associated facilities. In the case of the ac collector lines, the rights-of-way cross through lands which are isolated and have limited development. In terms of the ground electrode line, Manitoba Hydro is planning on routing the line in an existing cleared right-of-way although an additional 10 m of right-of-way is required. Given the location of the electrode line within an existing right-of-way, no aesthetic impacts are expected during operations. Perceived aesthetic effects would expect to be less than in areas that have more development.

Given the magnitude of the development, these are considered negative, moderate in magnitude, Local Study Area in geographic extent, medium-term in duration, and therefore not significant.

Riel Converter Station

Public Safety

Construction

The Riel Converter Station is located at the existing Riel Station site, which was developed as part of the Riel Reliability Improvement Initiative. As such, station security infrastructure such as fencing and a security building at the entrance to the site, have been installed. A remote controlled gate and vehicle barriers are located at the primary station entrance. Video cameras will also be used to monitor site activity. The station also has a site lighting system for safety and security purposes. Given that the site has been previously developed and has fencing and security, overall, the effect of the Riel Converter Station on public safety is anticipated to be negative, small in magnitude, Project Site/Footprint in geographic extent, short-term in duration, and therefore not significant.

Accidents and malfunctions are discussed in Section 8.4.

Operation

At the Riel Station, security infrastructure such as fencing and a security building at the entrance to the site have been installed. A remote controlled gate and vehicle barriers are located at the primary station entrance. Video cameras will also be used to monitor activities at the site. Given the security measures in place, potential effects to public safety are considered negative, small in magnitude, Project Site/Footprint in geographic extent, medium-term in duration and are not considered significant.

Accidents and malfunctions are discussed in Section 8.4.

Human Health

Construction

Electric and Magnetic Fields:

The EMFs associated with the Riel Converter Station are not expected to cause field levels outside of the station site to be significantly elevated except where the transmission line crosses the site boundary. As with the Bipole III line, DC EMFs will surround the electrode feeder line, while only dc magnetic fields will occur above the ground electrode as the earth will shield the dc electric field. The field levels associated with the operation of the electrode and electrode line will be well below levels recommended by the ICNIRP (Exponent 2001).

Noise, Vibration and Dust:

Noise will be generated from the construction of the Riel Converter Station. Although the site preparation of the station was conducted as part of the Riel Reliability Improvement Initiative, noise will be created with respect to the addition of equipment and the converter station building required for the Bipole III Project. Other sources of noise from construction will be from haulage of materials and equipment onto the site, the use of heavy machinery/equipment and tools (i.e., excavators, bulldozers/scrapers, dump trucks, cranes, compactors, generators, etc.) on-site. Manitoba Hydro may use implosives for splicing conductors during construction activities. Noise generated during construction activities will be temporary and intermittent, and will typically fall within acceptable provincial noise level guidelines.

Wherever possible, noise and disturbance effects are minimized by site planning and design. Mitigation measures include:

- In terms of noise, relevant by-laws and regulations will be observed where possible;

- The use of implosives for splicing conductors will require advance notice being given to adjacent landowners, local authorities (RM of Springfield, Manitoba Conservation, the RCMP and the City of Winnipeg) at the start of this activity on-site and this will involve an air horn being sounded every time a charge is set off as a warning and the posting of signs to advise travelers on PR 207 of the construction and noise for the specific periods when using implodes; and
- Dust control measures will be applied as required during construction.

Given that site preparation for the Riel Converter Station was conducted as part of the Riel Reliability Improvement Initiative, and that Manitoba Hydro has purchased residential properties in proximity to the site, effects are expected to be negative, small in magnitude, Local Study Area in geographic extent, short-term in duration, and therefore not significant.

Construction activities can result in noise and disturbance to people in the vicinity of the ground electrode site and the electrode line right-of-way. Given the location of the ground electrode in the center of a section of land, construction related noise, vibration and dust effects are not anticipated. Noise and disturbance effects during construction will be negative, small in magnitude, Local Study Area in geographical extent, short-term in duration, and therefore not significant. No mitigative measures are anticipated to be required.

Operation

The principal source of continuous noise from the Riel Converter Station will be the operation of the transformer units. The maximum sound level generated will be limited to 50 dBA when measured at any point on the Riel Site property line. Other sources of noise will include workers during regular inspection and maintenance once the converter station is in operation. As noted above, given the location of the site, and that Manitoba Hydro has purchased residential properties in the immediate vicinity, operational noise levels are not expected to be a concern. Worker exposure to high noise levels is the cause of noise induced hearing loss, and can also affect the ability of a person to work safely. Workplace noise requirements are governed by Part 12 of *Manitoba's Workplace Safety and Health Regulation* (M.R. 217/2006). This regulation requires employers to ensure that workers are not exposed to noise levels that may induce hearing loss. As an employer, Manitoba Hydro will conduct a noise exposure assessment of the Riel Converter Station site in accordance with CAN/CSA Standard-Z107.56-06, *Measurement of Occupational Exposure to Noise*.

A new workplace must be designed and constructed so that the continuous noise level generated is not more than 85 dBA, or if not able to meet this standard is kept as low as reasonably practicable with the use of sound control measures. Based on noise level readings recorded at Dorsey Station, noise levels are not anticipated to be above this threshold level.

If further noise exposure assessments following construction indicate that employees are exposed to levels above 85 dBA, sound control measures will be used where possible to reduce the noise levels below this threshold. Sound control measures are engineering or administrative controls that eliminate, control, or reduce noise exposure, and may include the following:

- Replacing, changing or eliminating equipment that contributes to excessive noise levels. This can include arranging equipment in a manner that blocks sound or increases the distance between a sound source and a worker;
- Changing a building or structure, which could include sound dampening of walls and installation of sound barriers;
- Changing operations or work processes;
- Installing equipment for the project that will be selected to minimize the potential to create noise exposure levels in excess of acceptable volume and intensity limitations;
- The level of audible sound inside buildings will not exceed 70 dB(A) in areas where personnel are permitted during operation;
- Hearing protection will be provided by Manitoba Hydro and worn by all employees where workers may be exposed to high sound levels;
- Manitoba Hydro will also post the sound levels that employees will encounter within the various areas of the site, to inform and remind workers of where the use of hearing protection is required; and
- In accordance with Workplace Safety and Health regulations, audiometric testing will be provided for these workers.

While audible noise levels arising from station equipment operation will be subject to final design and equipment selection, they will comply with applicable provincial regulations and guidelines. Electrical interference with radio, television and other electronic devices is not expected to be a problem. Radio frequency emissions produced by equipment at the station will be designed not to exceed 53 dB above one V/m during fair weather conditions when measured 15 m from the site perimeter.

The Riel ground electrode, will be designed to operate at a continuous current of 2,000 A and a higher current of 2,200 A (design option 1). Another design option evaluated by Teshmont was continuous current of 2,500 A and 60 days of operation at 2,750 A. The higher short-term loadings in design option 1 were assumed for all modeling. The magnetic field level above the ground electrode will be less than 1,000 mG at one m except where the feeder line enters the ground where it will be higher but still far below the ICNIRP exposure guideline level.

The static magnetic field level for a current flow on the feeder line of 2,200 A would rise to about 1,200 mG and the electric field level to less than 0.8 kV/m. The step potentials during monopolar operation have been projected to be 5-9 V/m (Teshmont, 2010, 2011) and these levels would not pose a shock risk to humans or animals on or off site. This conclusion would apply to fish in a stream 800 m outside the southern electrode site.

Operation of the ground electrode is not anticipated to result in any negative effects in terms of noise, vibration and dust. Manitoba Hydro will conduct an inspection of the feeder line annually once it is operational. Non-scheduled patrols may be conducted should unexpected information requirements be identified.

Given these measures, noise and other disturbance effects from operations of the Riel Converter Station are considered negative, small in magnitude, Local Study Area in geographic extent, medium-term in duration, and therefore not significant.

Aesthetics

Construction

Aesthetic effects of the Riel Converter Station and associated facilities are addressed under operations.

Operation

Manitoba Hydro's purchase of adjacent properties from landowners will minimize the aesthetic effect associated with the Riel Converter Station on rural neighbouring locations. The location of the Riel Site minimizes the requirement for aesthetic enhancements. Aesthetic requirements with respect to the buildings located within the Riel Site will be minimal due to the location and the industrial nature of the site. However, aesthetics relating to the overall appearance of the site from publicly accessed roadways (PR 207) and lands will be addressed through various landscaping techniques, and mitigation will include the following:

- Site lighting design will focus on the site and minimize effects on neighbouring properties;
- Earth fill berms and strategic plantings of trees will be placed, where possible, around the perimeter of the site where they do not pose a hazard to transmission lines, to provide a break in sight lines and serve as a noise barrier;

- Site design calls for the 230 kV and 500 kV switchyards to be set back from PR 207, whichwill improve the aesthetics of the site and will take into consideration the technical and functional requirements of the site;
- Tree plantings will be maintained at a safe distance from all overhead lines;
- Earth fill berms will not be constructed where their presence would prove detrimental to the requirements for site drainage and are expected to be flat enough to facilitate grass cutting or, alternatively, planted with native grasses to minimize future maintenance; and
- Site access will be in accordance with MIT design requirements and designated on-site parking and material storage areas will be provided.

Given the location of the Riel Converter Station and the use of surrounding properties, including the Deacon Reservoir, the City of Winnipeg Water Treatment Plant and the Red River Floodway, and the presence of rural residential development to the north of the site, the aesthetic effects associated with development of the converter station are considered to be negative, small in magnitude, Local Study Area in geographic extent, medium-term in duration, and therefore not significant.

Manitoba Hydro will be acquiring a full section of land (640 ac) for the Riel ground electrode with the ground electrode ring sited at the centre of the property. That portion of the ground electrode site will be permanently removed from the land base. The remainder of the land outside the site of the electrode ring within the section can remain in agricultural production. Given the location of the ground electrode in the centre of a full section of land and that the facility is buried, there will be no aesthetic impacts from the electrode during operations. Manitoba Hydro is proposing routing the ground electrode line using existing road allowances and other rights-of-way.

Aesthetic effects during operations of the ground electrode are considered negative, small in magnitude, Local Study Area in geographic extent, medium-term in duration, and not significant.

8.3.5.4 Summary of Residual Environmental Effects and Significance

Table 8.3-16 provides a summary of residual effects related to Personal, Family and Community Life for the Project and includes the identification of anticipated residual effects with respect to the VECs by Project component, their magnitude, geographic extent, duration, and a determination of their significance.

In terms of public safety, the primary residual effect during construction is construction site risks/accidents and worker interaction with local community members. During operations, there is still a risk of both accidents and worker interaction although it is greatly diminished. In terms of human health, there will be noise and other disturbance effects such as dust during construction, but these are short-term in duration. Although disturbance effects will also occur during operations, as with public safety, these will be diminished during operations. The locations of the Keewatinoow and Riel Converter Stations will minimize disturbance effects on people. With respect to aesthetics, the main residual effect is the physical presence of the new facilities. The presence of these facilities will alter the landscape for as long as the facilities are in operation.

Table 8.3-16: Residual Environmental Effects Summary – Personal, Family and Community Life

VEC	Project Component	Phase	Residual Effect	Assessment[1]
Public Safety	HVdc Transmission Line	Construction & Operations	Construction site risks; ROW dangers of high voltage line	Direction – Negative Magnitude – Small Geographic Extent – Project Site/Footprint Duration – Short to Medium-Term **Overall – Not Significant**
	Keewatinoow Converter Station & Associated Facilities[2]	Construction	Worker interaction with local community; Construction site risks	Direction – Negative Magnitude – Moderate Geographic Extent – Project Study Area Duration – Short to Medium-Term **Overall – Potentially Significant** Frequency – Infrequent Reversibility – Reversible **Overall– Not Significant**
		Operations	Risks related to high voltage power at site	Direction – Negative Magnitude – Small Geographic Extent – Project Study Area Duration – Medium-Term **Overall– Not Significant**
	Riel Converter Station & Associated Facilities	Construction & Operations	Construction site risks; Risks related to high voltage power at site	Direction – Negative Magnitude – Small Geographic Extent – Project Site/Footprint Duration – Short to Medium-Term **Overall– Not Significant**
Human Health	HVdc Transmission Line; Keewatinoow and Riel Converter Stations & Associated Facilities	Construction & Operations	Noise, vibration, dust & other disturbance effects	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Short to Medium-Term **Overall – Not Significant**

VEC	Project Component	Phase	Residual Effect	Assessment[1]
Aesthetics	HVdc Transmission Line	Operations	Physical presence of the line	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term **Overall – Not Significant**
	Keewatinoow Converter Station & Associated Facilities	Operations	Physical presence of the facilities	Direction – Negative Magnitude – Moderate Geographic Extent – Local Study Area Duration – Medium-Term **Overall – Not Signficant**
	Riel Converter Station & Associated Facilities	Operations	Physical Presence of the facilities	Direction – Negative Magnitude – Small Geographic Extent – Local Study Area Duration – Medium-Term **Overall – Not Signifcant**

Notes:

1. Expected residual effects (i.e., effects after mitigation) of the Project on each VEC are assessed using the regulatory significance evaluation approach and methods defined in Chapter 4, Section 4.2.10. Where feasible, regulatory significance is assessed for each non-negligible expected residual effect based on its expected direction, magnitude, geographic extent and duration (as each term is defined in Section 4.2.10); if an adverse residual effect is evaluated to be potentially significant, other factors are also considered (frequency, reversibility, ecological importance and societal importance). Scientific uncertainty is noted where it may materially affect the assessment.
2. The concern is infrequent but moderate worker interaction during construction beyond the construction site and beyond the Local Study Area. Based on mitigative measures, ongoing monitoring and adaptive management planning recognizing the potential negative effects, it is expected that the residual adverse effects will not be significant as this term is defined in Chapter 4 for the purpose of this environmental assessment.

8.3.5.5 Follow-up

As noted above, considerable uncertainty exists concerning the number of visits by Keewatinoow Converter Station construction workers to Gillam, the types of mitigation measures to be implemented, and the number and types of adverse occurrences. In these circumstances, a monitoring and adaptive management program is necessary. The monitoring program may focus on the number and types of adverse incidents occurring. This would require the tracking and reporting of incidents on a monthly basis from the beginning to the end of construction. Manitoba Hydro will work with Fox Lake to determine the best mechanism for tracking such incidents. The parties could work with local justice and social agencies to gather data. They could also help create a process that would allow the disclosure of incidents in a safe and confidential manner.

In terms of health effects and EMFs, Manitoba Hydro will continue to monitor studies and make information available to the public. As well, measurements of magnetic field will be made available on request.

8.3.6 Culture and Heritage Resources

8.3.6.1 Potential Effects and Key Topics

Culture

Culture is the learned, socially acquired traditions and life-styles of the members of a society, including their patterned, repetitive ways of thinking, feeling, and acting (Harris1987:6). All cultures contain recurring patterns or themes. For the Project, nine recurring themes were examined: traditional knowledge, language, kinship, worldview and spirituality, cultural practice, cultural products, law and order, health and well being and leisure/recreation. An understanding of these themes was obtained through ATK study workshops, self-directed studies and Key Person Interviews (KPIs) conducted for the Project. In the Project Study Area, there are many cultural affiliations, including First Nations and the Metis. Language is a distinctive identifying feature of these groups. There are some similarities in subsistence patterns, with seasonal hunting, fishing and gathering taking place.

The effects assessment for culture was derived from the Bipole III ATK process. ATK workshops were conducted by the Bipole III study team and self-directed ATK studies were conducted by specific First Nations and the Manitoba Metis Federation (MMF) (Chapter 5). UNESCO guidelines, reports and other scholarly anthropological sources provided additional support. KPIs were conducted as part of the socio-economic effects assessment. Certain similarities were noted concerning inherent or universal values held by both ATK and Key Person Interviews, such as strong sense of community. However, there are differences in the philosophical approach to both cognitive and perceptive processes that are based on the cultural experience. For example, people often differed in their relationship with the land. Aboriginal cultures in general are rooted in the interrelationship of all things, where the ecosystem and all its components interact with one another to maintain harmony and balance. Commercial value of the land is secondary to its natural productivity.

ATK plays a vital role in Aboriginal culture; Aboriginal people view the land on which they live as all-encompassing, a way of life, where relationships with the land reinforce and contribute to the cultural experience. Cultural patterns are not static, but dynamic. This means that as circumstances change internal adjustments are made that help maintain the harmony and balance needed to enjoy a good life. In this sense, change is fluid; decisions are made based on the best interest of the cultural group. To be denied the opportunity to actively participate in decision-making that directly affects the group has been known to have serious repercussions (Koolage 1970, Shkilnyk 1985, Petch 1998).

Though definitions vary, ATK is generally seen as the foundation of a way of understanding (perceiving) based on observations, experiences and events over time (cognition). Non-Aboriginal culture tends to view and appreciate the ecosystem for its commercial, recreational and aesthetic qualities and as a result, the landscape is not as strongly linked to cultural identity. For example, most of the RMs in the Project Study Area were developed and have been sustained primarily for resource use reasons (i.e., mining in areas surrounding Thompson and Snow Lake, agricultural use throughout agricultural Manitoba; forestry in the vicinity of Swan River, etc.) or as regional centres (i.e., Thompson, Dauphin, Swan River, Portage la Prairie, The Pas).

Heritage Resources

Heritage resources are non-renewable resources. They are tangible objects of human endeavour that have survived the rigors of time and which indicate evidence of past human activities. They provide a vital cultural link between the past and present and represent the material and symbolic culture that assists in describing certain aspects of culture.

In Manitoba, all heritage resources are protected by HRA, which requires that an assessment of the effects of a project be conducted when it is the opinion of the minister that heritage resources may be affected by development (Section 12(2)). HRA ensures that the effects of a project on heritage resources, known or undiscovered, will be addressed prior to commencement of the project. Heritage resources include:

- A heritage site;
- A heritage object; and
- Any work or assembly of works of nature or of human endeavour that is of value for its archaeological, palaeontological, pre-historic, historic, cultural, natural, scientific or aesthetic features, and may be in the form of sites or objects or a combination thereof (*Manitoba Heritage Resources Act* 1986, Definitions: i).

Supplementary to the HRA is Manitoba's Policy Respecting the Reporting, Exhumation and Reburial of Found Human Remains (1987) which provides guidelines for managing human remains found in an archaeological. Within the purview of the policy are all human remains found outside a cemetery setting, including teeth, digits, other partial bone elements and interred individuals.

8.3.6.2 Valued Environmental Components (VEC)

Two VECs were selected for Culture and Heritage Resources: Culture and Heritage Resources.

Culture

Culture is described as a VEC because the human relationship with the natural environment is expressed through the recurring themes described above. Culture is the expression of the ways in which groups of people collectively know and understand their natural and social experience.

In a recent UNESCO Report of the International Workshop document concerning the links between biological and cultural diversity,

> The notion of the 'inextricable link' implies not only that biological and cultural diversity are linked to a wide range of human-nature interactions, but also that they are co-evolved, interdependent and mutually reinforcing. Each culture possesses its own set of representations, knowledge and cultural practices which depend upon specific elements of biodiversity for their continued existence and expression. Cultural groups develop and maintain significant ensembles of biological diversity, with knowledge and practice as the media for their management (UNESCO 2007:7).

This workshop examined the links between biological and cultural diversity; stressing that a common methodological framework should be designed to:

- Monitor status, trends and drivers of change in diversity;
- Inform decision-making process on the impact of such change on environmental and human well-being;
- Incorporate holistic, interdisciplinary, multiscale, participatory, comparative and collaborate approaches;
- Integrate existing methods, adopt innovative approaches and combine qualitative and quantitative analysis, including development of indicators, to explor different systems of representations, knowedge and practice;
- Develop a common vocabulary and address the translation of concepts and terminologies for theoretical and on-the-ground study of the links between biodiversity and cultural diversity; and
- Adhere to ethical best practice which is essential to prevent conflicts between the relevant stakeholders (UNESCO 2007:25).

The Report further stated that:

> Indicators that quantify and summarize data on the overall status and trends of diversity provide bridges between natural and social sciences and science and policy-making. Development of indicators can entail over-simplification of an extremely complex issue, which may lead to misinterpretations. However, indicators present a powerful tool for informing decision makers and the general public on the issues of diversity, and for monitoring impacts of policy interventions and other actions.(UNESCO 2007:27).

Developing a reliable set of indicators that "...capture the complexity of interactions between biodiversity and cultural diversity" (UNESCO 2007:27) was determined to be paramount to the success of an interdisciplinary approach.

The approach taken for the Bipole III Project independently paralleled and surpassed the methods and indicators identified in the UNESCO framework (UNESCO 2007:27). For the communities participating in the Bipole III Project ATK process, nine indicators were selected to represent the Culture VEC because of their universal application: language, worldview and spirituality, kinship/family ties, traditional knowledge, cultural practices, cultural products, leisure/recreation, law and order, and health and well-being. Within this framework, a code book of over 200 categories was developed through which the indicators, acting as themes, were quantitatively and qualitatively examined.

Heritage Resources

Heritage resources are non-renewable resources and are considered a VEC based on their status as defined under the *HRA* and because of their intuitive value. Since all heritage resources are protected under the *HRA*, there are no limitations in describing these resources as VECs. Heritage resource sites can be categorized as being of high, medium or low priority depending on their current status. Events such as site disturbance may lower the priority for further investigations. However, this cannot be determined except by a site visit.

As with other VECs, heritage resources have certain indicators that can be viewed, categorized and measured. However, since all heritage resources are protected under the *HRA,* the ranking of heritage resources based on a valuation process was used mainly to avoid impacts on as many heritage resources as possible. Sites such as burials, pictographs and designated heritage sites were considered to be of highest value because of their heritage significance to Manitoba and, as in the case of burials, provincial policy and legislation provides additional protection of these sites. Pictographs (rock paintings) are not only representations of cultural expression, but are also integral to an ancient cosmology that forms the cultural core of many First Nations (Chapter 6).

8.3.6.3 Environmental Effects Assessment and Mitigation

For the environmental effects assessment of culture and heritage resources, ATK was provided by 19 participating communities in the Bipole III ATK Project and seven self-directed ATK studies by Fox Lake Cree Nation, Tataskweyak Cree Nation, Opaskwayak Cree Nation, Wuskwi Sipihk First Nation, Long Plain First Nation, Swan Lake First Nation and the MMF. ATK played an important role in identifying areas of potential cultural and heritage concern for the Project.

Culture

Construction activities such as excavation and clearing can cause changes to the physical environment which could potentially affect culture. Potential effects include:

- Changes to the cultural landscape such as excavation of soils can potentially inhibit certain activities that sustain culture, desecrate areas of cultural and spritiual value; and destroy landmarks or mnemonic features that sustain continuity of cultural expression and thought;
- Direct and indirect effects on culturally sensitive sites, such as areas wheremedicinal plant are gathered, which identified during the ATK studies. Some medicinal plant gatherers view transmission lines (and EMFs) as contaminants to the power of the plant; and
- Permanent loss of cultural landscapes that would inhibit the ability of First Nation, Metis and local people to orally recount history which, in turn, could effect culture and spirituality.

Operations have the potential to cause ongoing and/or inadvertent disturbance to cultural processes and the Aboriginal historic record as it has been identified through the Bipole III ATK workshops and self-directed studies.

Heritage Resources

Construction activities can cause changes to the physical environment that could potentially affect known and undiscovered heritage resources and sites. Potential effects include:

- Dislodgement of surface and sub-surface heritage resources during construction clearing that represent the cultural chronology of human occupation;
- Fragmentation and destruction of known and undiscovered heritage resources during construction and grading for access roads through land features;

- Dislodgement or change in the provenience of known and undiscovered heritage resources during in-ground drilling activities;
- Destruction of known and undiscovered heritage resources and/or burials during excavation and soil removal;
- Destruction of known and undiscovered rock features such as burials, petroforms, tepee rings, thunderbird nests, caches and waymarkers, palaeontological representations and other culturally sensitive sites during borrow/quarry excavations, grading and construction; and
- Damage to known or undiscovered heritage resources within material placement areas due to spoil piling of excavated soils, rock etc.

In addition, construction can cause direct and indirect effects on known heritage resources sites that have been identified through the Provincial heritage resource inventories, ATK and predictive modeling. Undiscovered heritage resources may be inadvertently affected by these activities and can result in the following:

- Permanent disturbance or destruction of heritage resources and burial sites. During the course of construction heritage resources that are currently recorded may be irreparably disturbed or destroyed;
- Permanent loss of future heritage resources data. The loss of heritage resources and burial sites may occur instantly with little time to record pertinent data;
- Permanent loss of heritage objects or sites. Heritage objects and sites are non-renewable resources and loss of same will result in an incomplete historical record;
- Permanent changes in the interpretive capacity of the region which reduces the ability to provide a complete record of both Manitoba and Aboriginal history; and
- Permanent loss of cultural landscapes and the ability of First Nation, Metis and local people to orally recount history may have an effect on the culture and spirituality.

Operations have the potential to cause inadvertent disturbance to known heritage resources that have been identified through the Provincial heritage resource inventories and those that are as yet undiscovered.

HVdc Transmission Line

No heritage resources were found during archaeological field investigations within the final preferred route. Field studies were conducted both aerially and on the ground in the summer of 2011. Most areas were inaccessible due to ground conditions or because landowner permission had not been obtained. Further fieldwork will be conducted in these areas prior to construction once access is available.

Ninety-four provincially registered heritage resources sites are located within the 4.8 km (3.0 mile) Local Study Area centered on the final preferred route for the Bipole III line (Table 8.3-17). No federally designated sites were identified in the vicinity of the route.

Table 8.3-17: Known Heritage Resource Sites within the Final Preferred Route Local Study Area for the Bipole III Line

Heritage Resources Category	Frequency
Archaeological Sites	57
Centennial Farms	19
Commemorative Plaques	16
Municipally designated heritage sites	2
Provincially designated heritage sites	0

In addition to the provincially registered sites, 194 environmental areas of heritage concern were identified through predictive modeling and ATK identified heritage areas; 69 occur north of The Pas within the 4.8 km (3.0 mile) Local Study Area around the final preferred route and 125 occur south of The Pas. Heritage resources that fall within the right-of-way for the Bipole III line have a greater potential to be directly affected by the construction and operations of the line.

Temporary mobile camps will be located at unknown locations along the route. These camp locations will not be established within 100 m of known archaeological sites or in areas identified by ATK as having heritage or cultural value, or potential site locations identified through the predictive model. Because of the nature of archaeological sites, many are not known until clearing and soil removal take place. Therefore, camp locations will be identified prior to set up and these areas will be assessed by the Project archaeologist before the camp is established.

With respect to culture, although the Bipole III line may not affect any physical aspects of culture, there could be indirect effects on the ability of people to feel comfortable in a traditional environment that has been modified by the construction and operation of the line.

ATK assisted in providing cultural context to three of the five main areas (Keewatinoow Converter Station region; Cormorant Bottleneck; Red Deer River Bottleneck) of heritage concern along the final preferred route (Table 8.3-18). In addition two self-directed studies provided cultural context to the Assiniboine River crossing.

Two heritage resource sites were identified within the Project Site/Footprint of the Keewatinoow Converter Station during a routine Heritage Resource Impact Assessment (HRIA) (NLHS 2010, 2011). Meetings and on-site visits with Fox Lake Cree Nation Elders assisted in providing cultural information regarding the stone features that were identified by Project Archaeologists. Appropriate cultural mitigation was suggested by the Elders and immediately implemented by Manitoba Hydro. These sites are discussed under the Keewatinoow Converter Station and Associated Facilities.

In the Cormorant area, a petroform is situated within 16 m of the centre line of the final preferred route for the Bipole III line. The site was discovered during HRIA archaeological investigations for the Wuskwatim Transmission Project in 2003. Temporary signage was established adjacent to the main site. The main undisturbed petroform is located approximately 50 m east of the existing Herblet Lake to Rall's Island 230 kV transmission line right-of-way and within the Bipole III right-of-way. The site will be mitigated with appropriate permanent protection if the route cannot be realigned through this area to avoid the site. Discussions will occur with the Province of Manitoba Historic Resources Branch (HRB) and the community of Cormorant regarding the petroform.

Table 8.3-18: Five Main Areas of Concern along the Final Preferred Route for the Bipole III Line as Identified by Archaeological & ATK records

Area of Concern	Identified by	Site Type
Keewatinoow Converter Station region	Archaeological Survey	Pre-European contact burials; work stations, campsite
Cormorant Bottleneck	Archaeological Survey	Petroform
Red Deer River Bottleneck	Archaeological Inventory & ATK	Historic Salt Works
Cowan-Briggs Spur	ATK	Burials
Assiniboine River	Archaeological Inventory & ATK (self-directed & workshops)	Yellow Quill Trail, burials, archaeological sites

The Red Deer River crossing was identified as a bottleneck area where ATK, heritage resources and resource use were located. The Bipole III right-of-way may pass through historic salt springs that have been archaeologically (Petch 1990) and locally (through the ATK workshops 2010) confirmed. Heritage discussions will occur with the HRB and the communities within the Barrows and Dawson Bay areas regarding the salt springs and Red Deer River crossing.

The Red Deer River, Cowan-Briggs Spur area and the Assiniboine River crossing were not investigated because landowner permission was not provided, but the ATK for these areas indicated that there is a need for field investigations to occur prior to construction once landowner permission is granted. The Red Deer River was noted by at least five communities as being of historic interest (ATK workshops 2010); archaeological investigations conducted in 1986 support the ATK (Petch 1990). Cowan-Briggs Spur and the area to the east were noted by at least three communities as having great cultural importance to the local people. The recorded archaeological record for this area supports the very early occupation by late Plano to present cultural groups. The

Assiniboine River Crossing was identified by Long Plain, Dakota Tipi, Swan Lake and Dakota Plain as an area of concern. The famous Yellow Quill Trail crosses the River nearby. Yellow Quill was the first Chief of these First Nations and was signatory to Treaty 1. Swan Lake First Nation has completed some heritage field work, but the area will require detailed survey by the Project Archaeologist working with the Swan Lake First Nation archaeologist prior to construction.

Mitigation Measures

With respect to the Bipole III line, in addition to further fieldwork, the following mitigation measures will be used to minimize potential effects of the Project on culture and heritage resources. Culture and heritage resources are inherently linked as they represent the cultural legacy associated with self-identification. They are, in fact, part of living history.

The following lists outline mitigation measures to ensure those impacts and their effects to culture and heritage resources are addressed in a manner that is culturally appropriate.

Culture

- EnvPPs for the construction and operations of the Project will include mitigation measures to minimize potential cultural effects. Further liaison with communities that have identified cultural concerns will occur to assist in identifying additional mitigation measures to be included in the EnvPPs. In addition, Manitoba Hydro anticipates opportunities for employing local Aboriginal people to assist in monitoring Project construction.
- The EnvPPs will contain heritage protection measures which will be developed in collaboration with First Nations, Metis and local interested parties for Project components that will ensure protection of Aboriginal and non-Aboriginal cultural interests.
- The Bipole III ATK process brought to light the valuable knowledge that exists within First Nation, Metis and other communities. In addition, through this process, as well as the Key Person Interviews and EACP, communities identified concerns and issues important to them regarding the Project. Apart from the other mitigation measures outlined in this section, Manitoba Hydro will continue to liaise with First Nations, the MMF and other communities to review concerns that arise about the Project and opportunities for cultural preservation occasioned by the Project. Manitoba Hydro anticipates that in the case of some First Nations and the MMF, the ongoing liaison and communications will occur through existing forums and protocols.

- Concerns regarding the effect of EMF on the natural environment and on humans were expressed through the Bipole III ATK process and the EACP (Chapter 5). Manitoba Hydro is exploring ways to share information about EMF in a meaningful way with Aboriginal people.
- The loss of the ability to conduct traditional activities such as trapping, hunting and fishing was noted in the ATK workshops and self-directed studies as potentially impacting culture. It must be understood however, that culture goes beyond these subsistence activities. As far as is practicable and in accordance with established laws and regulations overseen by Manitoba Conservation, Manitoba Hydro will respect and abide by local hunting protocols and cultural practices during construction and operation of the Project.

Heritage Resources

- EnvPPs for the construction and operation of the Project will include mitigation measures to minimize potential effects on known and unknown heritage resources. As noted above, Manitoba Hydro anticipates employing local Aboriginal people to assist in monitoring Project construction. The heritage protection measures, which will be part of the EnvPPs, will be developed in collaboration with First Nations, Metis and local interested parties for Project components. They will ensure the protection of known and undiscovered heritage resource sites.
- During construction, the Project Archaeologist will work with the Construction Supervisor and Site Manager to ensure that all in-field staff and workers are informed of and understand the process of implementing heritage protection measures and *The Heritage Resources Act*.
- Because of the development of the Heritage Protection measures in the EnvPPs, the effects on heritage resources during construction of the Bipole III line are expected to be negative, small in magnitude, Project Site/Footprint in geographic extent, short-term in duration, and therefore not significant. Because of the development of the heritage protection measures in the EnvPPs, the effects on heritage resources during operation are expected to be negative, small in magnitude, Project Site/Footprint in geographic extent, medium-term in duration, and therefore not significant.

Given the mitigative measures for the Project effects on culture during construction are expected to be negative, small in magnitude, Project Study Area in geographic extent, short-term in duration, and therefore not significant. Given the mitigative measures for the Project effects on culture during operations are expected to be negative, small in magnitude, Project Study Area in geographic extent, medium-term in duration, and therefore not significant.

Keewatinoow Converter Station & Associated Facilities

The Keewatinoow Converter Station area contains heritage resources that are regarded as archaeologically and culturally important. Two archaeological sites were found during Heritage Resource Impact Assessment (HRIA) investigations for the Project (Table 8.3-19). Because of the potential importance of these sites, culturally appropriate recommendations from Fox Lake Cree Nation Elders were implemented immediately. With respect to site HdK1-01, this included:

- Erecting a snow fence around the parameter of the site;
- Posting signage at the four openings of the snow fence;
- Clearing deadfall and debris from the site;
- Declaring the site an off-limits area;
- Planning to direct excess water flow from drilling for water away from the site; and
- Conducting geophysical survey of the potential burial sites.

At HdKl-02, a site impacted by construction of a winter road:

- Barricades of cut trees were placed at the north and south ends of the site, a permanent barrier is required; and
- The northwest extension of the site was identified as a no-go zone for equipment.

Subsequent field investigations were undertaken in the summer of 2011 to identify the extent of, and establish the boundaries of the sites to avoid impacts during construction of the converter station. Site HdK1-01 was determined to be located near proposed fencing, drainage ditches and the possible access road to the site. The HdKl-01 site was determined to be confined to the boundaries established by the HRIA conducted in 2010. Further testing in the surrounding black spruce swamp was negative for evidence of human occupation. The site contains a potential Palaeo-Inuit occupation and three possible burial features. The HRB has indicated that permanent fencing must be established around this site prior to construction.

Site HdKl-02 is located on a gravel ridge and appears to be concentrated in the area of original find. It consists of three possible tent rings that have been somewhat displaced by the grading of a winter road through the centre of the site and installation of a drill well. Testing for site extent was completed in 2011 and the site was noted as extending beyond the previous area, continuing along the gravel ridge for approximately 50 m. Site

HdKI-02 has been disturbed by activities in the area, and will require further archaeological field investigations, and monitoring during construction of the Keewatinoow Converter Station. It will require permanent fencing to protect the site from construction, and operations and maintenance activities.

The configuration of the Keewatinoow Converter Station has been modified to avoid these two sites; therefore no salvage of archaeological sites will be required unless there is potential for construction or operations activities in this area.

Table 8.3-19: Culturally Affiliated Sites and Archaeological Sites within the Keewatinoow Converter Station Site

Borden #	Archaeological Survey	Cultural Affiliation	Site Type	Artifacts Recovered Features Noted
HdKl-01	Pedestrian Survey Shovel testing	Palaeo-Inuit (Pre-European Contact) Potential burials	Work station; possible burials	Microblade projectile point; Lithic scraper; Biface; flakes Stone features
HdKl-02	Pedestrian Survey Controlled surface collection	Undetermined Pre-European Contact	Campsite	Lithic flakes; tepee rings

No heritage resources were identified for other facilities associated with the Keewatinoow Converter Station during field studies conducted in the summers of 2010 and 2011. In terms of culture, although the routes for the construction powerline and collector lines may not necessarily affect any physical aspects of culture, there may be indirect effects on the ability of people to "feel comfortable" in a traditional environment that has been modified by the construction and operations of the lines.

Mitigation Measures

Manitoba Hydro anticipates that all of the following mitigation measures will be discussed with local communities as appropriate methods, in addition to further fieldwork, to minimize effects of the Project on culture and heritage resources:

- Preparation of construction and operations EnvPPs which will include mitigation measures to minimize potential cultural effects, and the discovery of known and undiscovered heritage resources. Liaison with Fox Lake Cree Nation and Tataskweyak Cree Nation will occur to assist in the development of the EnvPPs.
- Preparation of heritage resources protective measures to be included in the EnvPPs to protect heritage resources that may be discovered during construction and construction decommissioning. The heritage resources protective measures will set out the provincial requirements, as well as any local cultural requirements for specific

procedures. A process of immediate reporting of heritage finds, including found human remains will be established.

- During construction, the Project Archaeologist will work with the Construction Supervisor and Site Manager to ensure that all in-field staff and workers are aware of the process of *The Heritage Resources Act*.

As discussed in Chapter 5, with respect to the Keewatinoow Converter Station and associated facilities, Manitoba Hydro and Fox Lake Cree Nation will be continuing efforts to identify potential adverse effects and conclude an Adverse Effects Agreement, pursuant to the process set out in Article 8 of the ISA. Manitoba Hydro and Tataskweyak Cree Nation are also continuing discussions towards a jointly developed set of principles to address, among other things, Project impacts.

Effects of the Project on heritage resources during construction of the Keewatinoow Converter Station and associated facilities are expected to be negative, small in magnitude, Project Site/Footprint in geographic extent, short-term in duration, and therefore not significant. Expected effects on heritage resources during operation are considered negative, small in magnitude, Project Site/Footprint in geographic extent, medium-term in duration, and therefore not significant.

The effects of the Keewatinoow Converter Station and associated facilities on culture will be similar in nature to those of the Bipole III line. Similar mitigative measures as outlined for the Bipole III line will be applied. Given these mitigative measures, effects of the Project on culture during construction are expected to be negative, small in magnitude, Project Study Area in geographic extent, short-term in duration, and not significant. Given these mitigative measures, effects of the Project on culture during operations are expected to be negative, small in magnitude, Project Study Area in geographic extent, medium-term in duration, and not significant.

Riel Converter Station

There does not appear to be any potential impact to culture at the Riel Converter Station site. Two archaeological sites (DlLf-10 & DlLf-11) were identified in the vicinity of the Riel Converter Station site during HRIA investigations in 2008 (Table 8.3-20). Both sites were determined to be disturbed by former homesteading and agricultural activities and therefore are low priority. In addition, as the site for the converter station was established and is being developed as part of the Riel Reliability Improvement Initiative, no impacts on heritage resources are anticipated.

Table 8.3-20: Archaeological sites located near the location of the Riel Converter Station

Borden #	Archaeological Survey	Cultural Affiliation	Site Type	Artifacts Recovered
DlLf-10	Pedestrian Survey	Undetermined-Pre-European Contact	Undetermined	Lithic scraper; Biface; Lithic flakes
DlLf-11	Pedestrian Survey	Undetermined-Pre-European Contact	Undetermined	Lithic flakes

The selected southern ground electrode site is not anticipated to impact culture and does not impact existing heritage sites. Archaeological field investigations in the summer of 2011 identified no sites of heritage concern as the site is under cultivation.

As with the other Project components, EnvPPs for construction and operations will be prepared, and will include mitigation measures to minimize potential cultural effects, and the discovery of known and undiscovered heritage resources. Heritage resources protective measures will also be prepared and included in the EnvPPs to protect heritage resources that may be discovered during construction and construction decommissioning. No effects are anticpated.

8.3.6.4 Summary of Residual Environmental Effects and Significance

Table 8.3-21 provides a summary of residual effects related to culture and heritage resources for the Project and includes the identification of anticipated residual effects with respect to the each VEC by Project component, their magnitude, extent, duration, and a determination of their significance.

With respect to heritage resources, the residual effect of the Project is the potential discovery of unknown heritage resources particularly during the construction phase of the Project. With the preparation of Project specific EnvPPs, which will include heritage resources protective measures, unknown heritage resources will be protected during Project construction and operations.

Culturally, the Project may be viewed as another impact on Aboriginal traditions, culture and practices. The ATK workshops, self-directed studies and KPIs associated with resource use indicate that many aspects of traditional culture may be lost if the opportunity to carry out certain activities is removed. The on-going liaison and communications Manitoba Hydro intends to maintain with First Nations, the MMF and Aboriginal communities with respect to the Project will facilitate the identification of potential lost opportunities and mutually agreeable ways to avoid such loss and to maintain important cultural activities.

Table 8.3-21: Residual Environmental Effects Summary – Culture and Heritage Resources

VEC	Project Component	Phase	Residual Effect	Assessment[1]
Heritage Resources	HVdc Transmission Line	Construction	Potential discovery of unknown heritage resources	Direction – Negative Magnitude – Small Geographic Extent – Project Site/Footprint Duration – Short-Term **Overall – Not Significant**
		Operations	Potential discovery of unknown heritage resources	Direction – Negative Magnitude – Small Geographic Extent – Project Site/Footprint Duration – Medium-Term **Overall– Not Significant**
	Keewatinoow Converter Station & Associated Facilities	Construction	Potential discovery of unknown heritage resources	Direction – Negative Magnitude – Small Geographic Extent – Project Site/Footprint Duration – Short-Term **Overall – Not Significant**
		Operations	Potential discovery of unknown heritage resources	Direction – Negative Magnitude – Small Geographic Extent – Project Site/Footprint Duration – Medium-Term **Overall – Not Significant**
Culture	HVdc Transmission Line	Construction	Impairment of Aboriginal Culture	Direction – Negative Magnitude – Small Geographic Extent – Project Study Area Duration – Short-Term **Overall – Not Significant**
		Operations	Impairment of Aboriginal Culture	Direction – Negative Magnitude – Small Geographic Extent – Project Study Area Duration – Medium-Term **Overall – Not Significant**
	Keewatinoow Converter Station & Associated Facilities	Construction	Impairment of Aboriginal Culture	Direction – Negative Magnitude – Small Geographic Extent – Project Study Area Duration – Short-Term **Overall – Not Significant**
		Operations	Impairment of Aboriginal Culture	Direction – Negative Magnitude – Small Geographic Extent – Project Study Area Duration – Medium-Term **Overall – Not Significant**

Note:

1. Expected residual effects (i.e., effects after mitigation) of the Project on each VEC are assessed using the regulatory significance evaluation approach and methods defined in Chapter 4, Section 4.2.10. Where feasible, regulatory significance is assessed for each non-negligible expected residual effect based on its expected direction, magnitude, geographic extent and duration (as each term is defined in Section 4.2.10); if an adverse residual effect is evaluated to be potentially significant, other factors are also considered (frequency, reversibility, ecological importance and societal importance). Scientific uncertainty is noted where it may materially affect the assessment.

8.3.6.5 Follow-up

The best form of mitigation is avoidance; however, this may not be possible in some areas. Activities during the construction phase of the Project that cause disturbance to the ground surface have the greatest potential to disturb *in situ* heritage resources, in particular the area of structures; borrow/quarry sites, and access roads.

Apart from the preparation of EnvPPs which will contain heritage resources protective measures as described above under each of the Project components, additional field work will occur prior to construction of the Bipole III line, as well as monitoring as outlined below. Monitoring requirements will be further identified in a Heritage Resources Monitoring Plan.

Culturally, monitoring and follow-up of participating communities will assist in future projects since a baseline has now been established. A culturally-driven model as suggested by UNESCO and independently derived for ATK studies links the cultural to biological diversity. In terms of the Project, Manitoba Hydro will continue to liaise with directly affected Aboriginal communities about concerns regarding the Project, and will give on-going consideration to community concerns. In addition, Manitoba Hydro anticipates opportunities for employing local Aboriginal people to assist in Project monitoring.

HVdc Transmission Line

Although no heritage resources were recovered during the HRIA field investigation of the Bipole III line, water crossings along larger rivers will be examined prior to and during construction of the line. Major rivers were important as gateways during all cultural periods and there is a high potential for the discovery of heritage materials.

In addition, because of the inaccessibility of some areas along the final preferred route, the Project Archaeologist will examine and monitor sites that are ranked of high or medium priority. The EnvPPs which will contain heritage resources protective measures will to provide direction as to the process for protecting heritage resources.

Keewatinoow Converter Station & Associated Facilities

Monitoring at key construction points such as the converter station foundation, inground fencing, access roads, and the ingress and egress of transmission lines will occur at, and in areas in proximity to the two known archaeological sites. Monitoring will occur at the ground electrode site if heritage resources are identified during any subsurface clearing or grading. The EnvPPs will contain heritage resources protective measures and provide instruction as to the process of protecting heritage resources.

Riel Converter Station & Associated Facilities

The Riel ground electrode site is found within agriculturally modified lands and therefore any previous remains of heritage resources may have been disturbed or destroyed over the years. However, there is the potential for heritage resources to be present. The EnvPPs will contain heritage resources protective measures and will protect any found heritage resources. In-field monitoring of in-ground activities may be required.

8.4 ACCIDENTS AND MALFUNCTIONS

This section reviews the potential for accidents or malfunctions that could affect primarily the biophysical environment. Issues of public safety are discussed in Chapter 8 Section 8.3. Accidents are discussed mainly in the context of hazardous materials and malfunctions in the context of fire response and emergency preparedness.

Hazardous materials are handled and generated in the course of construction and operational activities. Examples of some common types of hazardous materials to be handled or generated during the construction and operations of the Project include fuel, oil, lubricants, gasoline, solvents, herbicides, and pesticides. As with any project involving construction and operations, there is a risk of contingency events such as spills or fires. Accidental releases of hazardous materials may occur as a result of human-induced error (e.g., during re-fuelling of equipment) or failure of station components. With respect to the Project, there are a number of components and stages where this risk exists and, depending on the nature and magnitude of the contingency event, there is a resulting potential for an effect on the biophysical environment including soil, groundwater, surface water, and the aquatic environment if materials such as fuel, lubricants, solvents or herbicides enter a water course. Other contingency events could include accidental fires which may affect air quality or result in wildlife and habitat loss. If any of these contingency events occurs, it may create a risk to public health and safety or may potentially affect wildlife, fish and terrestrial and aquatic habitat.

Project activities have the potential to result in accidental releases of hazardous materials. These accidents could occur during all Project phases and include, but are not limited to, the use of heavy equipment during construction, construction decommissioning and operations, the filling of converter station equipment with insulating oil during station commissioning and operations, and the storage, transportation and handling of hazardous materials. Releases of hazardous materials can be measured through analytical analysis of relevant parameters (e.g., Benzene, Toluene, Ethylbenzene, Xylenes [BTEX], Mineral Oil and Grease [MOG], and Herbicides). Relevant criteria within the Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME 1999) would form the threshold levels for restoration of environments from any spills or leaks.

Spills in and adjacent to wetlands, waterbodies and water courses are of the greatest concern to fish and wildlife. Hydrocarbon spills in this type of habitat are difficult to clean-up and if not contained quickly, could contaminate the aquatic environment damaging aquatic life and habitat. Mitigation for the potential effects of accidental spills includes effective spill response management (Bipole III Environmental Protection Plan).

The approach to these potential accidents with hazardous materials involves good planning and prevention with the use of protocols, plans and mitigation measures. These are outlined in the EnvPP in sections on hazardous material and petroleum products use, handling and storage. (EnvPP Sections 3.7.4 and 3.7.5). This is followed by appropriate emergency preparedness and response that is detailed in the EnvPP Section 3.7.2. All spills and leaks will be reported to regulatory authorities in accordance with provincial requirements including regulations under the *Dangerous Goods Handling and Transportation Act*.

Some of the general mitigation measures to prevent and respond to accidental spills/releases of hazardous materials include:

- Construction crews will be adequately trained in spill prevention and clean-up procedures;
- Fuel, lubricants and other potentially hazardous materials will be stored and handled within dedicated areas at work sites and marshalling yards in full compliance with regulatory requirements;
- Harmful substances, such as fuels, chemicals and herbicides will be stored greater than 100 m from the ordinary high water mark (HWM) of any waterbody;
- All storage sites will be located a minimum distance of 100 m from waterbodies;
- Marshalling yards will be located on low permeability soils and upland sites, where possible (i.e., areas of well drained soils, as identified soils maps [Chapter 6] and locally by Manitoba Hydro's Construction Supervisor or Site Manager);
- Transfer of fuel must be attended at all times;
- An Emergency Preparedness and Spill Response Plan will be developed and an emergency response spill kit will be kept on-site at all times in case of fluid leaks or spills from machinery;
- Only clean construction materials and equipment will be used;

- Manufacturer machinery and equipment guidelines, procedures and spill prevention and emergency response measures will be adhered to;
- All vehicles, machinery and construction materials will arrive on site clean and free of leaks;
- Equipment refuelling and maintenance will be conducted greater than 100 m from the stream's ordinary high water mark (HWM) and away from wetlands;
- When servicing equipment, waste products such as oil and antifreeze will be drained into appropriate containers and removed to an approved disposal ground;
- Machinery will remain above the HWM, unless fording is required to transport equipment across the watercourse;
- All fuel spills or leaks will be reported to the Manitoba Hydro Project Manager or delegate immediately upon discovery;
- Any spills of hazardous substances will be cleaned up immediately and reported to the local Natural Resources Officer;
- General clean-up in storage areas, and sites where incidental spillage occurs, will be in accordance with regulatory standards;
- All soil is to be remediated or disposed of in a manner approved by regulatory authorities and Manitoba Hydro;
- Hazardous materials, fuel containers and other materials will be removed from the site and disposed of according to Manitoba Hydro's Hazardous Materials Management Handbook and in accordance with regulatory requirements; and
- The Canadian Wildlife Service (CWS) will be informed of all incidents where the spill of toxic pollutants will harm or potentially harm wildlife species and/or species at risk. In accordance with the National Policy on Oiled Birds and Oiled Species at Risk (Environment Canada 2011).

The operation of oil containing electrical equipment, the burning of trees and brush for disposal, and other potential sources of ignition creates a risk for accidental fires to start. Strict adherence to proper protocols to minimize the risk of accidental fires makes its occurrence highly unlikely. Mitigation for the potential effects of accidental fires includes effective fire response management (EnvPP Section 3.7.2) as part of emergency preparedness and response plans to be developed for the Project. There is substantial design mitigation to be prepared for potential station fires and to collect and separate oil contaminated water from such an event (Chapter 3 Project Description). The water supply system for the stations are designed for fire suppression to ensure there is sufficient pump and water storage capacity to adequately contain and extinguish any converter station fires. The stations are also designed with oil containment and drainage systems that will collect any oil and water from leaks, spills or fires and treat and separate the oil in oil/water separators prior to release to the environment. In the event of a station or other construction site fire, follow-up monitoring would be required.

Worker safety is highly regulated under provincial legislation and all activities during construction and operations of the Project components will be undertaken in compliance with current Workplace, Safety and Health requirements, to prevent accidents and injury. Manitoba Hydro is committed to safe workplaces and injury prevention through its corporate goals.

8.5 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

8.5.1 Context

The effect of climate and climate change on the Project is part of the environmental assessment and is reviewed in this section.

Concerns were expressed through the EACP about the risks to the Project and to the Manitoba Hydro transmission system from increased frequency of extreme weather events due to climate change.

Manitoba Hydro has undertaken considerable research respecting the vulnerability of its transmission facilities to catastrophic outage, in particular to the risk arising from extreme weather like severe synoptic wind and ice events or tornadoes. Essentially, the justification for both the Riel Reliability Improvement Initiative (Riel Sectionalization) and the Bipole III Project is the improvement of HVdc system reliability in the context of such risks. As well, Manitoba Hydro continues to monitor and to conduct research on the potential effect of climate change.

To the extent that predictions of global climate change models can be scaled down to regional levels relevant to the Manitoba Hydro system, the research broadly suggests that the probable outcome of current trends will be higher mean temperatures and precipitation, with changes expected to be most pronounced in the winter. These changes could affect the existing environment and its susceptibility to the potential environmental effects of the Bipole III Project, and have been considered in the assessment of those effects as presented elsewhere in this chapter and in the assessment of cumulative effects.

This section addresses the prospective effects of climate change on the Bipole III Project and, more importantly, on the Manitoba Hydro transmission system.

8.5.2 Potential Effects

Climate change effects on temperature and precipitation could indirectly affect the Bipole III Project (e.g., through degradation of permafrost or flooding). The potential for direct effects of climate change on Bipole III and the Manitoba Hydro transmission system arising from severe weather events is less clear. Both types of effect are addressed in this section.

Some studies and reports (Infrastructure Canada 2006; IPCC 2007[Parry, *et al*] have suggested that energy transmission infrastructure may be vulnerable to the possible influence of climate change in increasing the frequency and severity of extreme events. By the IPCC definition (IPCC 2007 [Solomon *et al*]), an extreme weather event is "an event that is rare at a particular place and time of year". Definitions of rare vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile of the observed probability density function. By definition, the characteristics of what is called extreme weather may vary from place to place in an absolute sense. Single extreme events cannot be simply and directly attributed to anthropogenic climate change, as there is always a finite chance the event in question might have occurred naturally. When a pattern of extreme weather persists for some time, such as a season, it may be classed as an extreme climate event, especially if it yields an average or total that is itself extreme (e.g., drought or heavy rainfall over a season).

Extreme events are not well simulated by global and regional climate change models. Model output is generally not specific as to the precise nature or location of such events, some of which (e.g., drought or heat waves) would involve little or no direct risk to transmission facilities.

Data on the frequency and severity of historical weather events in the Prairies are limited. Historical records for average and daily weather factors (i.e. temperature, wind speed and precipitation) do not indicate any specific trends in severe weather events, instead focusing on averages. This is likely due to the infrequent nature of these events, an inability to accurately predict their location, duration and intensity, and a general lack of attention to their occurrence based on their acceptance as part of normal weather. Recent research commissioned by Manitoba Hydro characterizes the present situation as follows.

> "In summary, the existing weather record is not conclusive, though highly suggestive and consistent with current climate change theory. The world appears

to be in the early phases of a fundamental shift towards a climate in which extremes of many kinds are more prevalent though there remains a small possibility that the present cluster of extreme events is a temporary phenomenon. Changes in the frequency and intensity of extreme events is expected to be one of the most significant effects of continuing climate warming, but the natural variability in these phenomena precludes easy detection of the signal, and so must await the passage of time and more detailed analysis" (Dr. John Hanesiak, Appendix B, in Teshmont, 2011).

8.5.3 Significance

Bipole III is planned to be in service by the fall of 2017. The prospect of significant new effects arising from climate change over this relatively short term (e.g., an inability to mitigate adverse effects in the north through winter construction) is considered unlikely.

Similarly, the prospect of significant effects on operation of the Project arising from the indirect implications of changes in temperature and precipitation is considered to be manageable. For example, issues arising from permafrost degradation as a result of higher temperatures will be avoided or mitigated by careful attention to tower location and foundation design, together with the use of guyed structures in the northern sections of the Project. All of these measures are integral to Bipole III planning and design. Increased incidence of flooding, arising from the prospect of higher precipitation, can be mitigated when required through consideration of flood protection in design of station facilities, and through provision of conductor to ground clearances in excess of the applicable standards.

The prospect of outages arising from severe weather events, though significant, is of greatest concern from a system rather than a project perspective. The separation of the Bipole III HVdc line and stations from those of Bipoles I and II will substantially reduce the risk of such outages. As well, the reliability based design criteria for the Bipole III HVdc line are for higher wind and ice loading than the deterministic design methods applied to Bipoles I and II. The return period of severe weather exceeding the design parameters of the Bipoles I and II HVdc transmission lines has been estimated to be 1 in 90 years in the case of wind loading, 1 in 20 years in the case of combined wind and ice loading. The development of Bipole III will improve the estimated return period for a common failure of all three Bipole HVdc lines to 1 in 560 years or more for wind loading and to 1 in 200 years or more in the case of combined wind and ice loading. Given the uncertain long term effect of climate change on severe weather events, this is a particularly significant improvement over current system risk exposure. Strengthening portions of the line where separation between Bipole III and Bipole I and II is reduced will further improve the common failure return period.

8.5.4 References

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