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6.0 EXISTING ENVIRONMENT

6.1 INTRODUCTION

This Chapter provides a description of the existing environment in the Project Study Area which is shown in Map 6-1. The Chapter is broadly organized into two main sections representing two broad environmental components: biophysical and socio-economic. Each of these is subdivided into smaller components and some of these are further subdivided into valued environmental components (VECs). Chapter 8 (Effects Assessment) describes the VECs and their use in the assessment.

The following lists two main section headings, biophysical and socio-economic, followed by environmental and socio-economic components, and then VECs are shown in parentheses.

- Biophysical environment:
    - Terrain and Soils (soil productivity, terrain stability)
    - Air Quality and Climate (air quality, climate)
    - Groundwater (aquifer productivity, groundwater quality)
    - Aquatics (surface water, fish habitat)
    - Terrestrial ecosystems and vegetation (plant species and communities of conservation concern, grasslands/prairie areas)
    - Mammals and habitat:
        - Ungulates – (Coastal and barren ground caribou, boreal caribou, moose, elk)
        - Furbearers – (American marten, beaver, wolverine)
    - Birds and habitat:
        - 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)
        - Songbirds and other birds (olive-sided flycatcher, loggerhead shrike, Sprague's pipit, golden-winged warbler, Canada warbler, rusty blackbird)

- Amphibians and Reptiles:
  - Amphibians (plains spadefoot toad, wood frog, northern leopard frog)
  - Reptiles (red-sided garter snake, northern prairie skink)
- Terrestrial Invertebrates (Dakota skipper, Ottoe skipper, Uncas skipper)

- Socio-economic environment:
  - Land Use
    - (Land Tenure and Residential Development)
    - (Private forestlands)
    - (Aboriginal lands) [meaning Reserve Lands and Treaty Land Entitlements]
    - (Designated Protected Areas and Protected Areas Initiative)
    - (Infrastructure)
    - (Agricultural land use/productivity)
  - Resource Use
    - (Commercial forestry)
    - (Commercial fishing)
    - (Mining/Aggregates)
    - (Trapping)
    - (Wild rice harvesting)
    - (Recreation and Tourism)
    - (Domestic resource use)
  - Economy (Economic opportunities)
  - Services (Community services, travel and transportation)
  - Personal, Family and Community Life
    - (Public safety)
    - (Human health)
    - (Aesthetics)
  - Culture and Heritage Resources (culture, heritage resources)

6.2 BIOPHYSICAL ENVIRONMENT

6.2.1 Terrain and Soils

6.2.1.1 Overview

The following is an overview of the existing terrain and soils environment of the Project Study Area. This includes a discussion of bedrock geology, surficial geology, terrain and soils components. A detailed description is presented in the Bipole III Terrain and Soils Technical Report.

This section provides information on the following:

- Summary of Components (bedrock geology, surficial geology, soils and terrain);
- Summary by Ecozones;
- VECs; and
- Existing Environment at Project Components.

6.2.1.2 Summary of Components

Bedrock Geology

The Project Study Area traverses the Precambrian Shield bedrock and two large sedimentary basins – the Western Canada Sedimentary Basin (WCSB) and the Hudson Bay Basin (HBB) (Map 6-4).

Located beneath the central portion of the Project Study Area, the Precambrian Shield, composed of igneous and metamorphic bedrock, generally consists of granites and gneisses of the Churchill and Superior geological provinces. The WCSB and HBB are respectively located in the southwestern and northwestern portions of the Project Study Area. The WCSB consists primarily of carbonate Paleozoic deposits and dominantly shale Mesozoic deposits; whereas, the HBB comprises mainly Paleozoic carbonates that gently dip toward the northeast.

The following is a general description of the soil environment of the Project Study Area. The northern portion of the Project Study Area, characterized primarily by wetland and forested land-uses, predominantly consists of Cryosolic and Organic orders in the low-lying and wetland areas, and the Brunisolic order in the upland, mineral soil areas. These soils are generally considered to have relatively low productivity. The Cryosolic soils are currently, or have been historically, influenced by permafrost. Agricultural Manitoba

predominantly consists of Chernozemic and Vertisolic orders, which are generally considered productive soils for agricultural.

Surficial Geology

The surficial geological materials or overburden that covers the majority of bedrock in Manitoba, presented in Map 6-5, consists mainly of glacial tills, glaciofluvial, glaciolacustrine sediments and glaciomarine deposits (Matile and Keller, 2007). Forming the basis of soil parent materials, these surficial geologic materials are highly variable in thickness from thin sediments and outcrops common in the Precambrian Shield to deposits over 100 m thick in locations of infilled bedrock channels and moraines primarily found in southern and western Manitoba (Betcher et al., 1995).

Surficial geology in the Project Study Area was primarily formed during the Pleistocene period and is characterized by offshore and distal glaciofluvial sediments (mainly clay, silt and fine sand) in the southern portion; poorly sorted/unsorted calcareous silty till with rare occurrences of younger organic (peat); and alluvial sediments in the west and offshore glaciofluvial clays and recent organic deposits common in the north.

Soils

The Regosolic, Gleysolic and Luvisolic soil orders, and Non-Soil are generally considered azonal in nature throughout the Project Study Area.

Soil drainage is predominantly very poor to poor in the northern portion of the Project Study Area, and well drained in the southern portion of the Project Study Area (Table 6.2-1). Imperfectly drained soils occupy a major portion of the Project Study Area. Surface soil textures are an important component, as surficial soil horizons are relatively productive and maintenance of these typically thin and fragile horizons is a key consideration in the maintenance of soil productivity. Organic surface textures in the Project Study Area were found to be mesic and fibric in nature (Table 6.2-1). A large portion of the Project Study Area was found to have medium and very fine textured mineral surfaces (Table 6.2-1). Very fine and fine textured soils are important to consider, as they tend to be prone to compaction effects under trafficking. Another important consideration is coarse textured (very coarse, coarse and moderately coarse) surface materials, particularly when they occur on poorly developed soils, as they have little resistance to wind erosion. These surface textures occupy a minor portion of the Project Study Area (Table 6.2-1), and are distributed throughout the Project Study Area.

Unique Terrain/Soils

Unique terrain/soil features are important to overall terrain/soil integrity as they represent relatively uncommon terrain/soil occurrences and have special physical, aesthetic, social, cultural or inherent terrain/soil diversity value. They are discussed

under Designated Protected Areas and Protected Areas Initiative (PAI) Enduring Features.

6.2.1.3 Summary by Ecozones

The following is an ecoregion-based summary of the Project Study Area soils and terrain environment. The Project Study Area traverses the following ecoregions, grouped by ecozone, as presented in Maps 6-2 and 6-3 and described further below:

- Hudson Plain Ecozone: Hudson Bay Lowland Ecoregion;
- Taiga Shield Ecozone: Selwyn Lake Upland Ecoregion;
- Boreal Shield Ecozone: Churchill River Upland Ecoregion and Hayes River Upland Ecoregion;
- Boreal Plain Ecozone: Mid-Boreal Lowland Ecoregion and Interlake Plain Ecoregion; and
- Prairie Ecozone: Lake Manitoba Plain Ecoregion and Aspen Parkland Ecoregion.

Hudson Plain Ecozone

Hudson Bay Lowland

The bedrock in this ecoregion is primarily flat Paleozoic limestone with low relief (AAFC 1998). The area is dominated by organic deposits overlying marine sediments underlain by glacial till, which surfaces in some locations. The relief is characterized by post-glacial marine submergence and isostatic rebound of the land surface (AAFC 1998). The elevation ranges from 150 masl (meters above sea level) to 30 masl and slopes northward.

Soils are dominated by Organic Cryosols, and are commonly complexed with Organic Mesisols. Common inclusions are Terric Organic soils in veneer bogs. Small occurrences of Brunisolic soils occur in association with exposed glaciofluvial deposits, beaches and outcropped loamy tills.

Approximately half of the Project Study Area in this ecoregion occupies an area dominated by Organic Cryosols, while the second half occupies an area largely dominated by Eutric Brunisols (Centre for Land and Biological Resources Research 1996).

Taiga Shield Ecozone

Selwyn Lake Upland

The bedrock in this ecoregion is composed of crystalline Archean massive rocks tilted to the northeast (AAFC 1998). Elevation ranges from 510 masl in the western uplands to 120 masl in the southeast. Surficial deposits range greatly with ridged hummocky bedrock outcrops with veneers and blankets of acidic till in the west to extensive loamy calcareous till often overlain by lacustrine and peat deposits in the east. Prominent glaciofluvial features are widespread throughout the ecoregion.

The western portion of the ecoregion is dominated by Dystric Brunisols, with inclusions of Static Cryosols. In the eastern portion (lower elevations), the ecoregion is dominated by Organic Cryosols with inclusions of Gray Luvisols on lacustrine sediments, Eutric Brunisols on calcareous tills and Turbic Cryosols on loamy to clay sediments.

The portion of the Project Study Area in this ecoregion traverses an area dominated by Organic Cryosols (Centre for Land and Biological Resources Research 1996).

Boreal Shield Ecozone

Churchill River Upland

The ecoregion occupies part of the Kazan Upland and sits on massive crystalline Precambrian rocks (Precambrian Shield). Landforms in the western part of the ecoregion are dominated by ridged and hummocky bedrock outcrops covered with veneers and blankets of sandy tills. The eastern portion is characterized by depressed to hummocky lacustrine sediments, commonly covered by peat deposits of varying depths. Prominent glaciofluvial features are present in the eastern portion of the ecoregion. These features can have considerable relief of up to 60 m with steep slopes. Elevation ranges from 450 masl near the Saskatchewan border to 150 masl along the east boundary near Grass River (AAFC 1998).

Eutric Brunisols dominate on the sandy tills and glaciofluvial features, while Gray Luvisols dominate the well- and imperfectly-drained lacustrine clay deposits. Granitic outcrops are co-dominant in the ecoregion, characterized by Mesisols, Fibrisols and Cryosols in bog basins, peat plateaus and veneer bogs. Permafrost is common in the north of this ecoregion, but diminishes to sporadic in the south (AAFC 1998).

The portion of the Project Study Area in the northern part of this ecoregion traverses large extents of Organic Cryosols and Gray Luvisols with minor occurrences of Eutric Brunisols (Centre for Land and Biological Resources Research 1996). In the southern portion of the ecoregion, the Project Study Area traverses considerable extents of Mesisols, Fibrisols, Eutric Brunisols and exposed bedrock.

Hayes River Upland

The ecoregion occupies part of the Severn Upland and sits on crystalline Archaen massive rocks. This ecoregion was strongly glaciated and exhibits ridged to hummocky bedrock outcrops with discontinuous veneers and blankets of acidic sandy till in the south, and calcareous, sandy to loamy till in the north. Large areas are also covered with glaciolacustrine clay veneers and blankets, veneer bogs and flat bogs. Elevation ranges within the Project Study Area from 250 masl at the southern edge of the ecoregions to 210 masl at the northern edge of the ecoregion (AAFC 1998).

The northern half of the ecoregion is dominated by Organic Cryosols developed on veneers and peat plateau bogs. In the southern portion of the ecoregion, Mesisols and Fibrisols are the dominant soils, with considerable extents of Eutric and Dystric Brunisols developed on glaciofluvial deposits and Gray Luvisols developed on silty to clayey glaciolacustrine and glaciofluvial sediments. The entire ecoregion is characterized by bedrock outcrops (AAFC 1998).

The Project Study Area follows the northern edge of the ecoregion, characterized dominantly by Gray Luvisols developed on lacustrine sediments, with large extents of Organic Cryosols in the extreme northeast of the ecoregion (Centre for Land and Biological Resources Research 1996).

Boreal Plain Ecozone

Mid Boreal Lowland

This ecoregion occupies the northern part of the Manitoba Plain and extends from the west shore of Lake Winnipeg to the Saskatchewan border. The area is underlain by low relief Paleozoic limestone bedrock that is extensively covered by glacial deposits of varying thickness (AAFC 1998). The limestone is at, or near, the surface along escarpments, ridges and channels. The ecoregion is level with north to south drumlinoid or ridged topographic pattern slopes. Elevation ranges from 350 masl at the Saskatchewan border to 250 masl along the eastern edge of the Project Study Area (AAFC 1998).

Clay, silt and sand deposits originating from glacial Lake Agassiz have smoothed the plain, and were subsequently covered by extensive organic deposits forming flat bogs and horizontal fens. Limestone domes with slopes ranging from 5 to 10% occur north of Clearwater Lake. Beaches marking the various water levels of Lake Agassiz can be found along The Pas moraine and along the exposed limestone bedrock north of Grand Rapids on the northwest shore of Lake Winnipeg (AAFC 1998).

The co-dominant soils in the region are Eutric Brunisols developed on the loamy till materials, and Organic Mesisols and Fibrisols in very poorly drained areas. Other

important soils are Gray Luvisols developed on the well- to imperfectly-drained loamy to clayey tills and clayey to silty glaciolacustrine deposits (AAFC 1998).

The Project Study Area traverses through the northwest and west portions of the ecoregion (Centre for Land and Biological Resources Research 1996). The dominant soils of importance are organic Mesisols and Fibrisols. A smaller component of Eutric Brunisols is traversed in the northern portion of the ecoregion.

Interlake Plain

This ecoregion forms a broad arc from the United States-Canada, border extending northwest across the Interlake region and ending at Red Deer Lake along the Saskatchewan border. This ecoregion also marks the southern limit of the boreal forest and the northern limit of commercial agriculture (AAFC 1998). Low relief, flat, Paleozoic limestone bedrock underlies the Interlake Plain. The Interlake and Westlake sections are characterized by low relief, north to south ridge and swale topographic patterns, with slopes from 1 to 3%. In these sections, the deposits are extremely calcareous, very stony water-worked tills over bedrock ranging from <20 m to >30 m thick. East and southeast of these sections, the water-worked till is covered by thin, discontinuous veneers and blankets of sandy to clayey glaciolacustrine deposits and sandy to gravelly beach deposits and bouldery near-shore deposits (AAFC 1998). Elevation in the ecoregion varies from 410 masl near the Manitoba Escarpment in the northwest to 260 masl along the eastern edge of the Project Study Area.

The Interlake Plain is dominated by well- to imperfectly- drained Dark Gray Chernozems with significant inclusions of well to imperfectly-drained Black Chernozems, all developed on very to extremely calcareous, fine textured glaciolacustrine materials that overlay glacial till. The occurrence of Eutric Brunisols and Gray Luvisols on till is limited; Organic Mesisols occupy the depressions while peaty Humic Gleysols are found in transitional areas (AAFC 1998). The Project Study Area traverses Regosols, Mesisols, Fibrisols and Eutric Brunisols north and south of the Swan River Valley, and Black Chernozems through the Swan River Valley (Centre for Land and Biological Resources Research 1996).

Prairie Ecozone

Lake Manitoba Plain

This ecoregion occupies a large portion of southern Manitoba, extending from the International Border northward to Lake Dauphin, with the Manitoba Escarpment as its western boundary. It is located within the lowest level of the prairies, the Manitoba Plain. The Lake Manitoba Plain is a mixture of glacial till and glaciolacustrine silts and clays from glacial Lake Agassiz, all underlain by flat Paleozoic limestone bedrock (AAFC 1998).

The northern half of the ecoregion is characterized by a ridge and swale topographic pattern with a north-south orientation, with fluting or grooving along the ridges. The fluting is a result of iceberg scouring as Lake Agassiz retreated. Wave action also resulted in local texture variations with finer materials in the depressions and coarser textured materials on the ridges. The southern half of the ecoregion is a smooth, thick and generally varved glaciolacustrine deposit composed of clays and silts. Relic beaches are found along the Manitoba Escarpment and mark the successively lower water levels of Lake Agassiz (AAFC 1998). Elevation ranges from 410 masl at the Manitoba Escarpment to 240 masl in the Red River Valley (AAFC 1998).

The Project Study Area is dominated by Black Chernozems, with small areas of Gleysols and Vertisols in the glaciolacustrine sediments and Regosols associated with drainage channels (Centre for Land and Biological Resources Research 1996).

Aspen Parkland

In Manitoba, the Aspen Parkland ecoregion occupies the southwest corner of the province and forms the transitional area between the boreal forest to the north and east and the grasslands to the west. The eastern boundary of the ecoregion is marked by the Manitoba Escarpment, which marks the step down to the Manitoba Plain from the Saskatchewan Plain. This ecoregion is characterized by a variety of glacial deposits: dominated by kettled to undulating loamy glacial till, with important areas of level to gently undulating sandy glaciofluvial and glaciolacustrine and eolian dunes with slopes that range to 30% and steeper (AAFC 1998). Elevation ranges from 320 masl at the Manitoba Escarpment to 600 masl in the uplands of the ecoregion along the western edge of the Project Study Area (AAFC 1998).

The soils of the Aspen Parkland are dominantly Black Chernozems developed from the moderately to very strongly calcareous glacial till, with significant areas of Regosols in the coarse materials and Humic Gleysols in poorly drained areas (AAFC 1998). The Project Study Area skirts the northern edge of the ecoregion, mostly traversing Black Chernozems, but also Regosols associated with the Assiniboine River valley and the glacial Assiniboine Delta (Centre for Land and Biological Resources Research 1996).

6.2.1.4 Valued Environmental Components

The environmental assessment has been focused on VECs selected for the terrain, soils and geology environment. Regions and sites of environmental sensitivity generally associated with the selected VECs have been determined, mapped and described in the *Bipole III Terrain and Soils Technical Report*, to aid in the development of site-specific environmental protection measures.

Two VECs have been identified for the terrain and soils environment: soil productivity and stable terrain, as described below.

Soil Productivity

Agricultural production is of general benefit to society and in agro-Manitoba, the productivity of soils for arable agriculture is valued by agricultural producers as a primary source of income and. Information on agricultural land use can be found in the socio-economics section. Maintenance of soil productivity for lands under annual and perennial agricultural crop production is important to minimize disruption to agricultural producers.

The primary environmental indicator of change to agricultural capability in Agro-Manitoba is the Agricultural Capability Rating (i.e., class) of soils. The Soil Capability for Agriculture (Canada Land Inventory 1965), commonly referred to as Agricultural Capability, is one of the most commonly used agricultural interpretations for soil productivity in agricultural lands in Manitoba.

The Agricultural Capability rating provides a numeric class rating between 1 and 7, which provides an overall indication of the capability of the land to support agricultural crop production, as determined by: soil moisture holding capacity, topography, soil structure and permeability, salinity, sodicity, erosion, stoniness, drainage and organic matter content. Class 1 has the least limitation to support agriculture, with Class 7 having the greatest limitation.

Agricultural capability is summarized by class (Fraser et al. 2001) below:

- Class 1 – soils in this class have no important limitations for crop use;
- Class 2 – soils in this class have moderate limitations that reduce the choice of crops or require moderate conservation practices;
- Class 3 – soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices;
- Class 4 – soils in this class have severe limitations that restrict the choice of crops or require special conservation practices or both;
- Class 5 – soils in this class have very severe limitations that restrict their capability to producing perennial forage crops, and improvement practices are feasible;
- Class 6 – soils in this class are capable only of producing perennial forage crops and improvement practices are not feasible; and
- Class 7 – soils in this class have no capability for arable culture or permanent pasture because of extremely severe limitations.

Organic soils (represented as class "O") and non-soils are considered to have no capability for arable agriculture.

Topsoil Quality

Outside of agricultural-Manitoba, primarily in the northern portion of the Project Study Area, soil productivity is necessary to support natural ecosystems (e.g., vegetation, wildlife) and is therefore of value to people and resource users.

The primary indicator of soil productivity outside of agricultural Manitoba is the quality of mineral topsoil and organic soils. Mineral soil quality in northern Manitoba is indicated by surface horizon thickness, bulk density, and carbon content of organic-enriched surface horizons, whereas organic soil quality is indicated by the thickness and nature of surface horizons.

Additional parameters that can be measured to evaluate topsoil quality include, but are not limited to, topsoil colour, soil texture, salinity, pH, nutrient/fertility status, and soil temperature.

Stable Terrain

Stable terrain, for the purposes of this assessment, is considered terrain that is unaffected or unmoved by non-natural or artificial instability resulting from Project-related activity. Features of the terrain environment that are susceptible to human-induced instability include sloped terrain (e.g., slope creep, slope failure) and permafrost terrain (e.g., subsidence, thermokarst). The maintenance of stable terrain has ecological and socioeconomic value as a function of its role in supporting existing ecosystems and human infrastructure (Duan and Naterer 2009).

Most indicators of unstable sloped terrain can be assessed by visual identification in the field (Schor and Gray 2007), including scars, tension fractures, and/or jack-strawed (tilted) or curved trees (Chatwin *et al.* 1994; British Columbia Government 1999); however, geotechnical-based calculations may also be used.

Indicators of change to permafrost stability include visual identification and active layer thickness. The active layer is the seasonally thawed layer that separates the permafrost layer from air. Disturbed permafrost terrain results in visually-identifiable distinct landforms, including retrogressive thaw slumps (bowl or horseshoe-shaped), active layer detachments (material accumulates at toe), and thermokast terrain (depressions that may collect water) (Kotler 2003). An increase in the thickness of the active layer can indicate thawing of permafrost as a result of disturbance; however, changes may not be evident until late in the season (Bronson *et al.* N.D.).

6.2.1.5 Existing Environment at Project Components

The following is a site-specific review of the soils and terrain environment within the footprint of Project components. A detailed description of the existing environment at

Project component footprints is found in the Bipole III Terrain and Soils Technical Report.

HVdc Transmission Line

Soil Productivity

Soil orders have a relatively even areal distribution along the HVdc transmission line right-of-way (Table 6.2-1); however, these soil orders are not evenly distributed spatially. Cryosolic (11.2%), Organic (18.9%) and Brunisolic (10.3%) orders are predominant in the northern portion, with Cryosolic and Organic orders generally occurring in low-lying and wetland areas and the Brunisolic order occurring in the upland mineral soil areas. In contrast, Chernozemic (17.7%) and Vertisolic (10.3%) orders are predominant in the southern portion of the right-of-way (i.e., agro-Manitoba), and are generally considered productive agricultural soils. The Regosolic (2.9%), Gleysolic (14.2%), and Luvisolic (13.0%) soil orders and non-soil (1.5%) are generally considered azonal in nature along the right-of-way.

Table 6.2-1: Soil Properties within the Local Study Area and Project Footprint

Study Area	Local Study Area		HVdc Footprint	
	ha	%	ha	%
Soil Order				
Brunisolic	68,571	10.3	937	10.3
Chernozemic	118,035	17.7	1,620	17.7
Cryosolic	73,502	11.0	1,021	11.2
Gleysolic	90,057	13.5	1,294	14.2
Luvisolic	83,237	12.5	1,191	13.0
Organic	128,226	19.2	1,727	18.9
Regosolic	19,792	3.0	262	2.9
Vertisolic	66,194	9.9	938	10.3
Non-Soil	18,567	2.8	141	1.5
Drainage				
Rapid	9,312	1.4	144	1.6
Well	127,673	19.2	1,743	19.1
Moderately Well	3,472	0.5	56	0.6
Imperfect	220,449	33.1	3,114	34.1
Poor	61,200	9.2	829	9.1
Very Poor	225,639	33.9	3,107	34.0
Non-Soil	18,437	2.8	139	1.5
Soil Texture				
Coarse Skeletal	13,833	2.1	148	1.6
Very Coarse	4,730	0.7	70	0.8
Coarse	43,723	6.6	623	6.8
Moderately Coarse	18,949	2.8	264	2.9
Medium	159,038	23.9	2,241	24.5
Moderately Fine	33,288	5.0	409	4.5
Fine	39,136	5.9	586	6.4
Very Fine	133,865	20.1	1,897	20.8
Fibric	71,402	10.7	1,011	11.1
Mesic	128,819	19.3	1,725	18.9
Undifferentiated	714	0.1	17	0.2
Non-Soil	18,685	2.8	141	1.5
Study Area				
	666,181	100.0	9,133	100.0

Soil drainage is predominantly very poor (34.0%) to poor (9.1%) in the northern portion of the right-of-way, and well drained (19.1%) in the southern portion of the right-of-way (Table 6.2-1). Imperfectly drained soils (34.1%) occupy a considerable portion of the right-of-way; however, are generally distributed.

A large portion of the right-of-way has medium (24.5%) and very fine (20.8%) textured mineral surfaces (Table 6.2-1). Organic surface textures are primarily mesic (18.9%) and fibric (11.1%) in nature. Coarse textured (very coarse [0.8%], coarse [6.8%] and moderately coarse [2.9%]) surface textured soils occupy a minor portion of the right-of-way and are distributed throughout.

Within agricultural Manitoba, approximately 42% of the right-of-way is rated as Agricultural Capability Classes 1 to 3 with no to moderate limitations for arable agriculture, while 38% is rated as Classes 4 and 5, with severe to very severe limitations. The remaining land has no capability for arable agriculture (9%) or is limited to perennial forage production (Class 6 - 7). A detailed summary of Agricultural Capability classes within the right-of-way within agricultural Manitoba is found in Table 6.2-2.

For the transmission line right-of-way, the largest extent of arable agricultural soils (Class 1-3) occurs between PTH 13 and the Riel Converter Station, east of the Portage la Prairie Area (Map Series 6-3100). The second largest extent occurs between the Whitemud River area east of Gladstone to where the right-of-way crosses PTH 1 west of Portage la Prairie. The area between PTH 1 and PTH 13 contains soils (Class 3-4) with moderate to severe restrictions for arable agriculture, where special conservation practices are required.

Table 6.2-2: Summary of Agricultural Capacity in the Local Study Area and Project Footprint in Agricultural Manitoba

	Study Area (Agricultural Manitoba only)			
	Local Study Area		HVdc Footprint	
	ha	%	ha	%
1	3,547	1.1	31	0.7
2	56,781	18.3	770	18.1
3	71,436	23.1	1,009	23.7
4	76,661	24.8	1,093	25.7
5	41,181	13.3	544	12.8
6	25,566	8.3	404	9.5
7	716	0.2	2	0.1
O	27,153	8.8	352	8.3
Non-soil	6,485	2.1	49	1.1
Total	309,527	100.0	4,254	100

Potential access routes are primarily located along existing access opportunities (e.g., other linear disturbances) within the Local Study Area. Soil orders potentially traversed by access routes are predominantly Organic, Brunisolic and Luvisolic Soils, with a minor number of potential routes traversing Gleysolic, Regosolic and permafrost-affected soils. Drainage is predominantly very poor, imperfect and well along the proposed access routes, occupied by predominantly very fine, moderately coarse and mesic textured soils. The majority of access routes are located on lands with severe limitations to no

capability for arable agriculture (i.e., Class 4 or higher), with a minority of access routes located on lands with moderate limitations (i.e., Class 3). The majority of access routes within agro-Manitoba are located on the existing road network.

Stable Terrain

A total of four occurrences of unstable or steep slopes were identified in the northern portion of the Local Study Area, based on a combination of existing soil resource information and digital stereo aerial photo interpretation. From north to south, these are located within the vicinity of Limestone River and its tributaries, the Odei River and the Overflowing River. The unstable/steep slopes identified in the Overflowing River are located within the HVdc right-of-way. Of the 1408 ha of sloped terrain within the Local Study Area in the Overflowing River area, approximately 2% or 27 ha is within the right-of-way. Potential access routes are identified along existing trails and a road and cutline in the vicinity of the unstable/steep slope area of the Overflowing River.

A summary of the data for these steep and unstable slopes is found in Table 6.2-3.

Table 6.2-3: Summary of Highly Erodible Soil Sites in the Local Study Area and Project Footprint

Ecoregion	Category	Description	Local Study Area		HVdc Footprint	
			ha	%	ha	%
Hudson Bay Lowland	Highly Erodible Soils	coarse textured, eolian sand deposits	1201	0.180	23	0.252
	Unstable and/or Steep Slopes	combinations of soils and slopes prone to water erosion, slumping and/or mass wasting	42	0.006		
Hayes River Upland	Unstable and/or Steep Slopes	combinations of soils and slopes prone to water erosion, slumping and/or mass wasting	130	0.020		
Mid-Boreal Lowlands	Highly Erodible Soils	coarse textured, eolian sand deposits	471	0.071	15	0.164
	Highly Erodible Soils	soils prone to water erosion due inundation and surficial materials	292	0.044	6	0.066
	Unstable and/or Steep Slopes	combinations of soils and slopes prone to water erosion, slumping and/or mass wasting	1408	0.211	27	0.291
Interlake Plain	Highly Erodible Soils	coarse textured, eolian sand deposits	873	0.131	19	0.208
Aspen Parkland/Lake Manitoba Plain	Highly Erodible Soils	coarse textured, eolian sand deposits	12526	1.880	192	2.107

The distribution and extent of permafrost was mapped to determine regions susceptible to melting or loss due to Project activities. Areas of permafrost were identified based on two data sources: Manitoba Wetlands (1:50,000) and the Soil Resource Information (varying scales). The extent of permafrost occurrence identified within each data source for a given area was classed according to generalized classes described by Natural Resources Canada (2010), as follows:

- Continuous - >90 % ground coverage;
- Extensive discontinuous – 50-90 % ground coverage;
- Sporadic discontinuous – 10-50 % ground coverage; and
- None or Isolated patches[1] - < 10 % ground coverage.

The occurrence and permanence of permafrost throughout the Local Study Area generally increases in a northerly direction. Isolated and sporadic discontinuous permafrost begins to occur in the area north of The Pas (Natural Resources Canada 2010). Sporadic and extensive discontinuous permafrost dominate the soil landscape from the area of Thompson north. Limited areas of continuous permafrost occur in the northern portion of the Local Study Area, including in the vicinity of the Keewatinoow Converter Station.

While the Manitoba Wetlands and Soil Resource Inventory were in general agreement with the proportion of the Local Study Area affected by permafrost, the spatial occurrence and classes were somewhat variable (Table 6.2-4). It is prudent to consider both datasets when assessing the occurrence and distribution of permafrost.

[1] The generalized categories from Natural Resources Canada (2010) consisting of Isolated patches and None had to be combined for the purposes of this evaluation, as the lowest extent of polygon coverage represented in the Manitoba Wetlands and Soil Resource Information is 10 %. In other words, the resolution of these data sets precluded the ability to otherwise categorize areas with < 10 % permafrost coverage.

Table 6.2-4: Permafrost Summary

	Manitoba Wetlands				Soil Resource Inventory			
	Local Study Area		HVdc Footprint		Local Study Area		HVdc Footprint	
	ha	%	ha	%	ha	%	ha	%
Continuous	789	0.1	10	0.1	4880	0.7	45	0.5
Extensive Discontinuous	26185	3.9	313	3.4	81249	12.2	1160	12.7
Sporadic Discontinuous	161660	24.3	2308	25.3	58808	8.8	797	8.7
Isolated Patches/None	477547	71.7	6502	71.2	521244	78.2	7131	78.1

Based on the Manitoba Wetlands data, a total of 0.1 % of both the Local Study Area and right-of-way was found to be classed as continuous permafrost (Table 6.2-4). A total of 3.9 % of the Local Study Area and 3.4 % of the right-of-way was classed as extensive discontinuous permafrost, while 24.3% of the Local Study Area and 25.3 % of the right-of-way was classed as sporadic discontinuous permafrost.

Based on the Soil Resource Inventory data, a total of 0.7 % of the Local Study Area and 0.5 % of the right-of-way was found to be classed as continuous permafrost (Table 6.2-4). A total of 12.2 % of the Local Study Area and 12.7 % of the right-of-way was classed as extensive discontinuous permafrost, while 8.8 % of the Local Study Area and 8.7 % of the right-of-way was classed as sporadic discontinuous permafrost.

Potential access routes in the northern portion of the Local Study Area in areas of permafrost-affected soils primarily traverse sporadic discontinuous and extensive discontinuous permafrost.

Keewatinoow Converter Station & Associated Facilities

The Keewatinoow Converter Station site is characterized as having a range of soils, including poorly to very-poorly drained permafrost-affected Organic soils (56%) and non-frozen Organic soils (6%), and well-drained, mineral Brunisolic soils (41%). Soil inspections conducted at the site confirmed the occurrence of permafrost-affected Organic soils, non-frozen Organic soils, and mineral soils of variable textures.

The Keewatinoow construction camp site is dominated by well-drained, medium-textured, mineral Brunisolic soils (89%), with minor inclusions of poorly to very poorly drained, permafrost-affected Organic soils.

The soils at the Keewatinoow construction power site were previously mapped as containing three soil types: well-drained, medium-textured mineral Brunisolic soils (50%), very poorly drained, permafrost-affected Organic soil underlain by mineral soil (30%), and poorly drained, permafrost-affected Organic soil (20%). Soil drainage ranges

from well to very poor. Soil landscape inspections completed at the site confirmed an absence of permafrost; however the sequence of materials was generally found to be consistent with the existing data for the area. A gravel pad exists at the site.

AC Collector Lines and Construction Power Lines

The 310 m right-of-way for the northern collector lines is dominated (58%) by permafrost-affected Organic soils. Other important soils in the right-of-way include non-frozen Organic soils (31%) and mineral Brunisolic soils (10%), which are generally found along the banks of the Nelson River and other streams. The right-of-way is dominantly very poorly to poorly drained (89%), corresponding to Organic soil occurrences, while areas of mineral soils are well to rapidly drained. Mineral soil textures along the right-of-way are medium to coarse.

Borrow Sites and Excavated Material

Borrow sites, excavated material placement areas and a lagoon siting area have been identified in the vicinity of Keewatinoow Converter Station and construction camp. A review of mapped data indicate that these borrow sites and the lagoon siting area are located on primarily well drained Brunisolic soils, whereas the excavated material placement areas are located on both very poor and well drained permafrost-affected (discontinuous) and Brunisolic soils.

The preferred Keewatinoow ground electrode site is characterized as having a range soils, including very-poorly drained permafrost-affected Organic soils (47%) and non-frozen Organic soils (19.7%), and well-drained, mineral Brunisolic soils (33%). Soil inspections conducted at the site were in general agreement with previously-identified soils at the site.

The Keewatinoow ground electrode line right-of-way runs from Keewatinoow Converter Station to Keewatinoow Ground electrode site. The route is characterized by dominant occurrence of well drained, mineral Brunisolic soils (69%), and large occurrences of poorly to very poorly drained permafrost-affected Organic soils (31%). No soil inspections were conducted along this right of way, as route information was not available at the time of the field assessment.

Riel Converter Station

The Riel Converter Station site is located within an existing developed site. The site was developed on very fine to fine textured, poorly to imperfectly drained, Vertisolic and Chernozemic soils that had good agricultural capability (Class 2-3).

The preferred Riel ground electrode site is characterized as having imperfectly drained, very fine textured Vertisolic soils, with good agricultural capability (Class 2-3). Soil inspections conducted in the vicinity of the site were in general agreement with the

previously inventoried soil information. There are no unique terrain/soil features identified at the preferred Riel ground electrode site.

6.2.2 Air Quality and Climate

6.2.2.1 Overview

The following section documents an overview of the climate and atmospheric variables relevant to the Project Study Area. This section provides information on the following topics:

- Air quality;
- Climate; and
- Summary of climate by ecozones.

6.2.2.2 Air Quality

The Province of Manitoba generally enjoys excellent air quality which is comparable to or better than the air quality in other parts of Canada. Air quality concerns in Manitoba tend to be local in nature. Some of these issues include the presence of odours, noise and other pollutants. The main sources of these pollutants are industrial and agricultural operations, and vehicle emissions.

In northern Manitoba, emissions from base metallurgic smelters in Flin Flon and Thompson, and smoke from forest fires, tend to be the primary sources of air pollution. The status of these two smelters as a source of air pollution has changed, or is in the process of changing, as discussed below.

Since 1995, Manitoba Conservation, in conjunction with Environment Canada, has implemented an Air Quality Index (AQI) program to monitor the air for carbon monoxide, particulate matter (PM10), nitrogen dioxide, and ground-level ozone and fine particulate matter (PM2.5). An hourly AQI for Winnipeg has been calculated since 1987 and for Brandon and Flin Flon since 1997. Air quality in Winnipeg is relatively unchanged since data has been collected and has been characterized as good for more than 95% of the time in recent years. Brandon and Flin Flon air quality has also continued to be good, 85% or more of the time over the period that data has been collected (Manitoba Conservation 2009).

Sulphur dioxide has been a common air pollutant in Manitoba and in portions of the Project Study Area. It reacts with water vapour to form sulphuric acid. The resulting acid precipitation can occur long distances from where the sulphur dioxide was emitted. Up until June 2010, sulphur dioxide emissions were monitored at five locations near the

Hudson Bay Mining and Smelting Co. Limited (HMB&S) zinc and copper smelter in Flin Flon. As of June 2010, the smelter operation at Flin Flon has been closed. For the last complete reporting year (2009), HBM&S reported that its emissions for sulphur dioxide were 144 kilotonnes (compared to the regulated limit of 220). This emission level was within the 2008 federal pollution prevention target for sulphur dioxide.

There are also four monitoring locations near the VALE (INCO) Limited nickel smelter in Thompson. For 2008, three of these sites were monitored by VALE; one was jointly monitored with Manitoba Conservation. For 2005, the last reporting year where data was available on air quality in Thompson, sulphur dioxide emissions were 180 kilotonnes (down from 192 kilotonnes the previous year). In the mid-1990s, these two smelters, both within the Boreal Shield ecozone, accounted for over 95% of the human-caused emissions of sulphur dioxide in Manitoba (Manitoba Conservation 1997). The emissions have continually decreased over the years with better control of sulphur dioxide from the metallurgic smelters. Precipitation has remained at acceptable levels and not within the range usually associated with human-caused acid rain. Acid rain is not a problem in the Province as acidic precipitation is not generally elevated and most of the soils and surface waters have a buffering capacity to neutralize such deposition. However, Manitoba is continuing its overall efforts to reduce sulphur dioxide emissions. In December 2010, VALE announced that it was closing down its smelter operations in Thompson beginning in 2012 due to a lack of raw materials, more stringent environmental standards required at the Thompson smelter, and refinery and extra smelter capacity elsewhere in Canada.

6.2.2.3 Climate

Climate data available for the Project Study Area was obtained using Environment Canada and Agriculture and Agri-Food Canada sources. Climate data from Agriculture and Agri-Food Canada followed the Ecozone, Ecoregion and Ecodistrict format. Climate data used are averages obtained from 1951-1980, 1961-1990, or 1971-2000. Climate averages and extremes (e.g. temperature and precipitation) are for Canadian locations with at least 15 years of data between 1971 and 2000 (Environment Canada, 2010). Averages have been calculated from climate data at weather stations in locations in the Project Study Area. Climate data for the ecoregions include the monthly and annual number of growing degree-days. Wind data was also collected from Environment Canada's Wind Energy Atlas using averages from seasonal data. For the purpose of this EIS, the seasonal frequencies that used monthly averages and the annual mean wind speed are included. Wind data that was obtained was for the same latitude and longitude of the corresponding weather station that provided temperature and precipitation information from Agriculture and Agri-Food Canada or Environment Canada (Environment Canada 2008). There are 72 weather stations in and around the Project Study Area.

The Project Study Area encompasses portions of five ecozones, as described below, and portions of 10 ecoregions. The Project Study Area ecoregions comprise six major ecoclimates. Map 6-2 shows ecozones and Map 6-3 shows ecoregions in the Project Study Area.

6.2.2.4 Summary of Climate by Ecozone

Hudson Plain Ecozone

In the north, the Hudson Plain Ecozone is strongly influenced by cold and moisture-laden Hudson Bay and Polar High air masses, resulting in short, cool summers with long, very cold winters. Mean annual temperatures can reach –7°C. Precipitation varies from about 400 to 800 mm annually. Within this ecozone, the Hudson Bay Lowland Ecoregion is part of the very extensive High Subarctic Ecoclimatic Region. The climate station at Churchill Airport is the only station within the Manitoba portion of the ecozone.

Taiga Shield Ecozone

The Taiga Shield Ecozone has a subarctic climate with short summers and long, very cold winters. The mean annual temperature can reach –9°C and can accumulate 200 to 500 mm of precipitation annually. Within this ecozone, the Selwyn Lake Upland Ecoregion has a Low Subarctic Ecoclimate. The closest climate station to the Project Study Area within the Manitoba portion of the ecozone is located at the Brochet Airport.

Boreal Shield Ecozone

The Boreal Shield Ecozone has a continental climate of long, cold winters and summers that are short and cool. The mean annual temperature is near –4°C and the area receives approximately 400 mm of precipitation annually. The average number of growing degree days over 5°C ranges from 1038 to 1079. The frost free period ranges from 59 to 115 days. The Churchill River Upland and Hayes River Upland Ecoregions lie within the continuous subhumid, High Boreal Ecoclimatic Region. Within the Project Study Area, climate stations within the Manitoba portion of the ecozone and ecoregions are located at Gillam, Thompson and Flin Flon Airports.

Boreal Plain Ecozone

The Boreal Plain Ecozone has a continental climate that consists of cold winters and moderately warm summers. The mean annual temperature ranges from –2°C to 2.5°C with approximately 600 mm of precipitation annually. The average number of growing degree days over 5°C is 1395. The frost free period is approximately 114 days. The Mid-Boreal Lowland and Mid-Boreal Upland Ecoregions are part of the Subhumid Mid-

Boreal Ecoclimatic Region. The Boreal Transition and Interlake Plain Ecoregions are part of the Subhumid Low Boreal Ecoclimatic Region. The climate station at The Pas Airport is the only station within the Manitoba portion of the ecozone.

Prairie Ecozone

In the south, the Prairie Ecozone has a continental climate with long, cold winters and short, warm summers. Mean annual temperature ranges from 1.5°C to 3.5°C. Mean annual precipitation reaches approximately 550 mm. The average number of growing degree days over 5°C ranges from 1631 to 1802. The frost free period ranges from 106 to 121 days. The Aspen Parkland and Lake Manitoba Plain Ecoregions lie within the Transitional Grassland Ecoclimatic Region. The climate stations at Dauphin Airport and Winnipeg International Airport are the two stations within the Project Study Area used to characterize the climate for the Manitoba portion of the ecozone. Other climate stations within Project Study Area ecoregions are located at Gilbert Plains and Brandon.

6.2.3 Groundwater

6.2.3.1 Overview

Groundwater is defined as water located beneath the ground surface in soil pore spaces and in the fractures of rock formations. A unit of rock or an unconsolidated deposit is called an aquifer when it can yield a usable quantity of water. Groundwater is recharged from, and eventually flows to, the surface naturally. Groundwater is also often withdrawn for agricultural, municipal and industrial use by constructing and operating wells. The study of the distribution and movement of groundwater is known as groundwater hydrology or hydrogeology. To understand the current groundwater regime in the vicinity of the Project, existing geological and groundwater hydrological information was reviewed.

This section provides information on the following groundwater topics:

- Summary by groundwater regions;
- VECs; and
- Existing environment at Project Components.

6.2.3.2 Summary by Groundwater Regions

Western Canada Sedimentary Basin

The Western Canada Sedimentary Basin occupies the southwestern part of Manitoba and consists of Paleozoic, Mesozoic and Cenozoic deposits (Map 6-6). Paleozoic rocks

are generally carbonates with minor clastics and evaporites, while Mesozoic rocks are dominantly shales with lesser amounts of sandstones, carbonates and evaporites. Paleozoic and Mesozoic rocks dip gently toward the southwest. Cenozoic rocks are found only in the Turtle Mountain area, which is removed from the Project.

Precambrian Bedrock

Groundwater resources and aquifer definition in the Precambrian Shield portions of the Local Study Area (Map 6-6) remain largely unexplored due to a sparse population and the abundance of surface water resources. Groundwater exploration in the southeast portion of the Province, however, can serve as a model for the northern reaches of this geologic unit.

Sand deposits encountered in the overburden are not well explored for the same reason as Precambrian bedrock, but the presence of local sand and gravel aquifers is expected in coarse glacial deposits such as eskers and moraines.

Hudson Bay Basin

The Hudson Bay Basin is located in the northeastern part of Manitoba and is comprised of primarily Paleozoic carbonates (Map 6-6). In this basin, sedimentary units gently dip toward to the northeast. Limited information is available on the basal sandstone separating the Precambrian metamorphic and igneous rock from these overlying Paleozoic carbonates. Betcher *et al.* (1995) suggests that the basal sandstone is regionally connected to the carbonate rock and therefore could be considered as a part of the Western Canada Sedimentary Basin Carbonate-Evaporate Unit. The Carbonate-Evaporate Unit primarily consists of limestones and dolostones of Silurian and Ordovician age containing karst aquifers nearby. Shallow marine and continental deposits up to 80 m thick overlie the Paleozoic bedrock of the Hudson Bay Basin. Groundwater supply potential of these deposits is not well explored.

6.2.3.3 Valued Environmental Components

Sustainability of aquifers 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 quality and aquifer productivity have been identified as VECs and are described below.

Aquifer Quality

Aquifer quality is an important component of groundwater resources and is valued by humans for domestic, agricultural and industrial consumption and use, where both suitable and feasible. 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 contamnants. Aquifer quality can be compromised by a potential entry of contaminants.

Sites Vulnerable to Shallow Subsurface Contamination

Aquifer vulnerability to shallow subsurface contamination was assessed using the map developed by Kirch (1997), in collaboration with Manitoba Conservation, for the assessment of aquifer sensitivity to contamination from underground petroleum tanks. This approach can be adopted to assess the vulnerability of groundwater impacts to a potential contingency event (e.g., surface spill).[2]

The most sensitive areas of the Local Study Area route to potential groundwater contamination from any contingency event are located along the southern portion of the route (east of the Red River) and immediately north of The Pas. The sensitivity in these locations is related to the connection between the potable carbonate aquifer and the overlying shallow sand and gravel aquifers wherein the shallow aquifer is the recharge zone for the deeper aquifer.

Areas with Artesian Conditions

Artesian groundwater conditions have been identified as environmentally sensitive areas because of the risk of potential interconnection between artesian aquifers and the surficial environment due to interception during drilling or foundation installations. The locations of known flowing wells and springs (i.e., artesian groundwater conditions) were provided by Manitoba Water Stewardship (Betcher 2011 *pers. comm.*) The highest risk of interception is expected in the areas of artesian saline aquifers, because of potential interconnection between saline aquifers and the surficial environment or freshwater aquifers will cause degradation of soil and/or water.

[2] It is noted that the results of Manitoba Conservation's vulnerability analysis is biased by parameter weighting and limited to a regional scale and therefore may not resolve local sand and gravel aquifers up to 5 km long or wide.

Therefore, artesian areas were separated into three categories listed in decreasing risk of potential interception as follows:

- Saline artesian areas;
- Artesian areas with uncertain water quality; and
- Freshwater artesian areas.

These areas are separately shown on Map 6-7. The salinity of groundwater in the artesian areas was identified where possible using the 1:250,000 scale Provincial Groundwater Map series and report by Rutulis (1985).

Aquifer Productivity

Measurable parameters of aquifer productivity include, but are not limited to, groundwater levels, hydraulic conductivity, aquifer extents and specific yield. Additional detail may be found in the Bipole III Groundwater Technical Report.

6.2.3.4 Existing Environment at Project Components

HVdc Transmission Lines

Detail on bedrock geology and aquifers for the HVdc treansmission line may be found in the *Bipole III Groundwater Technical Report*.

Keewatinoow Converter Station & Associated Facilities

Hydrogeological conditions at the Keewatinoow Converter Station and ground electrode site are expected to be similar to conditions at the construction camp site due to proximity and similar geomorphologic setting of these components (see above). Ongoing investigations will confirm expected hydrogeological conditions prior to construction. Surficial soils at the Ground Electrode Site are characterized as a mix of medium-textured fluvial mineral deposits and organic deposits overlying medium-textured till materials.

At the borrow sources and excavated material placement sites (identified in the vicinity of the northern Project components), the major bedrock aquifer is separated from the surface by approximately 60 m of overburden. Sand and gravel aquifers are not explored in the area, but small aquifers (less than 0.5 km^2) might associate with the granular deposits.

The construction camp will be located within Section 9 and the carbonate rocks of the Hudson Bay Basin. Groundwater investigations in the vicinity of the camp indicate that the carbonate bedrock beneath this area contains a potable aquifer which could serve as the main source of groundwater supply for the construction camp and the Keewatinoow Converter Station. The bedrock aquifer has a high permeability but is also hydraulically

connected to the Nelson River. Piezometric levels in the aquifer are a few meters above bedrock surface. The bedrock is overlain by a thick (approximately 60 m) overburden that has hydraulic conductivities between 10^{-4} m/s (river alluvium) and 10^{-6} m/s (till and lower postglacial sediments. Data on the groundwater quality of the overburden are not available.

The local conditions at the northern AC collector and construction power lines are expected to be similar to conditions at the Keewatinoow construction camp site due to proximity of these components of the Project (see above). Ongoing investigations will confirm expected hydrogeological conditions prior to construction.

Riel Converter Station & Associated Facilities

The Winnipeg Formation sandstone and carbonate aquifers are encountered beneath the sites for the Riel Converter Station and preferred site for the ground electrode. The upper carbonate aquifer used for local groundwater supply for domestic and agricultural/livestock supply. The carbonate aquifer is overlain by 10-20 m of clay at the ground electrode site and 20-30 m of clay at the Riel Converter Station site (Rutulis 1990). Flowing wells were documented at the Ground Electrode site indicating artesian conditions. It is noted that 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.

6.2.4 Aquatic Environment

6.2.4.1 Overview

This section focuses on the existing aquatic environment in the Project Study Area. This includes surface water flows (hydrology) and quality, as well as the aquatic biota that use surface waters. The section is organized into the following topics:

- Hydrology;
- Surface water quality;
- Lower trophic levels;
- Fish species and distribution;
- Fish habitat and water courses;
- Aquatic invasive species;
- Protected species;

- VECs; and
- Existing Environment at Project Components.

6.2.4.2 Hydrology

The Project Study Area crosses portions of eight Manitoba drainage basins (Map 6-9), including 34 sub-basins (Table 6.2-5; Fedoruk 1970). In order from north to south, these include the Hudson Bay, Churchill River, Nelson River (then the Churchill River basin again), Saskatchewan River, Lake Manitoba, Assiniboine River, Red River, and Lake Winnipeg basins. An inventory of the, larger water bodies within the Project Study Area is shown in Appendix 6A, Table 6A-1 as listed in Fish Inventory Habitat Classification System (FIHCS).

Table 6.2-5: Drainage Basins within the Project Study Area

Drainage Basin	Drainage Sub-basin	Area (km^2)	% Study Area
Hudson Bay	Owl River	3,024	1.4
	Total	3,024	1.4
Churchill River	Lower Churchill River	11,498	5.5
	Upper Churchill River	10,576	5.0
	Total	22,074	10.5
Nelson River	Lower Nelson River	16,039	7.6
	Upper Nelson River	7,269	3.5
	Burntwood River	25,229	12.0
	Grass River	16,220	7.7
	Total	64,757	30.9
Saskatchewan River	Cedar Lake	7,586	3.6
	Clearwater Lake/Moose Lakes	9,179	4.4
	Pasquia River/Saskeram Lake	14,883	7.1
	Total	31,648	15.1
Lake Manitoba	Duck Mountain	4,543	2.2
	Lake Manitoba West	3,969	1.9
	Lake Winnipegosis	16,774	8.0
	Shoal Lakes/Delta Marsh	641	0.3
	Swan Lake	7,232	3.4
	Turtle River	2,455	1.2
	Valley River	6,278	3.0
	Whitemud River	12,108	5.8
	Total	54,000	25.8
Assiniboine River	Assiniboine West	2,155	1.0
	Birdtail Creek & Oak River	5,791	2.8
	Central Assiniboine	4,039	1.9
	Lake of The Prairies	2,192	1.0
	Little Saskatchewan	4,386	2.1
	Lower Assiniboine	1,768	0.8
	Shell River	2,632	1.3
	Souris River/Whitewater Lake	883	0.4
	Total	23,846	11.4
Red River	Red River South	266	0.1
	Cooks Creek/Devils Creek	1,215	0.6
	La Salle River	2,677	1.3
	Morris River	2,218	1.1
	Rat River	194	0.1
	Netley Creek/Grassmere Creek	529	0.3
	Seine River	2,057	1.0
	Total	9,156	4.4

Drainage Basin	Drainage Sub-basin	Area (km^2)	% Study Area
Lake Winnipeg	Brokenhead River	1,200	0.6
	Total	1,200	0.6
TOTAL STUDY AREA DRAINAGE		209,705	100

The Churchill and Nelson River drainage basins lie on the Canadian Shield through the west and central portions of Manitoba, but eventually descend easterly onto the Hudson Bay coastal plain. The Project Study Area portion of the Saskatchewan River basin transitions from the Prairie in the south to the Canadian Shield in the north. The Lake Manitoba, Assiniboine River, Red River, and Lake Winnipeg drainage basins are located within the Prairie and/or Aspen Parkland area and extend beyond Manitoba.

Hudson Bay Basin

The northeastern-most part of the Project Study Area begins in the Hudson Bay basin, where it is limited to a small headwater portion of the Owl River sub-basin. Approximately 1% of the Project Study Area is within this drainage basin (Table 6.2-5). This basin is outside the extent of the Canadian Shield on the Hudson Bay coastal plain. Water courses in this part of the Project Study Area are generally low gradient bog/fen with limited surface drainage. Streamside vegetation is generally alders, spruce or willow (Mills *et al.* 1976). The lakes are generally small, shallow, with stained brown water, and soft fine sediment substrates. Shoreline vegetation for these water bodies is generally birch, larch, peat (lichen/moss), sedge, and spruce (Mills *et al.* 1976). Drainage flows northeast into the Owl River and eventually into Hudson Bay.

Churchill River Basin

The Project Study Area includes two separate portions of the Churchill River drainage basin. In the northwest it encounters the Upper Churchill River sub-basin and in the northeast it encounters the Lower Churchill River sub-basin (separated by the Nelson River basin). Approximately 10% of the total Project Study Area is within this basin (Table 6.2-5). Both sub-basins lie entirely in the Canadian Shield. Riparian vegetation is similar to the Hudson Bay basin, consisting of a combination of alders, birch, larch, peat, poplar, sedge, spruce or willow (Mills *et al.* 1976). The Upper Churchill River sub-basin drains northeast and includes Kississing and Highrock lakes and the Kississing River. The Lower Churchill sub-basin also drains northeast and includes large lakes such as Waskaiowaka and Baldock.

Nelson River Basin

The Nelson River basin comprises the largest proportion of the Project Study Area (31%; Table 6.2-5). The Nelson River basin's extent in the Project Study Area begins in the west near Cranberry Portage and flows northeast ending near Gillam. Most of this basin is on the Canadian Shield; however, the easternmost extent is on the Hudson Bay

coastal plain (Mills *et al.* 1976). Marsh and bog areas are common throughout and the landscape is generally hummocky and predominated by small to medium oval and rounded lakes with smooth shorelines. Many larger lakes exist; often shallow with irregular rocky shorelines (Schlick 1972; Cleugh 1974; Veldhuis 1979). Riparian vegetation is similar to the Hudson Bay and Churchill River basins, consisting of a combination of alders, birch, larch, peat, poplar, sedge, spruce or willow (Mills *et al.* 1976).

Within the Project Study Area, the Lower Nelson River sub-basin begins at Split Lake and flows northeast ending at the potential future Conawapa Generating Station site. This sub-basin includes the Nelson River mainstem and Split Lake as well as numerous headwater lakes and tributaries of these water bodies. The eastern portion of this sub-basin lies within the Hudson Bay coastal plain and is notable for a number of small to medium sized tributaries of the Nelson River mainstem that, with their coarse substrate and groundwater flows, support fall spawning runs and resident populations of brook trout. These include the Weir and Limestone rivers. Further west, this sub-basin consists of more typical boreal lakes and rivers such as the Crying and Assean rivers.

The Burntwood River sub-basin is the largest sub-basin within the Project Study Area and contributes the greatest drainage area to the Nelson River basin (Table 6.2-5). Within the Project Study Area, the sub-basin generally begins at Rat Lake, flows southeast to Wuskwatim Lake, and then flows northeast joining the Nelson River at Split Lake. The predominant water course in the Burntwood River sub-basin is the Churchill River Diversion (CRD), which enters the Project Study Area from the north via the Rat River. The diversion was constructed during the early 1970s to divert water from the Churchill River system into the Nelson River system for hydroelectric generation. Flows in the Rat River are augmented with flows from the Churchill River through a diversion channel that was excavated from South Bay on Southern Indian Lake to Issett Lake in the upper reaches of the Rat River system. Flows in the diversion channel are controlled by the Notigi Control Structure located at the outflow of Notigi Lake adjacent to Provincial Road (PR) 391. Water released through Notigi flows through Wapisu Lake and into Threepoint Lake where it converges with the Burntwood River. Diversion flows continue down the Burntwood River through Wuskwatim, Opegano, Birch Tree, and Apussigamasi lakes before converging with the Nelson River at Split Lake. High clay banks that are treed to the shoreline characterize river shorelines from Notigi Control Structure to Threepoint Lake. Flooded standing dead trees occur in low areas, near tributary confluences and in backwater bays. Bedrock banks occur in constricted areas, where current is higher.

The Grass River sub-basin lies south of the Burntwood River sub-basin and is similar in size to the Lower Nelson sub-basin (Table 6.2-5). This system begins in the west near Cranberry Portage and, similar to the Burntwood River basin, flows northeast converging with the Nelson River at Split Lake. Water bodies in this sub-basin include

numerous lakes and rivers; notably, the Grass, Missipisew and Wuskatasko rivers and Wekusko, Herblet, Snow and Tramping lakes.

Saskatchewan River Basin

The Saskatchewan River basin has the third largest drainage area in the Project Study Area (approximately 15%; Table 6.2-5). This basin begins near Flin Flon along the Saskatchewan border and flows southeast to Cedar Lake. Water bodies in this area are typically characterized by shallow depth, soft substrate, higher turbidity and marsh or bog shorelines. The northern portion of this basin is underlain by limestone and includes Clearwater and Cormorant lakes. The Saskatchewan River delta, Summerberry Marsh, and the Pasquia and Carrot river valleys dominate the central and southern portion of this basin and include Mawdesley, Atikimeg, and Tremaudian lakes. Flows in the Saskatchewan River are controlled by the E.B. Campbell Generating Station at Iskwao Rapids in Saskatchewan and by the Grand Rapids Generating Station in Manitoba. A typical water course in the southern portion of the Project Study Area drains low boggy areas, is highly convoluted, and has relatively low water velocities. Shoreline vegetation is generally a combination of birch, dogwood, grass/sedge, peat, poplar, or willow (Benke and Cushing 2010).

Lake Manitoba Basin

The Lake Manitoba basin is the second largest drainage basin in the Project Study Area comprising 26% of its area (Table 6.2-5). This basin extends from the Lake Winnipegosis sub-basin in the north, south through the escarpment region of Manitoba to the Whitemud River sub-basin. Water courses generally flow from west to east. The varied topography in this basin, ranging from the steep elevation change of the escarpment to the lowland region adjacent to lakes Winnipegosis and Manitoba, results in a diverse range of fish habitat features. The northern portion of the Lake Winnipegosis sub-basin is characterized by the Overflowing River, Red Deer Lake, and Red Deer River. Further south, the small lakes and streams on top of the Porcupine Mountains flow northeast to Lake Winnipegosis through the Bell, Birch, Woody and Steeprock rivers. The Swan Lake sub-basin captures water from the southern portion of the Porcupine Mountain through the Woody River and the Swan River valley through the Swan and Roaring rivers. The Valley River, Turtle River, and Duck Mountain sub-basins collect water from the eastern sides of the Duck and Riding mountains and enter Lake Winnipegosis either directly or via Dauphin Lake and the Mossy River. The Lake Manitoba West sub-basin captures water from the southeastern slopes of Riding Mountain before flowing through the low gradient landscape adjacent to the lake. Characteristic of the escarpment streams are elevated water velocity and coarse stream substrate. Once on the lowland areas adjacent to lakes Winnipegosis and Manitoba or to Swan Lake, water velocity slows and substrates shift to fine silts and organics. Shoreline vegetation is generally a combination of birch, dogwood, grass/sedge, poplar, or willow.

Assiniboine River Basin

The Assiniboine River basin comprises 11% of the Project Study Area (Table 6.2-5). Its catchment area begins with the Shell River and Lake of the Prairies sub-basins in the northwest, flows southeast including the southwestern drainages of the Duck and Riding mountains in the Little Saskatchewan River and Birdtail Creek sub-basins, and then flows east through the sand hills region of Spruce Woods before joining the Red River at Winnipeg. The majority of lands adjacent to water bodies in this basin are in agricultural use, and many riparian areas have been encroached upon by related activities. Shoreline vegetation is generally a combination of Manitoba maple, ash, basswood, cattail, cottonwood, dogwood, elm (although now largely gone due to disease), grass/sedge, or poplar (Benke and Cushing 2010). Major features of this basin include Lake of the Prairies, created on the Assiniboine River by the Shellmouth Dam, three impoundment lakes on the Little Saskatchewan River system, and numerous small pothole lakes and streams in the area south of Riding Mountain. Flows in the Assiniboine River are controlled by the dam at Lake of the Prairies and through the Assiniboine River Diversion at Portage la Prairie. Similar to the Lake Manitoba basin, higher elevation streams of the escarpment area in the Assiniboine River basin have higher water velocity and coarse stream substrates compared to streams in more southern lowland areas that have slower water velocity and substrates composed of fine silts and organics.

Red River Basin

The Red River basin comprises approximately 4% of the Project Study Area and generally surrounds Winnipeg (Table 6.2-5). It is characterized by a low gradient landscape dominated by row-crop agriculture where many of the smaller water courses have been severely altered or eliminated. Major water courses still persist, but have undergone shoreline modifications and flow management. Examples include the Red, La Salle and Seine rivers. Even so, water courses in this basin, with fine substrates of silt and clay, are highly productive supporting a high diversity of fish. Shoreline vegetation is generally a combination of Manitoba maple, ash, basswood, cottonwood, elm (limited to sites where managed, due to disease), oak or willow (Benke and Cushing 2010). Drainage is generally east and west to the river and north to Lake Winnipeg.

Lake Winnipeg Basin

The Lake Winnipeg basin comprises the smallest portion of the Project Study Area, comprising less than 1% (Table 6.2-5). The Project Study Area portion of this basin is situated east of Winnipeg and contains the small headwater streams of the Brokenhead River sub-basin. This area has similar characteristics to the Red River basin: low gradient area dominated by agriculture with water courses altered for field drainage. Water courses have fine substrates of silt and clay. Shoreline vegetation in this small area is

generally a combination of ash, basswood, cottonwood, elm (limited due to disease), oak, spruce or willow. Drainage is generally northward to Lake Winnipeg.

6.2.4.3 Surface Water Quality

Surface water quality throughout the Project Study 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 artificially altered surface water conditions are experienced throughout the region.

The majority of the northern half of the Project Study Area is comprised of the Churchill and Nelson River basins, which lie within the Canadian Shield physiographic region of Manitoba. The quality of surface water within this area is influenced by glacio-lacustrine deposits which overlie the Precambrian bedrock (Hecky and Ayles 1974). Although lakes in this region may be considered Precambrian in nature, the water is somewhat harder, more nutrient rich, and more turbid than typical Shield lakes, primarily due to the presence of the glacio-lacustrine deposits (Hecky and Ayles 1974).

The majority of the northeast part of the Project Study Area lies within the Nelson River basin, where flows have been altered by water regulation for hydroelectric development, i.e., Churchill River Diversion (CRD) and Lake Winnipeg Regulation. Similar to the Burntwood River sub-basin, the major water bodies within this area have well documented water quality information. Generally, notable increases in turbidity, dissolved minerals, and phosphorous have been observed since hydroelectric development (Baker and Davies 1991; Williamson 1993).

The Burntwood River sub-basin covers the majority of the north-central region of the Project Study Area. Water bodies within this sub-basin (includes the Rat River watershed) have well documented water quality information developed in anticipation of and/or resulting from the CRD project. The primary effects of CRD development on this system were: increased turbidity, higher concentrations of sodium, potassium, chloride, fluoride, and total phosphorous, as well as decreased conductivity, alkalinity, and concentrations of calcium and magnesium (Ramsey 1991; Williamson and Ralley 1993). These effects primarily resulted from the addition of softer Churchill River water to the system and from shoreline erosion caused by elevated water levels and increased discharge through the system.

Lakes within the northern region are generally similar in chemical composition and are predominantly isothermal throughout the summer (Cleugh 1974; Hecky and Ayles 1974; Bezte and Kroeker 2000). The isothermal nature of the lakes throughout most of the open-water season can generally be attributed to relatively shallow average depths and turbulent flows throughout the riverine sections of the system. These characteristics, combined with the presence of glacio-lacustrine clays, and the potential for wind-induced mixing, result in relatively high water turbidity (Cleugh 1974). The Burntwood

River upstream of Threepoint Lake is generally the most turbid region of this system, with somewhat less turbid water in Footprint Lake (on the Footprint River). Notigi and Wapisu lakes tend to be less turbid than lakes downstream of the Burntwood River influence, such as Threepoint and Wuskwatim lakes (Bezte and Kroeker 2000).

The Grass River sub-basin lies within an area of mainly grey wooded podzol soils, which are low in available nutrients and generally poorly drained (CEC 1982). Lakes within this area are typical shield lakes: hard (high calcium carbonate [$CaCO_3$]), shallow (average depth of 3-6 m), with rocky shorelines and numerous islands. Because of the exceptionally high water quality within the upper Grass and upper Burntwood River systems, the CEC (1981) proposed that these waters come under a "non-degradation" objective for water quality control. Water bodies under this designation include the Grass River, Reed Lake, Simonhouse Lake, Cranberry Lakes, Tramping Lakes, and others (CEC 1982).

The central portion of the Project Study Area includes the eastern tip of the Saskatchewan River basin. This area consists mainly of carbonate rock overlain by glacial tills and proglacial lacustrine sediments (Betcher 1995). Lake water in this area is typically well aerated and rich in dissolved minerals (Williamson 1988). Both Clearwater and Cormorant Lakes have received much attention due to their excellent clarity and pristine conditions. Clearwater Lake received the "High Quality Surface Water" designation from the CEC in 1989 which implies strict regulations on discharges into and development involving Clearwater Lake.

The south-central section of the Project Study Area lies within the Lake Manitoba basin. This is an area of gentle relief bounded to the west by the higher relief areas of the Manitoba Escarpment. Mainly carbonate bedrock is overlain by highly calcareous glacial till and proglacial lacustrine sediments (Betcher 1995 and Weir 1983). This area includes a number of small streams and rivers and in particular, includes Dauphin Lake, a large, shallow (mean depth 2.1 m) water body with mostly silty-clay substrates (Schaap 1987). Complete mixing caused by wind action results in elevated turbidity and water temperatures, which in turn create favourable conditions for algal blooms.

The southern extent of the Project Study Area encompasses the eastern edge of the Assiniboine River basin and a portion of the northern tip of the Red River basin to the south. Areas within the Assiniboine drainage basin of Manitoba are characterized by shale, sandstone, and limestone bedrock overlain with moderately calcareous glacial tills (Weir 1983; Betcher 1995). Areas within the Assiniboine river floodplain are typically flat with sandy/silty soils. Surface water quality within the Assiniboine River and its tributaries is directly impacted by discharges from industrial, municipal, and agricultural sources. Bourne *et al.* (2002) reported 52 wastewater treatment facilities and five major industrial operations were licensed to discharge directly into the Assiniboine River. These activities, along with other natural processes, have resulted in excessive nutrient loading (nitrogen and phosphorous) within this system. By 1994, total Nitrogen load

within the Assiniboine River (at Headingly, Manitoba) had increased by 863 tonnes from 1973 levels (Bourne 2002). Higher concentrations of both nitrogen and phosphorous can result in algal blooms which reduce water quality and can limit the productive capacity for local biota.

The Red River watershed is underlain with Ordovician limestone and dolomite bedrock covered by mostly clay and silt surface deposits (CEC 1981). This area is dominated by the Red River and its tributaries, including the Assiniboine River to the west. Historically, this basin had a diversity of streams and wetlands. However, agricultural development has eliminated the majority of wetlands and created an artificial drainage network that diverts most surface waters into the Red River and its larger tributaries. Water quality within the Red River is subject to inflows from wastewater treatment facilities, industrial, and agricultural activities originating both in the United States and southern Manitoba. The resulting river conditions include high turbidity, varying levels of dissolved oxygen, periodic algal blooms and, in some areas, a noticeable odour (CEC 1981). Downstream of Winnipeg, detectable levels of pesticide and fertilizer residues have been identified, along with certain non-degradable chemical compounds from wastewater treatment effluents. Accidental spills of organic and untreated effluent into the Red River have occurred and remain a serious threat to the integrity of these waters. Concerns have been raised on several occasions regarding the potential health risks associated with microbial and pathenogenic organisms existing in the Red River water.

Both the Assiniboine and Red River basin areas are strewn with small, generally stagnant prairie pothole lakes and constructed dugouts. Given their nature and proximity to agriculture and livestock operations, these water bodies are typically high in nutrient concentrations and host rich algal communities. These small water bodies in particular are prone to outbreaks of blue-green algae (cyanobacteria), which can produce deadly toxins for wildlife, livestock, and humans (Jones *et al.*1998).

In Manitoba, water quality is monitored using a Water Quality Index (WQI) which was developed through a joint federal-provincial-territorial program by the Canadian Council of Ministers of the Environment (CCME). Based on this index, water quality in three Manitoba ecozones was classified over a period from 1992 to 2007. Water quality was determined to be good in the Boreal Shield and Boreal Plains ecozones and generally fair in the Prairie ecozone. In all three of these ecozones, water quality was reported as being relatively stable (Manitoba Conservation, 2008). Water quality was also determined at individual monitoring sites for Manitoba, specifically within the Lower Saskatchewan - Nelson River and Assiniboine - Red River Drainage Basins for the period 2005 to 2007. The results ranged from good to fair. All water quality at the monitoring stations was rated as excellent, good, marginal, fair, or poor based on the water's suitability for protecting aquatic life (Environment Canada Water Quality Indicators, 2010). Fifteen monitored sites are located in the Lower Saskatchewan - Nelson River Drainage Basin within the Project Study Area.

Four of these sites, Split Lake (near the community of Split Lake), Footprint Lake (near the community of Nelson House), Mossey River (near Winnipegosis) and Boggy Creek (downstream of Lake Irwin) had water quality ratings by the Provinve of good. Nine sites had a water quality rating of fair, including: the Burntwood River (at Thompson); Saskatchewan River (above Carrot River); Woody River (northeast of Swan River); North Duck River (at Cowan); Valley and Vermillion Rivers (north of Dauphin); Ochre River (near community of Ochre River); Turtle River (at Ste. Rose du Lac); and Whitemud River (at Westbourne). At two of the monitoring sites, Swan River (near Lenswood) and Edwards Creek (south of Dauphin), water quality was rated as marginal. Within the Assiniboine - Red River Drainage Basin, eight monitoring sites are located within the Project Study Area. One site, the Little Saskatchewan River (near Rivers), was rated as having good water quality. Three sites had a water quality rating of fair, including: Assiniboine River (at Brandon); Seine River (south of Winnipeg); and Cooks Creek (at the Springfield and St. Clements boundary). The remaining four monitoring sites had a water quality rating of marginal, including: Assiniboine River (upstream and downstream of Portage la Prairie); Assiniboine River (at Headingley); and La Salle River (downstream of la Barrier Park Dam).

6.2.4.4 Lower Trophic Levels

Aquatic lower trophic level organisms include bacteria, algae (large filamentous algae and microscopic phytoplankton), large rooted plants (aquatic macrophytes), and invertebrates (zooplankton, aquatic insects, shellfish). Lower trophic levels form the basis of the food web and, therefore, are important to higher trophic levels such as fish. In particular, aquatic invertebrates are noted for their ecological significance as a dietary item for fish.

Aquatic invertebrates are defined as those living organisms that lack a spinal chord and are associated with the aquatic environment in one or more of their life stages. Aquatic invertebrates can be divided into two main categories: microinvertebrates (those indistinguishable by the naked eye) and macroinvertebrates (those that can be distinguished without the aid of magnification). Microinvertebrates are widespread throughout the Project Study Area and are broadly classified as zooplankton. Macroinvertebrates include a wide range of organisms such as water mites, insects, worms, mollusks, and crayfish.

Aquatic invertebrates within the Project Study Area inhabit a variety of riverine and lacustrine environments. Species distribution, diversity, and relative abundance throughout the area are influenced by differences in water depth, water current, substrate type, vegetation, water chemistry, and climate. Although parameters can be broadly characterized, it is the compounding effects of these parameters that directly influence the suitability of water bodies for invertebrate communities. Within individual water bodies, invertebrates utilize various habitat types based on physiological constraints (e.g.,

temperature), feeding habits (e.g., filter feeders versus carnivores), trophic interactions (e.g., predator and prey relationships), and physical constraints (e.g. flow regimes). Some types of invertebrates spend their entire life cycle within the aquatic environment while others utilize this medium only during particular life stages (e.g., egg or larval stages with larvae eventually emerging from the water as a terrestrial adult).

Aquatic invertebrates occupy valuable ecological roles; serving as food sources for higher trophic levels (including fish species), recycling organic materials and nutrients, and removing toxic substances from the water column. Aquatic invertebrates can also serve as valuable bio-indicators of environmental change. Invertebrate responses at the individual, species, or community level can be observed and linked to short and long-term environmental stresses (Hodkinson and Jackson 2005, Rosenberg *et al.* 2005).

The southern reach of the Project Study Area encompasses the geographic range of the endangered Saskatchewan-Nelson population of the mapleleaf mussel as designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The mapleleaf mussel inhabits medium to large rivers with low to moderate flows and shallow lakes with soft to coarse substrate (Metcalfe-Smith *et al.* 2005; COSEWIC 2006). Historic distribution of this species within the Project Study Area includes the lower reaches of the Assiniboine River as well as the Red River and its tributaries (COSEWIC 2006).

6.2.4.5 Fish Species and Distribution

At least 82 species of fish representing 19 families are found within, or are likely to be found within, the Project Study Area. A list of these species by their scientific names, common names, and abbreviations is provided in Appendix 6A, Table 6A-1). The Project Study Area covers a large expanse, with variations in the fish community from northern to southern Manitoba. In order to describe this variation, fish communities are organized by the eight drainage basins occurring in the Project Study Area (*Bipole III Aquatic Technical Report*) also includes: a list of fish distributions by drainage basin; a summary of life history characteristics for all fish species; and a description of fish utilization and an assessment of habitat conditions of selected water bodies within the Project Study Area.

Some fish species are distributed throughout the Project Study Area, including brook stickleback (*Culaea inconstans*), northern pike (*Esox lucius*), and white sucker (*Catostomus commersonii)*. Excluding the most northern basin (i.e., Hudson Bay basin), other species are distributed throughout the Project Study Area, and include burbot (*Lota lota*), walleye (*Sander vitreus*), troutperch (*Percopsis omiscomaycus*), yellow perch (*Perca flavescens*), emerald shiner (*Notropis atherinoides*), longnose dace (*Rhinicthys cataractae*), and johnny darter (*Etheostoma nigrum*).

6.2.4.6 Fish Habitat and Water Courses

Fish habitat components include substrate, water depth/velocity and cover, as well as aspects such as temperature and water chemistry. Fresh water fish habitat is found in a wide variety of water bodies, such as lakes, reservoirs, rivers, streams, creeks, marshes, ponds and swamps. Any place that fish depend on for food, shelter, reproduction (i.e., spawning and larval rearing), growth or migration is considered fish habitat (see Section 34(1) of the *Fisheries Act*). Habitat requirements particular to a fish species can change depending on the stage of its life cycle. For example, reproductive habitat requirements (i.e., spawning habitat) will often be different than those required for adult fish feeding and shelter (e.g., overwintering habitat). Thus, one species of fish may require a wide variety of habitats to successfully complete its life cycle.

Intermittent Streams

There are numerous intermittent streams in the Project Study Area, many of which are unnamed. Intermittent streams have well-defined banks and scoured channels, but typically have flowing water for only a portion of the year. Intermittent streams in the Project Study Area generally drain local, low-lying areas (e.g., bogs, fens, wetlands) into larger water courses. Water levels and discharge are reliant on runoff from precipitation events. Discharge can range from a number of cubic metres per second during the spring freshet to zero during subsequent dry periods. Maximum water depths are usually less than 1 m. Water temperatures in these streams can rise rapidly from 0˚C at break-up in April or May to the mid-twenties by late May.

Fish habitat is generally only provided for a brief period of time during spring when these streams have water. During this time, northern pike and suckers might utilize these streams as spawning and nursery areas. Smaller forage species such as minnows and stickleback might utilize these streams whenever water is available. In winter, low water flow and low dissolved oxygen levels generally preclude fish overwintering. In northern Manitoba an example of this type of stream is Canada Creek, a tributary to Snow Lake. Stewart-Hay (1951) noted that Canada Creek became only a trickle by August, but was used by pike and suckers for spawning during the spring. Similarly Fifty-five Mile Creek, a tributary to Wapisu Lake that crosses PR 391, is an important walleye spawning location during spring, but has little flow throughout the rest of the year. In southern Manitoba, Rat Creek, a tributary of the Whitemud River, provides excellent spawning habitat for white suckers and northern pike in the spring, but by summer has little flow and is considered poor habitat (MacDonell and Remnant 1999).

Perennial Streams

Perennial streams have well-defined channels and continuously flowing water most years. There are numerous perennial small streams in the Project Study Area that provide year-round fish habitat. These streams generally have larger watersheds than

intermittent streams and are characterized by discrete water flow habitat types (i.e., riffle/pool/run sequences), diversified substrates (generally coarser with less organic material than intermittent streams), and beaver activity. Discharges can reach 3 to 8 m^3/sec during spring, but may decrease to less than 0.1 m^3/sec during dry periods in summer/fall and during winter. Generally, mean annual flows are 0.1 to 1 m^3/sec and maximum water depths are 1 to 3 m. Water temperatures approach 0°C during winter and increase to the mid-twenties during summer.

In the Project Study Area, these streams potentially supply spawning (spring) and nursery habitat (spring to fall) for larger fish species such as northern pike and suckers. Various species of darters, minnows, sculpin, and stickleback potentially utilize these streams for all life cycle stages. Fish overwintering potential is generally limited by low winter stream discharge and shallow winter water depths; however, overwintering of smaller fish may occur where deeper pools are available. These types of streams within the Project Study Area generally include ones named as a 'creek', e.g., Bell, Brannigan, Cooks, Fetterly, Goose, Kiski, McMillan, and Moose creeks. Wachistoon Creek, a tributary to Wapisu Lake, is known to be an important spawning location for walleye.

Other noteworthy perennial streams include the creeks throughout the Manitoba escarpment. These are higher gradient and higher water velocity streams that are spring-fed, clear, and cool with coarse, clean substrates. These streams potentially supply spawning and nursery habitat for brook (*Salvelinus fontinalis*), rainbow (*Oncorhychus mykiss*), and brown trout (*Salmo trutta*) that have been introduced into the area.

Small to Moderate Sized Rivers

In general, small to moderate sized rivers in the Project Study Area are characterized by mean annual discharges of 1 to 10 m^3/sec, more diverse water flow habitat types (e.g., riffle, pool, run, falls, rapids, etc.), abundant fish cover (e.g., undercut banks, woody debris, boulders, vegetation, pools), larger sized substrate than perennial streams (i.e., cobbles and boulders), and more distinctive banks and floodplains. During spring or after heavy precipitation, flows may reach into the 100 m^3/sec range, but can also be as low as 1 m^3/sec during dry periods or during the winter. Maximum depths are generally in excess of 3 m.

Small and medium sized rivers are common within the Project Study Area and provide migratory routes and habitat for a variety of large and small fish. Generally, these water courses offer spawning, nursery, foraging, and overwintering areas; however, low flows during summer, fall, and winter can limit the abundance of larger fish. Rapids and riffle habitat in these rivers can provide important spawning habitat for suckers and walleye during spring and lake whitefish (*Coregonus clupeaformis*) during fall. Examples of this type of stream within the Project Study Area include: File, Hunting, Grass, La Salle, Morris, Sinclair, Taylor, Winnapedi, and Valley rivers.

Manitoba escarpment small rivers potentially supply spawning and nursery habitat for brook, rainbow, and brown trout that have been introduced into the area. Examples of these small rivers include the Steeprock, Garland, North Duck, and Pine rivers.

Large Rivers

Large rivers generally do not show differentiation of water flow habitat types (e.g., distinct pool, riffles, and runs). While differences in depth may occur across the river channel, habitat features (e.g., water flow, substrate, cover) are generally associated with shoreline, island, and tributary confluence areas. In general, large sized rivers are characterized by mean annual discharges over 10 m^3/sec and maximum depths in excess of 5 m.

Large rivers in the Project Study Area provide migratory routes and habitat for a variety of large and small fish. Similar to smaller rivers, rapids and riffle habitat in large rivers can provide important spawning habitat for sucker and walleye during spring and lake whitefish during fall. The main channel and tributary confluences of large rivers are also important lake sturgeon (*Acipenser fulvescens*) habitat, where populations of that species occur. Large rivers are important overwintering habitat for large fish.

Examples of large rivers in the Project Study Area include the Assiniboine, Burntwood, Nelson, Red and Saskatchewan rivers.

Lakes and Reservoirs

There are numerous small lakes within the Project Study Area with surface areas of 1 to 2 km^2. Lakes of this size are generally unnamed, have detritus substrates, are shallow (less than 2 m), and often freeze to the bottom or become anoxic during winter. This generally precludes fish overwintering in these small water bodies and may lead to winter fish die-offs for fish that remain (known as winterkills). Fish species such as brook stickleback and pearl dace are tolerant of low oxygen conditions and are common in small Project Study Area lakes. Depending on connectivity to adjacent fish bearing water bodies, these small lakes may provide rearing and feeding habitat to other fish species during the open water season. In general, however, these lakes provide very little fish habitat except for a few minnow species and stickleback.

Moderate sized lakes that can provide life history requirements for some larger fish species year-round are generally deeper than 2 m or have inflows that prevent ice from forming to the bottom and replenish oxygen levels. Substrates are organic, but have less detritus than smaller lakes. In the Project Study Area, lakes of this type are usually 2-5 km^2 in area and greater. Minnow species, perch, pike, stickleback, and sucker frequently inhabit these lakes, all of which are somewhat tolerant to moderately low dissolved oxygen levels and higher water temperatures.

Many small to moderate sized lakes are highly productive (i.e., nutrient rich that in turn promotes algae, plant, and invertebrate growth) compared to larger lakes and can offer superior fish foraging habitat throughout the year. Higher productivity can be a result of extended warmer water temperatures and less dilution of nutrient inputs compared to bigger, colder lakes.

Lakes larger than 5 km^2 in the Project Study Area generally provide a diversity of habitats that support all life history requirements for lake-dwelling fish species. In the Project Study Area, substrates are generally clays with occasional rocky shorelines and reefs, and maximum water depths commonly exceed 20 m. Fish species such as burbot, goldeye, (*Hiodon alosoides)*, lake whitefish, northern pike, lake cisco (*Coregonus artedii)*, and walleye are common in lakes of this type. Some larger lakes in the Project Study Area are sufficiently deep and cold to provide habitat for cold-water fish species such as lake trout.

6.2.4.7 Aquatic Invasive Species

The introduction of non-native species (i.e., invasive species) continues to be a worldwide phenomenon due largely to human effects (DFO 2003). Introductions of invasive species to non-native habitats can be deliberate (e.g., sport fishermen introducing bait fish) or unintentional (e.g., zebra mussel larvae in boat ballast water). The effects can be devastating on an ecosystem scale (Ricciardi and Rasmussen 1998; Ricciardi 2003).

Several aquatic invasive species potentially exist in the Manitoba. Invasive species within the Project Study Area include two fish species (rainbow smelt and carp) and two plants (purple loosestrife, *Lythrum salicaria* and Eurasian watermilfoil, *Myriophyllum spicatum*). Table 6.2-6 lists the distribution of invasive species existing in Manitoba and also lists species on the Invasive Species Council of Manitoba's (ISCM) watch list. In general, invasive species are known to be particularly resilient and tough to remove once they have become established in an ecosystem.

Table 6.2-6: Status and Distribution of Invasive Aquatic Species in Manitoba

Common Name	Species Name	Area of Known Occurrence	Reference
Fish			
Rainbow smelt	Osmerus mordax	Lake Winnipeg, Nelson River	Gov. Man 2010; Remnant et al. 1997
Carp	Cyprinus carpio	Red River, Assiniboine River, Lake Winnipeg drainage	ISCM 2010
Mosquito fish	Gambusia affinis/holbrooki	Southern Manitoba	ISCM 2010
Invertebrates			
Zebra mussel	Dreissena polymorpha	Winnipeg River (N. Dakota, USA)	ISCM 2010
Rusty crayfish	Orconectes rusticus	Falcon Lake	ISCM 2010
Spiny water flea	Bythotrephes longimanus	Dept. of Fisheries and Oceans watch list	North/South 2006
Riparian/Aquatic Macrophytes			
Purple loosestrife	Lythrum salicaria	Southern Manitoba	ISCM 2010
Eurasian watermilfoil	Myriophyllum spicatum	Red River watershed	ISCM 2010

6.2.4.8 Protected Species

There are six fish species and one mollusk species within the Project Study Area that are listed under the federal *Species at Risk Act* (SARA) or have designation via COSEWIC (SARPR 2010, COSEWIC 2010). Canada's *Species at Risk Act* (SARA), proclaimed in 2003, establish the official list of wildlife species at risk in Canada. The purposes of the Act is to prevent Canadian indigenous species, subspecies, and distinct populations from becoming extirpated or extinct, to provide for the recovery of endangered or threatened species. Once listed, the measures to protect and recover a listed wildlife species are implemented. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is a committee of experts established in 1977, which assesses and designates which wildlife species are in some danger of disappearing from Canada. Within the *Species at Risk Act,* COSEWIC was recognized as an independent body of experts responsible for identifying and assessing wildlife species considered being at risk.

COSEWIC uses a process based on science, ATK and local knowledge to assess the risk of extinction for wildlife species.

The six fish species and one mollusk species, their distributions, and their status are identified in Table 6.2-7. Most of these species (e.g., the chestnut lamprey, silver chub, bigmouth shiner, and mapleleaf mussel) are found within the southern portion of the Project Study Area (i.e., Red River and Assiniboine River basins). The shortjaw cisco is only found in Lake Athapapuskow, which is situated in the Saskatchewan River basin. Lake sturgeon has a broad distribution across the Project Study Area; however, they have a limited distribution within the Red and Assiniboine River basins (Stewart and Watkinson 2004).

Table 6.2-7: Distribution within the Project Study Area of Aquatic Species with Regulatory Status

Species	Study Area Basin	Status	
		SARA	COSEWIC
Chestnut lamprey (Ichthyomyzon castaneus)	Lake Winnipeg, Red River, Assiniboine River	Special Concern (Schedule 3)	Special Concern
Silver chub (Macrhybopsis storeiana)	Assiniboine River, Red River	Special Concern (Schedule 1)	Special Concern
Bigmouth shiner (*Notropis dorsalis*)	Lake Manitoba, Assiniboine River, Red River	Special Concern (Schedule 3)	Not at risk
Shortjaw cisco (Coregonus zenithicus)	Saskatchewan River	Threatened (Schedule 2)	Threatened
Bigmouth buffalo (Ictiobus cyprinellus)	Lake Manitoba, Assiniboine River, Red River	Special Concern (Schedule 3)	Non-active
Lake sturgeon (Acipenser fulvescens)	Hudson Bay, Churchill River, Nelson River, Saskatchewan River, Assiniboine River, Red River	No status	Endangered
Mapleleaf mussel (*Quadrula quadrula*)	Assiniboine River, Red River	No status	Endangered

Note: Refer to COSEWIC (2010) for criteria of their classifications. The Act establishes Schedule 1 as the official list of wildlife species at risk, at which time measures to protect and recover a listed species are implemented. Species that were designated at risk by COSEWIC prior to October 1999 require reassessment using revised criteria before they can be considered for addition to Schedule 1 of SARA. Species listed under Schedules 2 and 3 must be reassessed within a given timeframe.

6.2.4.9 Valued Environmental Components (VECs)

Two VECs were chosen for the aquatic environment component: surface water quality and fish habitat. While water quality is a component of fish habitat, it is important to discriminate between the chemical and physical effects in some instances.

Surface water quality is considered a VEC in all water bodies that are considered fish habitat. Potential Project-related effects on surface water quality include the introduction of sediments and other contaminants from right-of-way surface runoff or the release of contaminants from equipment or accidental spills. Since water quality protection is linked to fish habitat, it will be discussed conjointly as the fish habitat VEC. Provincial guidelines for surface water quality as it relates to humans and aquatic life will be given consideration.

Fish habitat is considered a VEC and is generally used as a surrogate for measuring productive capacity. Section 35.1 of the *Fisheries Act* prohibits the Harmful Alteration, Disruption or Destruction (HADD) of fish habitat. Maintaining fish habitat is best assured by minimizing short-term and avoiding long-term degradation of instream and riparian habitats.

Fish habitat is defined by a variety of biophysical parameters, including hydrology, channel and flow characteristics, substrate, cover, water and sediment quality, aquatic macrophytes and periphyton, and benthic invertebrate communities. Benthic invertebrate communities represent a large and diverse food base for higher trophic levels such as fish populations and are also of indirect importance to fish populations through ecological importance to the overall structure and function of aquatic environments. Water quality parameters key to defining fish habitat characteristics include temperature, dissolved oxygen (DO), total suspended solids (TSS), turbidity and pH.

6.2.4.10 Existing Environment at Project Components

HVdc Transmission Line

The HVdc transmission line spans portions of five major watersheds and 18 sub-basins, including the Nelson River, Saskatchewan River, Lake Manitoba, Assiniboine River, and Red River major drainage basins (Map 6-9). Overall, the Nelson River basin comprises the largest proportion of the transmission line followed by the Lake Manitoba, Saskatchewan River, Assiniboine River, and Red River basins. In total 317 water courses are intersected by the HVdc transmission line and include water courses that do not support fish (57), those considered to support marginal fish habitat (182) and important fish habitat (78). A detailed description of fish habitat within each water course

intersected by the HVdc Transmission Line is available in the *Bipole III Aquatic Environmental Technical Report.*

The Nelson River basin begins in the west near Cranberry Portage and flows northeast ending at Hudson Bay. Within this watershed, the HVdc Transmission Line intersects four sub-basins (Lower Nelson River, Burntwood River, Grass River, and Upper Nelson River) and includes 155 water course crossings that extend from Goose Creek, a tributary of the lower Nelson River, to near Hargrave Lake located approximately 100 km due east of Cranberry Portage. A number of large a notable rivers are intersected by the transmission line, including Limestone River, Burntwood River and Partridge Crop Lake.

The Saskatchewan River basin originates near Flin Flon along the Saskatchewan border and flows southeast to Cedar Lake. The transmission line intersects two sub-basins (Clearwater Lake/Moose Lake and Cedar Lake) and includes 30 water course crossings that extend from Cedar Lake, south of The Pas, to near North Moose Lake. The Clearwater Lake/Moose Lake sub-basin includes tributaries such as Frog Creek and Little Frog Creek, and the majority of crossing sites in this basin are located on unnamed tributaries of Little Frog Creek. The Cedar Lake sub-basin includes the Saskatchewan River, which flows eastward across Saskatchewan and Manitoba and empties into Lake Winnipeg. The sub-basin also includes significant feeder streams such as Rall's and Iskwayanikakespeetik creeks which the transmission line intersects in the vicinity of The Pas, Manitoba.

The Lake Manitoba basin extends from the Lake Winnipegosis sub-basin in the north, south through the escarpment region of Manitoba to the Whitemud River sub-basin. Within the Lake Manitoba basin, the HVdc transmission line intersects five sub-basins (Lake Winnipegosis, Swan Lake, Duck Mountain, Lake Manitoba West, and Whitemud River) and includes a total of 93 water course crossings.

The northern portion of the Lake Winnipegosis sub-basin includes crossings of the Overflowing River, and Red Deer River. Further south, stream flowing off the Porcupine and Duck Mountains are intersected including the Steeprock River, Woody River and Pine River. The Whitemud River sub-basin includes a crossing of the Whitemud River, a small highly meandering river in southwest Manitoba.

Within the Assiniboine River catchment, the HVdc transmission line crosses one sub-basin (Central Assiniboine) and three water courses; notably the Assiniboine River in the area north-east of Treherne, Manitoba.

The Red River drainage basin largely surrounds Winnipeg and is characterized by a low gradient landscape dominated by row-crop agriculture where many of the smaller water courses have been severely altered or eliminated. Within the Red River basin, six sub-basins (La Salle River, Morris River, Red River South, Rat River, Seine River, and Cooks Creek/Devils Creek) are intersected and include a total of 36 water course crossings that

originate at St. Claude, flow east towards Steinbach, and then north, passing near Landmark, Manitoba. Water courses are characterized by diverted drainage channels along the agricultural landscape but include the non-channelized rivers such as the Red River and Rat River.

Keewatinoow Converter Station & Associated Facilities

The Keewatinoow Converter Station and associated facilities are located in proximity to the Nelson River within the Lower Nelson River sub-basin. Most of the infrastructure is located on the northwest side of the Nelson River, with only the collector lines crossing the Nelson River to the southeast shoreline.

North shore tributaries of the Nelson River between Limestone Generating Station and the Keewatinoow area generally arise from bogs and fens where flow is low and sediments are primarily organic. As these streams approach better-drained areas near the banks of the Nelson River, gradient increases and streams descend rapidly through narrow, eroded channels with coarse substrates to the Nelson River (Kroeker and MacDonell 2006). Smaller tributaries are often ephemeral to intermittent in flow regime and typically do not support fish in the upper reaches if at all. These small unnamed tributaries either join moderate sized streams or flow directly into the Nelson River.

The moderate sized tributaries have headwaters in bog and fen habitats with undefined channels and low flow conditions. Closer to the Nelson River, these streams are characterized by a defined channel, with elevated water velocities and riffle/scour pool habitat (Swanson and Kansas 1987). Groundwater flow into many of the moderate sized streams in the lower reaches is also common (Swanson and Kansas 1987; Lavergne and MacDonell 2010). Fish use of these streams includes migrations of large bodied species such as suckers and pike and, in many cases, the lower reaches of these moderate sized streams are used by brook trout as spawning and nursery habitat. Such streams include Goose, Tiny and Swift creeks.

The Limestone River is the largest un-impounded tributary of the lower Nelson River. It is 150 km long, has 35 tributaries (Gaboury 1978), and drains an area of approximately 3,160 km^2 (MacDonell 1991). The mouth of the river enters the Nelson River immediately below the Limestone Generating Station. The shoreline of the Limestone River has both slumping escarpment and bench type shoreline with vegetation near the banks consisting of willows, alder, and dwarf birch. The Limestone River has a gravel and cobble substrate and is comprised predominantly of riffle/pool/run habitat types and supports a diversity of fish including spawning migrations of lake cisco and brook trout.

The northern collector lines extend to the southeast side of the Nelson River, an area where the river is impounded by the Limestone GS. Wilson Creek, which flows into the upstream end of the Limestone Forebay is the largest tributary is this area. However,

since impoundment, habitat in the lower reaches of this creek as for others has been affected.

Keewatinoow Construction Camp

The Keewatinoow construction camp site is situated adjacent to four watercourses: Creek Fifteen, Creek Fourteen, an unnamed tributary to the Nelson River, and the Nelson River proper. However, the camp does not overlap or encroach on any creek.

Creek Fifteen is a small tributary of the Nelson River approximately 15 km in length. Fish habitat in the creek is characterized by cascade/scour pool and riffle/scour pool in the lower 2 km and by bog/wetland habitat upstream of 2 km (Swanson and Kansas 1987). The creek supports a diversity of fish including brook trout and ground water upwelling occurs in the creek downstream of the Conawapa access road. This creek provides important fish habitat including nursery habitat for brook trout.

Creek Fourteen originates in a low-lying saturated area draining directly to the Nelson River. This creek is an ephemeral stream with no defined channel connectivity to the Nelson River. This creek was rated as marginal fish habitat and does not support fish directly.

The Nelson River is a major river system that drains into the Hudson Bay. The river is a perennial watercourse that supports a diverse fish community, providing spawning, rearing, feeding and overwintering habitat.

The unnamed tributary of Nelson River is a small stream with a small watershed and minimal water levels. This creek was rated as marginal fish habitat and does not support fish directly.

AC Collector and Construction Power Lines

There are 43 water course crossings on the rights-of-way of the northern AC collector and construction power lines, all within the Lower Nelson River sub-basin. Four water course crossings were considered to provide no fish habitat. These crossings were of wetlands, with no connection to other waterbodies. Marginal fish habitat occurred at 31 of the crossings and these were characterized as headwater wetland habitat of Nelson River tributaries. The remaining eight water course crossings support important fish habitat and include major rivers such as the Nelson and Limestone River, with known indicator and forage fish populations, as well as the lower reaches of moderate sized streams.

Keewatinoow Converter Station and Ground Electrode

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, in this area was rated as important fish habitat, consisting of riffle/scour pool habitat

with areas of groundwater seepage. In contrast, the unnamed tributary was rated as marginal fish habitat consisting of wetland habitat with an undefined channel and no clear connection to the Nelson River. This tributary was defined as indirect fish habitat, providing water and nutrients to downstream areas but not directly supporting fish.

One watercourse lies within the Keewatinoow ground electrode site. The small tributary of the Nelson River provides marginal fish habitat and is not expected to support fish within the site. The Keewatinoow ground electrode line right-of-way crosses five water courses, all of which are tributaries of the Nelson River. Three of the water courses are small wetland headwaters supporting marginal fish habitat and the remaining two, Swift Creek and Goose Creek, support important fish habitat.

Borrow Sites and Excavated Material Placement Areas

Five of the Keewatinoow area borrow site locations overlap water bodies. 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.

Fish habitat in Swift Creek differs between the borrow sites with the downstream sites overlapping higher quality habitat. These two sites on Swift Creek are approximately 1.4 and 1.7 km upstream from the confluence with the Nelson River. In these areas habitat consists of riffle/pool/run sequences with boulder and cobble. The creek is confined by a wooded boundary and the riparian vegetation is made up primarily of shrubs and coniferous trees. Instream cover is composed predominately of large woody debris along with overhanging vegetation and boulders (Swanson and Kansas 1987). Fish habitat in this section of Swift Creek was rated as important and includes clusters of ground water upwelling's in the creek. In contrast the third borrow site overlaps Swift Creek approximately 2.2 km upstream from the Conawapa access road crossing and 5.3 km upstream from the confluence with the Nelson River. Fish habitat in Swift Creek at this distance from the confluence consists of deep (1-2 m) run habitat with organic substrates and no ground water upwellings. Fish habitat was rated as Marginal in this portion of Swift Creek.

The unnamed tributaries are intermittent streams with faint channel development and were rated as marginal fish habitat.

Goose Creek in the area of the borrow sites supports important fish habitat and the two nearby intermittent unnamed creeks support marginal fish habitat.

The six excavated material placement areas do not overlap any waterbodies. The areas lie adjacent to a number of small streams and ponds and those within approximately 100 m of the sites include Creek Fifiteen, Creek Eighteen, Tiny Creek and seven unnamed creeks.

In the small streams and in areas upstream of the Conawapa access road, habitat consists primarily of headwater boreal wetland with undefined channel development, abundant

pools, and vegetation, and undergo restricted periods of flow. These sites generally support Marginal fish habitat and fish use is limited to species such as brook stickleback and fathead minnow, if any. Creek Eighteen and the unnamed creeks would be considered Marginal fish habitat. Habitat in Creek Fifteen, and Tiny Creek is considered Important.

Riel Converter Station & Associated Facilities

The Riel Converter Station and ground electrode lie within the Red River basin. Most of the smaller tributaries have been straightened and channelized into roadside ditches. Fish habitat is often simple with little cover or diversity and fish use is limited by access to overwintering areas. Water courses in the converter station and ground electrode sites are both headwater tributaries of Cooks Creek.

6.2.5 Terrestrial Ecosystems and Vegetation

6.2.5.1 Overview

The following section provides information on the existing environment for the Project with respect to terrestrial ecosystems and vegetation. It describes the following:

- Summary by Ecozone and Ecoregion;
- Important communities and habitats;
- Plant species of conservation concern;
- Plants and resource use; and
- Fire in the boreal forest.

In addition to the characterization of the Project Study Area, more detailed information is provided on the existing environment for the specific Project components. A brief review of the VECs selected for the Project, as well as methods used to assess the VEC occurrence and distribution is also provided.

6.2.5.2 Summary by Ecozone

Descriptions of the ecozones and ecoregions of the Project Study Area (Maps 6-2 and 6-3) are provided below and have been referenced from Smith *et al.* (1998). Vegetation descriptions are provided in the *Bipole III Terrestrial Ecosystems and Vegetation Technical Report*. Map Series 6-1000 provides an overview of forest cover and distribution in the Project Study Area.

Hudson Plain Ecozone

In Manitoba, The Hudson Plain Ecozone is located in the north east corner of the Province. Within it, only the Hudson Bay Lowland Ecoregion is overlain by the Project Study Area. The vegetation cover is controlled by latitude, and changes significantly through the transition from the extensively forested Boreal Shield Ecozone to the south and the Taiga Shield and Southern Arctic Ecozones to the north. The ecozone is largely characterized with wetlands of bogs and fens. The bogs generally occupy mosses, shrubs and black spruce, while fens occupy sedges, mosses, a varying abundance of shrub cover, and tamarack.

Hudson Bay Lowland Ecoregion

The Hudson Bay Lowland Ecoregion is part of the Hudson Plain Ecozone. It occurs in the northeastern portion of the Project Study Area. This ecoregion forms part of the transition between the boreal forest to the south and the tundra to the north. Vegetation characteristic of the boreal forest dominates and is interspersed with stands of low black spruce and an understory of dwarf birch, Labrador tea, lichen and moss. Drier, mineral sites support stands of black spruce, white spruce and paper birch with an understory of low shrubs, such as bearberry, bog cranberry, as well as widespread lichen and moss ground cover. Low black spruce, Labrador tea, blueberry, bog rosemary and sphagnum moss and lichens populate the poorly drained, peat-filled sites of this ecoregion.

Taiga Shield Ecozone

The Taiga Shield is a large ecozone covering the northwest corner of Manitoba with rolling uplands and lowlands. Only the Selwyn Lake Upland Ecoregion is included within the Project Study Area. As in the case of the Hudson Plain ecozone, this ecozone is a transition from the extensively forested Boreal Shield Ecozone to the south and the Southern Arctic Ecozone to the north. The Precambrian Shield is characteristic of the ecozone with open coniferous forest occurring on shallow soils. White spruce, paper birch, and trembling aspen may occur in more southern areas. Lowlands are dominated by bogs and fens.

Selwyn Lake Upland Ecoregion

The Selwyn Lake Upland Ecoregion is part of a broad area of coniferous forest transition, present in the northeastern portion of the Project Study Area. Typically this ecoregion ranges from closed coniferous boreal forest to open stands of low black spruce with an understory of dwarf birch, Labrador tea, lichens, and mosses. Black spruce dominates this ecoregion, although open stands of white spruce and paper birch are commonly found in drier sites with an understory of ericaceous shrubs, such as bearberry and rock cranberry. Bogs in the region are populated by sphagnum mosses, ericaceous shrubs and black spruce.

Boreal Shield Ecozone

In Manitoba, the Boreal Shield Ecozone extends along the east side of Lake Winnipeg, and north of the lake from the Ontario border west to the Saskatchewan border north of The Pas. It is the largest ecozone in the Province. The Project Study Area includes portions of the Churchill River Upland and the Hayes River Upland Ecoregions. Much of the northern portion of the Project Study Area falls within this ecozone, as do some very small portions of the study area in its extreme southeastern extension east of Winnipeg. Closed stands of white spruce, black spruce, balsam fir and jack pine are found on well to imperfectly drained sites. White birch, trembling aspen, and balsam poplar occur towards the south. Stands of black spruce or tamarack are located on organic deposits.

Churchill River Upland Ecoregion

The Churchill River Upland Ecoregion is located along the southern edge of the Precambrian Shield and extends westward from the Grass River to the Saskatchewan border. As indicated in Map 6-3, this ecoregion includes much of the northern portion of the Project Study Area. Black spruce and jack pine stands dominate forest cover while white spruce, white birch and trembling aspen are particularly important components of some of these stands. Feather mosses, rock cranberry, blueberry, Labrador tea and lichen comprise the understory vegetation in this ecoregion. Black spruce and jack pine stands occupy drier sites while lichens generally dominate exposed bedrock. Poorly drained basin and peat plateau bogs have stands of stunted black spruce with an understory of Labrador tea, blueberry, bog rosemary and sphagnum mosses.

Hayes River Upland Ecoregion

The Hayes River Upland Ecoregion is located northeast of Lake Winnipeg and extends east into northwestern Ontario. The Hayes River Upland Ecoregion, together with the Churchill River Upland Ecoregion, includes much of the northern portion of the Project Study Area. Dominant tree species in this ecoregion include black spruce, jack pine and lesser amounts of paper birch. Understory species include feather moss, rock cranberry, blueberry, Labrador tea and lichen. The southern area of this ecoregion is host to white spruce, balsam fir and trembling aspen stands, which are especially abundant along rivers in the region. Black spruce and jack pine stands occupy drier sites while lichens generally dominate exposed bedrock. Bog vegetation is comprised of stands of black spruce with an understory of Labrador tea, blueberry, bog rosemary and sphagnum mosses.

Lake of the Woods Ecoregion

The Lake of the Woods Ecoregion is part of the Boreal Shield Ecozone. Small portions of the extreme southeastern section of the Project Study Area east of Winnipeg lie within this ecoregion. The region is forested with mixed forests. On the driest sites, jack

pine, trembling aspen, green ash and bur oak are found. Moister sites support mixtures of trembling aspen, elm, black ash, eastern white cedar, white spruce, paper birch and jack pine. Red pine and eastern white pine are present in this ecoregion. Poorly drained peatland sites support black spruce and tamarack.

Boreal Plain Ecozone

The Boreal Plain ecozone has four distinct ecoregions in Manitoba that include much of the west-central portion of the Project Study Area. These include the Mid-Boreal Lowland, the Boreal Transition, the Mid-Boreal Upland and the Interlake Plain Ecoregions, which are overlaid by the study area. A smaller portion of the southeast portion of the Project Study Area, east of Winnipeg, overlaps the Interlake Plain Ecoregion of the ecozone. Nearly level to gently rolling plains dominates the landscape. The vegetation is characterized by stands of white spruce, black spruce, jack pine and tamarack. Towards the south, trembling aspen, white birch and balsam poplar are more frequent.

Mid-boreal Lowland Ecoregion

The Mid-Boreal Lowland Ecoregion is the northernmost ecoregion within the Boreal Plains Ecozone in Manitoba. The ecoregion skirts the west side of Lake Winnipeg from Riverton north and includes the northern two thirds of Lake Winnipegosis and areas north of the Porcupine Mountain to the southern boundary of the Boreal Shield Ecozone. Well to imperfectly drained clayey and loamy tills and glaciolacustrine deposits support closed stands of black spruce, jack pine, trembling aspen and balsam poplar. Black spruce is dominant in late-succession stands. Fire-induced regeneration on well drained sites typically results in very dense jack pine, while on wetter sites trembling aspen dominates. Lake shores and alluvial deposits along rivers support mixed stands of black spruce, white spruce, balsam fir and trembling aspen. Poorly drained sites are more suited to black spruce. Black spruce, ericaceous shrubs and mosses are typical in bogs while fens are dominated by sedges, dwarf birch, tamarack and sphagnum mosses.

Boreal Transition Ecoregion

The Boreal Transition Ecoregion is part of the Boreal Plain Ecozone and consists of a narrow belt of wooded upland bordering Riding Mountain, Duck Mountain and part of the gap between Duck Mountain and Porcupine Hills. This ecoregion is present in the central and very southern portion of the Project Study Area. Dominant vegetation in this ecoregion consists of trembling aspen with an understory of mixed herbs and tall shrubs. Climax communities consist of white spruce and balsam fir, but forest fires and logging have restricted the abundance of these species. Black spruce, tamarack, willow and sedges populate poorly drained sites.

Mid-Boreal Uplands Ecoregion

The Mid Boreal Uplands Ecoregion occurs as three separate elevated uplands along the Manitoba Escarpment known as the Porcupine Hills, Duck Mountain and Riding Mountain. This mixed forest ecoregion is characterized by medium to tall closed stands of trembling aspen and balsam poplar and extensive white spruce, balsam fir and black spruce stands occurring throughout, but especially as stands in later successional stages. Jack pine occurs throughout but generally is more prevalent on drier sites while white birch is locally significant. A wide variety of shrubs and herbs comprise the understory species in deciduous and mixed forest stands, while feather moss dominates as the ground cover in coniferous stands. Tamarack and black spruce bogs are also interspersed throughout this ecoregion.

Interlake Plain Ecoregion

The Interlake Plain Ecoregion extends in a broad arc from the United States-Canada border at the southeastern edge of the Manitoba Plain, northwestward across the southern Interlake/Westlake region to the Saskatchewan border at Red Deer Lake. It is a mosaic of farmland and forest marking the southern limit of closed, mixed boreal forest and northern and eastern extent of commercial agriculture. Dominant deciduous species in this ecoregion include trembling aspen and balsam poplar with tall shrubs and mixed herbs comprising the understory. Limited communities of white spruce and balsam fir can also be found within this ecoregion. Jack pine is often found on dry, sandy sites. Sedges, willows, and minor amounts of black spruce and tamarack dominate poorly drained sites.

Prairie Ecozone

The Prairie Ecozone extends from the United States border to the Red River in eastern Manitoba. This ecozone includes three ecoregions in Manitoba that are overlain by the study area. The Aspen Parkland Ecoregion includes the western portion of the Project Study Area, the Lake Manitoba Plain Ecoregion covers most of the southeastern study area, and the Southwest Manitoba Uplands Ecoregion overlaps a smaller section of the central portion of the southern study area. The landscape is characterized by level to rolling or gently undulating terrain. Agricultural crops dominantly represent the vegetation. Groves of trembling aspen, balsam poplar and bur oak are represented in the prairies. Nearly all the tall grass and mixed grass prairie have been modified by human activity. Remaining grassland vegetation is dominated by spear grass, wheat grass and blue gamma grass.

Aspen Parkland Ecoregion

The Aspen Parkland Ecoregion is dominant in the south-central and southwestern portion of the province and occupies a small area between the Riding and Duck

Mountains. Forest cover consists primarily of aspen, with smaller amounts of white spruce, oak, maple and elm. Trembling aspen and shrubs occupy moist sites and bur oak and grassland communities occupy drier sites with Manitoba maple and ash found typically in river bottom areas. In southern Manitoba, the grasslands parallel the edge of Manitoba's central forest zone. The thousands of small broadleaf forest stands dotting the prairie landscape throughout the grasslands are composed of aspen, willow, oak, and river-bottom Manitoba maple, ash and poplar species. Numerous shrubs and herbs also occupy the ecoregion. Common grasses in the Aspen Parkland include fescues, June grass, Kentucky bluegrass, and wheatgrasses. Slough grasses, marsh reed grass, sedges, cattails, and willows are found on poorly drained sites.

Lake Manitoba Plain Ecoregion

The Lake Manitoba Plain Ecoregion stretches northwestward from the International Boundary to Lake Dauphin in southern Manitoba. The Manitoba Escarpment marks its western boundary. Before settlement, this ecoregion was a mosaic of trembling aspen/oak groves and rough fescue grasslands. Trembling aspen and shrubs occur on moist sites, while bur oak and grassland communities occupy drier sites. Dominant grasses include fescue grasses, wheat grasses, June grass and Kentucky bluegrass. A wide variety of deciduous shrubs and herbs are abundant. Various deciduous shrubs and herbs also contribute to the understory. Hydrophilic plant species including slough grasses, marsh reed grass, sedges, cattails, and willow can be found in poorly drained areas of this ecoregion.

Southwest Manitoba Uplands Ecoregion

The Project Study Area overlays the Southwest Manitoba Uplands Ecoregion, located in south-central Manitoba. It represents a mosaic of farmland and forest stands with trembling aspen, balsam poplar and bur oak, and an understory of tall shrubs and herbs. Some of the land is planted to white spruce and has been altered to support farmland. Sloughs, ponds and small lakes fill the shallow depressions, and the more poorly drained areas support willows and sedges.

6.2.5.3 Important Communities and Habitats

Manitoba Conservation Listed Communities

Terrestrial communities of conservation concern in the Province are listed by the Manitoba Conservation Data Centre (MCDC). In the Project Study Area, six ecoregions support vegetation communities of concern listed by the MCDC. These ecoregions include the Lake Manitoba Plain, Interlake Plain, Boreal Transition, Aspen Parkland, Mid-Boreal Lowland and Mid-Boreal Upland (Map 6-11). Twelve communities of concern are listed in the six ecoregions and all have the potential to occur in the Project

Study Area. These include: two very rare communities (S1), two rare communities (S2), five uncommon communities (S3), and three communities ranked as uncommon to widespread (S3S4). These communities are either forest, wetland or grassland types and include the following:

- Big Bluestem-Prairie Dropseed-Little Bluestem herbaceous vegetation (S1) – Grassland;
- Plains Rough Fescue-(Spear Grass) herbaceous vegetation (S1) – Grassland;
- Alkali Grass-Wild Barley-Nuttall's Salt Meadow Grass-Seaside Plantain saline herbaceous vegetation (S2) – Wetland Herb;
- Green Ash-American Elm-(Hackberry, Basswood) forest (S2) – Broadleaf;
- Little Bluestem-Grama Grass (Blue, Side-oats)-Thread-leaved Sedge herbaceous vegetation (S3) – Grassland;
- Green Ash-(American Elm)-Manitoba maple forest (S3) – Broadleaf;
- Needle-and-thread-Blue Grama-Thread-leaved Sedge herbaceous vegetation (S3) – Grassland;
- Common Reed herbaceous vegetation (S3?) – Wetland Herb;
- Bur Oak-Saskatoon Serviceberry-Sarsaparilla-Assiniboia Sedge forest (S3?) – Broadleaf;
- Trembling Aspen-Bur Oak-Sarsaparilla forest (S3S4) – Broadleaf;
- Sandbar Willow shrubland (S3S4) – Wetland Shrub; and
- Sprangletop herbaceous vegetation (S3S4) – Grassland.

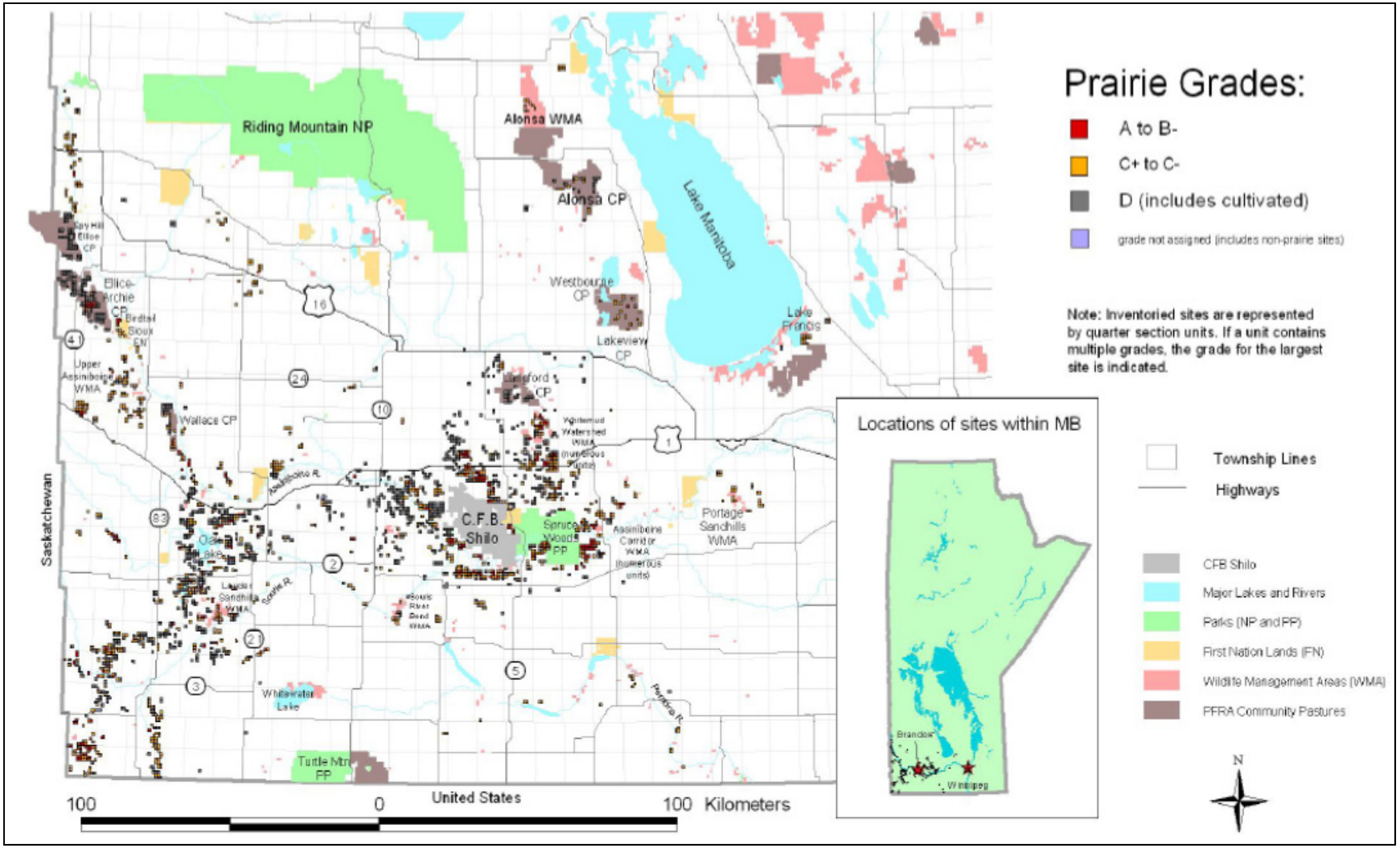
Grasslands and Prairie Areas

Grassland and prairie areas represent an important cover type in the Project Study Area as they have the potential to support federally and provincially protected species. Thirteen plant species that are listed as protected have the potential to occur in the southern portion of the Project Study Area and include rough purple false-foxglove (*Agalinis aspera*), Gattinger's agalinis (*Agalinis gattingeri*), buffalo grass (*Buchloë dactyloides*), hackberry (*Celtis occidentalis*), smooth goosefoot (*Chenopodium subglabrum*), small white lady's-slipper (*Cypripedium candidum*), hairy prairie-clover (*Dalea villosa*), western prairie fringed orchid (*Platanthera praeclara*), Riddell's goldenrod (*Solidago riddellii*), great plains ladies'-tresses (*Spiranthes magnicamporum*), western silvery aster (*Symphyotrichum sericeum*), western spiderwort (*Tradescantia occidentalis*) and Culver's-root (*Veronicastrum virginicum*). Preferred habitat for these species generally ranges from dry sandy areas to moist prairies.

Historically, grassland ecosystems existed over large areas but only a few undisturbed natural areas remain today and need to remain intact as these areas provide important plant and wildlife habitat. The Critical Wildlife Habitat Program, Manitoba Conservation and Prairie Farm and Rehabilitation Administration compiled information on mixed-grass prairies from 1989 through 2007. Figure 6.2-1 illustrates locations of native grassland and cultivated sites included with the mixed-grass prairies in southern Manitoba.

Salt Marshes

Salt marshes are areas with high salt concentrations. These areas are important habitats as they may support a unique community of invertebrates or epiphytic algae adapted to these conditions (Londry *et al.* 2005). As vegetation composition and structure are regulated by the saline conditions, a limited number of plants, including threatened species, can tolerate the high salt levels (Albert 2010). Saline areas are found within the Project study area and are known to occur in the Mid-Boreal Lowland and the Interlake Plain Ecoregions (Ducks Unlimited Canada 2009). Forest Resource Inventory recognizes mud/salt flats in the Project Study Area and these are found in the Churchill River Upland, Hayes River Upland, Mid-Boreal Upland, Mid-Boreal Lowland, Boreal Transition, Interlake Plain, Aspen Parkland and Lake Manitoba Plain Ecoregions.



Source: Critical Wildlife Habitat Program, Manitoba Conservation, Prairie Farm Rehabilitation Administration.

Figure 6.2-1 Locations of Grades of Native Grassland and Cultivated Sites included in the Mixed-Grass Prairie Inventory for Manitoba (1989 to 2007)

Wetland Communities

In Manitoba, Halsey *et al.* (1997) estimates that wetlands cover 233,340 km^2 or 43% of the terrestrial landscape, with peatlands representing 90% of all wetlands. It is well documented that wetlands are ecologically important (Bond *et al.* 1992; Smith 1992; Environment Canada 2010). Foster *et al.* (2004) noted the importance of calcareous wetlands and their potential to support species of conservation concern. There are several threats to wetlands that include agricultural runoff, drainage, forestry activities, off-road vehicles, peat extraction, and right-of-way activities (Foster *et al.* 2004).

Four wetland classes, as described in the Canadian Wetland Classification System (National Wetlands Working Group 1997), occur within the Project Study Area including bog, fen, marsh and swamp.

6.2.5.4 Species of Conservation Concern

The term "species of conservation concern" includes species that are rare, disjunct, or at risk throughout their range in Manitoba and require further research. Species that are listed under *The* (Manitoba) *Endangered Species Act* (MESA), or that have a special designation by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) are included under this term (Manitoba Conservation 2010). Two hundred and three species of conservation concern are known to occur in the Project Study Area (Appendix 6A, Table 6A- 2). These include 125 species ranked by the MCDC as very rare to rare (S1, S1S2, or S2) throughout their range or in the province. Forty-eight species are listed as rare to uncommon (S2S3 to S3); eight are listed as uncommon to widespread (S3S4); and 22 are listed as either historical, possibly in peril, or with a rank of "not applicable". Map 6-12 illustrates the locations of plants of conservation concern in the Project Study Area.

One-hundred and seven vascular plants of concern have been recorded in the Aspen Parkland Ecoregion (Map 6-13). This ecoregion also had the greatest number of S1 plants. The Interlake Plain and the Lake Manitoba Plain Ecoregions each have 89 species of concern. Similar to the Aspen Parkland Ecoregion, large portions of these ecoregions are located in the Project Study Area. The Interlake Plain has the second greatest number of S1 plant records with 24. The ecoregion that has the least number of records for species of concern is the Hudson Bay Lowland followed by the Selwyn Lake Upland with four and nine species, respectively.

Seven vascular plant species that are protected under provincial and federal legislation are known to occur within the Project Study Area (Table 6.2-8). A brief description of these species is found below.

Rough Purple False-foxglove

Rough purple false-foxglove is listed as endangered by SARA and COSEWIC, and is ranked as very rare to rare throughout its range by the MCDC. This plant is an annual herb that is 10 to 30 cm high with narrowly-linear leaves; the tubular flowers are pink in color (Looman and Best 1979). Dry prairies and sandy or rocky slopes were noted as preferred habitat for this species (Scoggan 1978), while Looman and Best (1979) and Friesen and Murray (2010) identify moist, calcareous grasslands as favorable growing conditions. In Manitoba, populations have been previously recorded in the south Interlake, Brandon area, and south of Bird's Hill Provincial Park which was the first known occurrence east of the Red River (Friesen and Murray 2010).

Small White Lady's-slipper

Small white lady's-slipper is listed as endangered by SARA, MESA, and by COSEWIC. The MCDC ranks the conservation status of this orchid as very rare throughout its range or in the province. The small white lady's-slipper is a perennial orchid 10 to 30 cm tall. The flower has yellow to greenish sepals and petals with a glossy, white, egg-shaped lip. Plants often form clonal clumps that can include greater than 50 individuals. The short blooming period is usually late May to early June in Manitoba (Ames *et al.* 2005). In Manitoba the small white lady's-slipper is found in calcareous prairies and in wooded grasslands. It is most often found in undisturbed locations but can also occur in disturbed sites such as roadside ditches (Reimer and Hamel 2003). This prairie orchid is at the northern edge of its North American range in Manitoba. Populations have been recorded at Brandon, in the Interlake near St. Laurent, near Steinbach and at the Tall Grass Prairie Preserve in the Stuartburn-Vita area.

Smooth Goosefoot

Smooth goosefoot is listed as threatened by SARA, endangered by COSEWIC, and the MCDC conservation status for this plant is very rare throughout its range. This plant is an errect annual that grows to a height of 20 to 80 cm (Looman and Best 1979). The leaves are linear, entire, glabrous, and are alternately arranged on ascending branches. The inflorescence consists of small greenish or redish flowers that develop from June to July (Hamel and Foster 2005). Smooth goosefoot is generally found on active sand dunes, dune blowouts and occasionally on sand plains that are bare or recently disturbed (Robson 2006). In Manitoba, the species is known to occur in the area of the Routledge Sandhills (Hamel and Foster 2005).

Hackberry

Hackberry is listed as threatened by MESA and is listed as very rare by the MCDC. Hackberry is a small deciduous tree with arching branches that forms a broad crown and can achieve a height of 15 m (Farrar 1995). The tree bark is gray to yellowish-brown and

has irregular ridges with wart-like projections. The leaves are alternate and are variable in shape, with an asymmetrical base and tapering tip. This shade tolerant tree reproduces vegetatively by stump sprouts and grows on a variety of soil conditions (Farrar 1995). In Manitoba, hackberry is found on beach ridges at the south end of Lake Manitoba and in dry prairie habitats in the southwestern portion of the province (Reimer and Hamel 2003).

Hairy prairie-clover

Hairy prairie clover is listed as threatened by the SARA, MESA, and COSEWIC. The MCDC ranks the conservation status of this plant as rare throughout its range or in the province. Hairy prairie-clover is a perennial that is 20 to 50 cm high. The plant branches from the base and its leaves are compound with seven to 17 leaflets that are densely covered with fine hairs. The flower spikes are two to 10 cm long which can be reddish, purple or pink (Looman and Best 1979). This plant grows in the prairie region on open to partially vegetated sand dunes and prefers south to southwest facing slopes (Reimer and Hamel 2002). In Manitoba, this plant has been observed south of Portage la Prairie, southwest of Carberry and west of Souris (Reimer and Hamel 2002).

Riddell's Goldenrod

Riddell's Goldenrod is listed as threatened by MESA, and is listed as a species of concern by SARA and COSEWIC. The MCDC ranks this plant as rare in the province. Riddell's goldenrod is a perennial with an erect stem that grows to a height of 40 to 100 cm. The leaves are linear, recurved and are usually three veined. The inflorescence is flat-topped to rounded and flowering occurs from August to September (Reimer and Hamel 2003). The plant occurs in swamps and wet meadows (Looman and Best 1979) as well as in undisturbed roadsides, tall grass prairies and open fens (Reimer and Hamel 2003). In Manitoba, populations occur in the southeastern portion of the province at Kleefeld, Gardenton and Green Ridge (Reimer and Hamel 2003).

Culver's-root

Culver's-root is listed as threatened under MESA and is ranked as very rare by the MCDC. This plant is a tall perennial, which can achieve a height of 2 m. The sharply toothed leaves are spaced along the stem in whorls of three to nine. The tubular flowers are white to pinkish in color and bloom from July to August. In Manitoba, populations of culver's-root occur in tall grass prairie, ditches along roadsides, edges of thickets, and trembling aspen/bur oak woods. Preferred habitat includes moist, calcareous, sandy loam soils (Hamel and Foster 2005). In Manitoba, populations of Culver's-root occur around the Tall Grass Prairie Preserve and in the RM of Franklin in southern Manitoba. One disjunct population was known to occur along the southern portion of the Project Study Area near Kleefeld (Hamel and Foster 2005).

One non-vascular species (a fungus) is also known to occur in the Project Study Area, that being flooded jellyskin (*Leptogium rivulare*). Three ecoregions, the Aspen Parkland, Lake Manitoba Plait and Interlake Plain, have recorded protected species (SARA and MESA) in the Project Study Area.

Table 6.2-8: Protected Plant Species known to occur in the Project Study Area

Scientific Name	Common Name	Grank	Srank	MESA	SARA	COSEWIC
Vascular Plants						
Celtis occidentalis	Hackberry	G5	S1	Th		
Chenopodium subglabrum	Smooth Goosefoot	G3G4	S1		Th	Th
Cypripedium candidum	Small White Lady's-slipper	G4	S1	E	E	E
Veronicastrum virginicum	Culver's-root	G4	S1	Th		
Agalinis aspera	Rough Purple False-foxglove	G5	S1S2		E	E
Dalea villosa	Hairy Prairie-clover	G5T5	S2	Th	Th	Th
Solidago riddellii	Riddell's Goldenrod	G5	S2	Th	SC	SC
Non-vascular Plants						
Leptogium rivulare	Flooded jellyskin	G3G5	SNR			Th

Note: Plant information obtained from Manitoba Conservation; G (global), S (provincial), Rank 1 (very rare), Rank 2 (rare), Rank 3 (uncommon), Rank 4 (widespread), Rank 5 (demonstrably widespread), GNR/SNR (species not ranked), SNA (rank not applicable), SH (historically known), SU (possibly in peril), E (endangered), Th (threatened), SC (special concern).

6.2.5.5 Plants and Resource Use

There are approximately 1,075 plant species that have the potential to occur in the Project Study Area. Many of these plant species are considered botanical resources and are used by Aboriginal and local people (see Domestic Resource Use).

6.2.5.6 Fire in the Boreal Forest

In Canada, the forest fire season generally starts in April and can continue until mid-October (Stocks *et al.* 2003). Weather and climate play a major role in the occurrence and spread of fires in the boreal forest (Johnson 1992). According to Natural Resources Canada (2008) lightning fires represent 45% of all fires and 81% of the area burned. The majority of human-caused fires are in southern regions of Canada that are heavily populated (Natural Resources Canada 2009). Lightning fires cause the majority of large fires in northern ecozones (Stocks *et al.* 2003). Most of the human-caused fires tend to occur in April and May with lightning fires dominating in the late spring/summer (Stocks *et al.* 2003). According to the large fire database developed by Stocks et al.

(2003), 31% of fires in Canada are 200 to 500 ha (1.4% of area burned) and 2.5% of fires are 50,000 ha (44% of area burned).

The boreal forest is dominated by coniferous trees (Natural Resources Canada 2009) including jack pine, black and white spruce, balsam fir and tamarack. Species such as jack pine, black spruce, paper birch and trembling aspen immediately regrow in the area that was affected by forest fires (Weber and Stocks 1998). Jack pine and black spruce have serotinous cones, which require the heat from fires to regenerate (Weber and Stocks 1998). Millions of seeds per hectare can be stored in serotinous cones that accumulate for decades until released by fire (Perry 1994). Other coniferous trees (e.g., white spruce) do not require fire to regenerate. Deciduous trees such as paper birch regenerate from stem sprouts and trembling aspen regenerate from root suckers, while other species (e.g., poplar) readily disperse seeds.

The boreal forest tends to burn at different intervals based on a variety of factors including: combustibility of tree species (conifers are more readily combustible then deciduous trees); presence of highly combustible material on the forest floor that acts as a ladder for fire spread; precipitation regimes; localized microclimates; proximity to human settlement/activities; and how widespread a species is in a forest stand.

In the Boreal Shield Ecozone, wildfire is a frequent event that has a large effect on the vegetation composition and age distribution of forest stands. Due to the common occurrence of fire, the landscape of the ecozone consists of a mosaic of stands of varying ages, wetlands and bedrock outcrops. Upland forests are often younger than 150 years (Smith *et al.* 1998). Map 6-14 shows the Forest Fire Histroy for fires over 900 hectares in the Project Study Area.

6.2.5.7 Valued Environmental Components

Two VECs were identified and include species of conservation concern, and native grassland/prairie areas, and are briefly discussed below.

Plant species/communities of conservation concern

Species of conservation concern are important because these plants exist in low numbers and play a role in helping to preserve species diversity. Protection of species of conservation concern is critical as the abundance and distribution of these plants are often restricted. Plants species 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 them being listed by the MCDC as very rare to uncommon.

Native Grassland/Prairie Areas

Native grasslands are important sites, as these ecosystems once existed over large areas, but only remnant prairie areas remain today. Grasslands and prairie areas were identified as a VEC and utilized in this assessment because these areas are known to support species of conservation concern and 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.

6.2.5.8 Existing Environment at Project Components

The following sections describe the specific existing environment for the Project components including the HVdc transmission line, Keewatinoow and Riel converter stations, Keewatinoow construction power station, ground electrodes, northern AC collector and construction power lines, construction camp, borrow sites (including excavated material placements sites) and access roads.

HVdc Transmission Line

The local study area and preferred route ROW both intersect five ecozones and eight ecoregions. The Boreal Plains and Prairies Ecozones represent the greatest area for the Local Study Area and preferred route ROW. The ecoregions (division of ecozones) include the Hudson Bay Lowland, Selwyn Lake Upland, Churchill River Upland, Hayes River Upland, Mid-Boreal Lowland, Interlake Plain, Aspen Parkland, and Lake Manitoba Plain.

Vegetation Cover Types

Twenty-one cover types from the Land Cover Classification Enhancement for the Bipole III line (LCCEB) occur within the Local Study Area of the preferred route. These include Mixedwood Open, Broadleaf Sparse, Shrubland, Wetland, Broadleaf Forest, Developed Land, Exposed Land, Herb, Perennial Cropland and Pasture, Coniferous Sparse, Mixedwood Dense, Broadleaf Dense, Broadleaf Open, Wetland Treed, Wetland Herb, Shrub Tall, Grassland, Coniferous Open, Coniferous Dense, Wetland Shrub, and Annual Cropland. Within the Local Study Area, the annual cropland cover type occupies the greatest area, with 112,563 ha, and represents 16% of the total land area. The majority of this land area occurs in the Lake Manitoba Plain Ecoregion with 104,109 ha. Nine other extensive cover types (less than 3%) that occur within the Local Study Area include wetland shrub (72,978 ha), coniferous dense (68,954 ha), coniferous open (62,409 ha), grassland (55,179 ha), shrub tall (53,676 ha), wetland herb (49,452 ha), wetland treed (47,387 ha), broadleaf open (40,350 ha) and broadleaf dense (26,552 ha). Within the preferred route ROW, the greatest land area was occupied by the annual cropland cover type with 1,492 ha and a total land area proportion of 16%. The eight

extensive cover types (>3%) within the ROW include coniferous dense (1,021 ha), coniferous open (913 ha), shrub tall (807 ha), wetland shrub (789 ha), grassland (756 ha), wetland treed (670 ha), wetland herb (604 ha) and broadleaf open (559 ha).

Vegetation Community Types

One hundred and nineteen plots were sampled along the preliminary preferred route to describe the vegetation community types. The communities described are grouped broadly by vegetation type, based on the LCCEB, including coniferous forests, mixed forests, deciduous forests, grasslands, and wetland areas. The community types are listed below for each ecoregion, with detailed descriptions for each provided in the *Bipole III Terrestrial Ecosystems and Vegetation Technical Report*.

Hudson Bay Lowland Ecoregion:

Coniferous Forest: Open Black Spruce—Coniferous/ Schreber's Moss; Open Black Spruce—Coniferous/ Reindeer Lichen—Peat Moss; Regenerating Open Jack Pine—Black Spruce/ Labrador Tea

Wetland: Treed Black Spruce Bog

Selwyn Lake Upland Ecoregion:

Coniferous Forest: Open Black Spruce—Coniferous/ Splendid Feather Moss; Regenerating Jack Pine/ Tall Shrub

Wetland: Sedge Fen

Churchill River Upland Ecoregion:

Coniferous Forest: Open Black Spruce/ Schreber's Moss; Open Jack Pine –Black Spruce/ Splendid Feather Moss; Sparse Black Spruce/ Labrador Tea

Mixed Forest: Open Trembling Aspen Mixed/ Green Reindeer Lichen

Wetland: Treed Black Spruce Bog; Willow Riparian; Sedge Fen

Hayes River Upland Ecoregion:

Coniferous Forest: Open Black Spruce/ Labrador Tea/ Schreber's Moss; Open Black Spruce/ Labrador Tea/ Reindeer Lichen; Sparse Black Spruce/ Reindeer Lichen; Sparse Black Spruce—Jack Pine/ Green Reindeer Lichen; Open Tamarack—Black Spruce/ Peat Moss; Regenerating Open Conifer

Mixed Forest: Closed Trembling Aspen Mixed; Trembling Aspen Mixed/ Green Alder; Closed White Spruce—Balsam Poplar; Treeless Regenerating Jack Pine Mixed

Deciduous Forest: Closed White Birch; Graminoid Wetland; Treed Black Spruce/ Peat Moss Bog

Mid-Boreal Lowland Ecoregion:

Coniferous Forest: Jack Pine/ Green Reindeer Lichen; Regenerating Jack Pine; Black Spruce-Tamarack/Labrador Tea-Common Horsetail/Feathermoss; Black Spruce/Splendid Feathermoss; Tamarack/Speckled Alder/Peat Moss

Mixed Forest: Jack Pine-White Spruce-Trembling Aspen/Common Juniper/Feathermoss

Wetland: Wet Sedge Meadow; Treed Black Spruce-Tamarack/Peat Moss Bog; Sparse Black Spruce/Labrador Tea/Peat Moss-Feathermoss

Interlake Plain Ecoregion:

Coniferous Forest: Closed Black Spruce-Coniferous

Mixed Forest: Open Trembling Aspen-Mixed /Tall Shrub; Closed Deciduous-Mixed

Deciduous Forest: Closed Deciduous/Tall Shrub

Wetland Type: Salt Marsh

Lake Manitoba Plain Ecoregion:

Deciduous Forest: Sparse Trembling Aspen-Balsam Poplar; Closed Trembling Aspen/Bluegrass; Open Trembling Aspen-Bur Oak/Tall Shrub; Closed Bur Oak

Grassland: Mixed Grass

Wetland: Sedge Wetland; Cattail or Reed Canary Wetland

Riparian Habitat and Wetlands

The total amount of riparian habitat found along the Local Study Area is approximately 103,463 ha. Of this total, the ecoregion with the largest area of riparian habitat is the Hayes River Upland with 29,734 ha. Along the ROW, the total area of riparian habitat is 957 ha. The Lake Manitoba Plain Ecoregion has the largest area of riparian habitat along the ROW with 361 ha.

The total area of all wetlands along the Local Study Area is approximately 137,701 ha. The amount of bog wetlands that occur in the Local Study Area is 36,358 ha, with the Hudson Bay Lowland occupying the largest area (17,041 ha). Fen wetlands, along the Local Study Area total a larger area then the bog wetlands with 90,135 ha. The Mid-Boreal Lowland Ecoregion occupies the largest area of fen wetlands along the Local Study Area with 50,382 ha. Marsh wetlands have the smallest area intersected by the Local Study Area (11,207 ha) that dominantly occur in the Mid-Boreal Lowland (8,399 ha). The total area of all wetlands along the preferred route is approximately 1,456 ha with 272 ha represented by bog wetlands, 1,046 ha by fen wetlands, and 138 ha by marsh wetlands.

Plants and Distribution of Species

A total of 457 plant taxa were observed in the Local Study Area (Appendix 6A, Table 6A-3). All plants were grouped by primitive vasculars (eg. ferns and horsetails), gymnosperms (conifers), angiosperms (flowering plants) and non-vascular plants. Vascular plants were distributed among 76 families. The aster (Asteraceae) and grass (Poaceae) families were the largest with 54 and 49 plant taxa each, followed by the sedge (Cyperaceae) and rose (Rosaceae) families with 36 and 24 species, respectively. Greater than 20 species were observed in each of the crowfoot (Ranunculaceae), heath (Ericaeae), and pea (Fabaceae) families. The primitive vasculars are distributed among five families including the horsetail (Equisetaceae), club-moss (Lycopodiaceae), adder's tongue (Ophioglossaceae), fern (Pteridaceae) and spikemoss (Selaginellaceae). Species within the gymnosperms were members of the cypress (Cupressaceae) and pine (Pinaceae) families.

The flora observed and recorded in the Local Study Area was distributed among seven ecoregions: Hudson Bay Lowland (60 plant taxa), Selwyn Lake Upland (38 plant taxa), Churchill River Upland (101 plant taxa), Hayes River Upland (147 plant taxa), Mid-Boreal Lowland (160 plant taxa), Interlake Plain (210 plant taxa) and Lake Manitoba Plain (280 plant taxa).

Twenty-seven species of the flora observed in the Local Study Area were introduced. These species were members of eight families including the pea (Fabaceae) and grass (Poaceae) families that had the highest amount of introduced plants with eight each. Introduced plants were observed in all ecoregions except for plots sampled in the Selwyn Lake Upland and the Hudson Bay Lowland. Invasive plant species included Canada thistle (*Cirsium arvense*), white sweetclover (*Melilotus alba*), yellow sweetclover (*Melilotus officinalis*), purple loosestrife (*Lythrum salicaria*), and reed canarygrass (*Phalaris arundinacea*).

Species of Conservation Concern

Twenty nine records of species of conservation concern (two point and 27 polygon) were previously known to occur in the Local Study Area and 15 records were previously known to occur along the ROW. Of the plants along the ROW, two records of annual skeletonweed (*Shinnersoseris rostrata*) occurred which is ranked very rare to rare (S1S2). Plants ranked rare (S2) along the ROW included whorled milkweed (*Asclepias verticillata*), Houghton's umbrella-sedge (*Cyperus houghtonii*), Louisiana broom-rape (*Orobanche ludoviciana*), smooth woodsia (*Woodsia glabella*), white-haired panic-grass (*Dichanthelium linearifolium*) and lyre-leaved rock cress (*Arabis lyrata*). Few-flowered meadow-rue (*Thalictrum sparsiflorum*) is ranked rare to uncommon (S2S3), while green needle grass (*Nassella viridula*), yellow stargrass (*Hypoxis hirsuta*), and dog violet (*Viola conspersa*) are ranked as uncommon species (S3). Eleven of the 15 records occurring along the ROW are listed historical by the MCDC. Map 6-12 shows the locations for species of

conservation concern along the preferred route. No species listed by COSEWIC, SARA or MESA were known to occur along the route. No previously known communities of conservation concern listed by the MCDC were identified along the preferred route.

In 2010, botanical surveys identified 14 species of conservation concern (26 locations) within the local study area of the preferred route. Species ranked as rare (S2) throughout their range included dwarf bilberry (*Vaccinium caespitosum*), hairy prairie-clover (*Dalea villosa*), large enchanter's nightshade (*Circaea lutetiana*), Schweinitz's flatsedge (*Cyperus schweinitzii*), slender-leaved sundew (*Drosera linearis*), timber oatgrass (*Danthonia intermedia*) and western jewelweed (*Impatiens noli-tangere*). American bugseed (*Corispermum americanum*) is ranked as rare to uncommon (S2S3). Five species were ranked uncommon (S3) throughout their range or in the province and included linear-leaved pucoon (*Lithospermum incisum*), lopseed (*Phryma leptostachya*), oblong-leaved sundew (*Drosera anglica*), snow willow (*Salix vestita*), and yellow star grass (*Hypoxis hirsuta*). Lesser wintergreen (*Pyrola minor*) was ranked as uncommon to widespread (S3S4). Map 6-13 shows the location for these species. Hairy prairie-clover is also listed as threatened by COSEWIC and is protected by SARA and MESA. Hairy prairie-clover was observed at one location in the Local Study Area during the surveys where 12 individuals were counted in a prairie habitat. No communities of conservation concern (listed by the MCDC) were identified during the 2010 field assessments.

Nine species of conservation concern were observed in the vicinity of the preferred route during surveys conducted for Swan Lake First Nation (Reeves 2011). These included tall hairy agrimony (*Agrimonia gryposepala*) ranked very rare to rare (S1S2), bloodroot (*Sanguinaria canadensis*), enchanter's nightshade (*Circaea lutetiana* ssp. *canadensis*), showy tick-trefoil (*Desmodium canadense*) and hairy sweet cicely (*Osmorhiza claytonii*) ranked rare (S2), alternate-leaved dogwood (*Cornus alternifolia*), black ash (*Fraxinus nigra*) and lopseed (*Phryma leptostachya*) ranked uncommon (S3), and western false gromwell (*Onosmodium molle* var. *occidentale*) ranked uncommon to possibly in peril (S3SU) by the MCDC.

Fire History

The fire history along the preferred route has been assessed by ecoregion using available data from 1928 to 2010 (Map 6-14). Land area burnt was determined on a per hectare basis and data analysis did not delineate overlapping burns along the ROW. Three fires have occurred in the Hudson Bay Lowland and approximately 237 of the 350 ha of land (67%) intersected by the ROW have been burnt. Only one burn has been recorded along the ROW in the Sewlyn Lake Upland Ecoregion with 100% of the 52 ha been burnt in a 1992 fire. Five fires have occurred along the ROW of the Churchill River Upland Ecoregion where approximately 322 of the 746 ha of land (43%) have been burnt. Nine fires have occurred in the Hayes River Upland with 693 ha of land (35%) burnt, while nine separate fires in the Mid Boreal Lowland Ecoregion accounted for 344 ha (19%)

been burnt. In the Interlake Plain Ecoregion, 13 fires since 1928 have accounted for 574 of 1,252 ha of land (45%) been burnt. Approximately 384 of 2,994 ha of land (12%) intersected by the ROW have been burnt in eight fire occurrences since 1928 in the Lake Manitoba Plain Ecoregion. The most recent fire was in 1984 and burned 8 ha of land.

Environmentally Sensitive Sites

Environmentally sensitive sites identified from the assessment of the HVdc transmission line include dry upland prairies, salt marshes/flats, patterned fen wetlands, areas that support species of conservation concern, and areas of botanical importance identified through ATK. These sites were identified as being environmentally sensitive as they have greater potential for occupying species of concern (i.e., dry upland prairies, and patterned fens), may contain unique species (i.e., salt marshes/flats), and support plants of medicinal and cultural value (i.e., ATK sites).

All grassland sites visited during the 2010 fieldwork season are considered agricultural pastureland. Each site displayed evidence of cattle grazing (e.g., close cropped grasses and forbs, some browsing on shrubs or rubbing on trees), and either current or past cattle activity (e.g., cattle and/or cattle trails in pasture and through forested areas, manure, fencing to enclose cattle). A drier mixed grass prairie was also identified through Forest Resource Inventory Mapping. These dry upland prairie ridge sites were visited to assess each area for plant species and communities of concern. Although each of the sites visited had cattle grazing activity present, there were also several plant species of conservation concern observed (American bugseed, linear-leaved pucoon, Schweinitz's flatsedge). One site supported hairy prairie-clover, a species protected by SARA and MESA. Depending on the level of grazing activity, a grazed site can also support a diverse composition of native species. The dry upland prairie ridge sites have the best variety of native prairie observed along the preferred route, even though these areas often contained sparse to open tree cover. Dry upland prairies were located along the Local Study Area of the Aspen Parkland, Interlake Plain, and Lake Manitoba Plain Ecoregions. The total area of the dry upland prairie ridge sites within the local study area was 428 ha with 348 (81%) occurring in the Lake Manitoba Plain Ecoregion. Within the ROW, only the Lake Manitoba Plain includes dry upland prairies and these sites occupy an area of 9 ha.

Salt marsh complexes are found in the Mid-Boreal Lowland and Interlake Plain Ecoregions along the Local Study Area. The total area of salt marshes within the Local Study Area covers 712 ha. Along the ROW, salt marshes are only found in the Interlake Plain Ecoregion and cover an area of 6 ha. Salt flats (FRI data source) are found in the Mid-Boreal Lowland, Interlake Plain and Lake Manitoba Plain Ecoregions along the Local Study Area. The total area of salt flats within the Local Study Area covers 212 ha. Along the ROW, salt flats are only found in the Interlake Plain Ecoregion and cover an area of 1 ha.

Patterned fen complexes are composed of narrow ridges of peat that have wet depressions between the ridges. Patterned fens occur in the Churchill River Upland, Hayes River Upland, Mid-Boreal Lowland and Interlake Plain Ecoregions within the Local Study Area and 66 m ROW. The total area occupied by primary patterned fen classes within the local study area is 45,967 ha while 535 ha occurred within the ROW. The Mid-Boreal Lowland has the largest area of patterned fens in the ROW with 396 ha. This ecoregion represents 74% of the patterned fens within the ROW. A comparison of the area between the ROW and the local study area indicates that no ecoregion has a proportion of greater than 1% for patterned fens. Oblong-leaved sundew (*Drosera anglica*) and slender-leaved sundew (*Drosera linearis*) were two species of concern observed in patterned fen wetlands.

Keewatinoow Converter Station & Associated Facilities

The Keewatinoow Converter Station occurs in the Hudson Bay Lowland Ecoregion and occupies an area of approximately 120 ha. Five cover types occur in the footprint with shrub tall being dominant (103 ha). The other types include exposed land, coniferous open, coniferous sparse, and wetland shrub. The area of riparian habitat found within the Project Footprint is approximately 15 ha.

The proposed Keewatinoow Converter Station site consists dominantly of black spruce (*Picea mariana*) with Labrador tea (*Rhododendron groenlandicum*) as the major understory shrub. Several open bog areas with surface water also occur in the area. The northern part of the site is a regenerating burn, with standing dead trees. Based on fire history records, 94% (113 ha) of the area was previously burned. The middle of the site (west side of the Conawapa access road) is a very wet area that consists of black spruce, tamarack (*Larix laricina*), willows (*Salix* spp.), white birch (*Betula papyrifera*) and dwarf birch (*Betula glandulosa*). The southern part of the site is a mature black spruce - tamarack bog with feathermosses (*Pleurozium schreberi* and *Hylocomium splendens*), peat mosses (*Sphagnum* spp.), reindeer lichen (*Cladina* sp.) and brown mosses as ground cover. No species of conservation concern were observed at the Keewatinoow Converter Station site.

Construction Power Station

The Keewatinoow construction power station occupies an area of approximately 2 ha and occurs in the Hudson Bay Lowland Ecoregion. The two cover types that are represented include exposed land (1.4 ha) and shrub tall (0.8 ha).

A substantial portion of the proposed site for the construction power station has already been degraded of vegetation. The middle of the site consists of gravel that has been invaded by plant species such as common dandelion (*Taraxacum officinale*) and golden rod (*Solidago* sp.). The eastern part of the site is a black spruce (*Picea mariana*) dominated forest with minor amounts of tamarack (*Larix laricina*) present. Trees in the canopy are

approximately 10 m tall with these species also occurring in the shrub stratum. The western part of site is a regenerating burn area with black spruce and tamarack that are less than 5 m tall. Labrador tea (*Rhododendron groenlandicum*) is the principle low shrub, while the ground cover consists of feathermosses (*Pleurozium schreberi* and *Hylocomium splendens*), peat mosses (*Sphagnum* spp.), reindeer lichen (*Cladina* sp.) and pelt lichens (*Petligera* spp.). Snow willow (*Salix vestita*) was the only species of conservation concern observed at the proposed construction power station site. This species is ranked as uncommon (S3) by the MCDC.

AC Collector and Construction Power Lines

The northern ac collector lines and the construction power line are in the Hudson Bay Lowland Ecoregion. The northern collector lines occupy an area of approximately 822 ha, 160 ha for the Long Spruce to Henday and 24 ha for the construction power line.

Nine cover types are found along the northern AC collector and construction power line ROWs, and include exposed land, shrub tall, wetland treed, wetland shrub, wetland herb, coniferous dense, coniferous open, coniferous sparse and mixedwood dense. For the northern collector lines, the dominant cover types are coniferous sparse (280 ha) and wetland shrub (218 ha) while wetland shrub is the dominant cover type for the Long Spruce to Henday transmission line (80 ha) and construction power line (12 ha). The total riparian habitat found along the AC collector lines and construction power line ROWs is 193 ha with the largest area found along the northern collector lines (193 ha), followed by the Long Spruce to Henday transmission line (26 ha) and the construction power line (8 ha). Both bog and fen wetlands occur along the Long Spruce to Henday transmission line with 54 ha and 37 ha respectively, while only bogs wetlands are found in the northern collector (544 ha) and construction power line (6 ha) ROWs.

Fire history records for the area identified that 228 ha (28%) has burned for the northern collector lines, 15 ha (61%) for the construction power line and 32 ha (20%) for the Long Spruce to Henday transmission line. Along the northern collector lines ROW, blue-grass (*Poa arctica* ssp. *caespitans*) was previously known to occur, which is ranked as a species that is possibly in peril, but the status is uncertain (SU) and more information is needed. As the location of the AC collector lines and construction power line ROWs were not finalized until the winter of 2011, field assessments for these components were not completed and pre-construction surveys for species of conservation concern will be conducted for these ROWs.

Northern Ground Electrode

The Keewatinoow ground electrode site (NES6) and distribution line right-of-way occupy approximately 401 ha and 44 ha respectively, and both occur in the Hudson Bay Lowland Ecoregion. Eight cover types occur for these Project components and include exposed land, shrub tall, wetland treed, wetland shrub, wetland herb, coniferous dense,

coniferous open and coniferous sparse. The dominant cover types for the northern ground electrode site are wetland shrub (142 ha) and coniferous open (127 ha) while expose land (15 ha) and shrub tall (14 ha) were dominant for the distribution line. The total area of riparian habitat for the ground electrode site is 49 ha and 12 ha for the distribution line. Only bog wetlands were known to occur within the project footprint and occupy an area of 137 ha. Fire history records identified that 147 ha (37%) and 0.4 ha (1%) have been burned for the ground electrode and distribution line, respectively.

Black spruce (*Picea mariana*) and tamarack (*Larix laricina*) dominate the dense coniferous forest canopy of the ground electrode site. The understory consists of ericaceous shrubs (*Kalmia polifolia, Rhododendron groenlandicum, Rhododendron tomentosum,* and *Vaccinium* spp.), peat moss (*Sphagnum* sp.), feathermoss (*Pleurozium schreberi*) and reindeer lichen (*Cladina* sp.). Tree composition is dominantly black spruce with a shrub stratum dominated by Labrador tea and a high abundance of cloud berry (*Rubus chamaemorus*). Several small bogs and a large pond are present at this site. No species of concern were observed at this site.

Keewatinoow Construction Camp

The construction camp occurs in the Hudson Bay Lowland Ecoregion and will occupy an area of approximately 28 ha. Four cover types occur for this component and include exposed land, wetland shrub, coniferous sparse, and shrub tall as the dominant type with an area of 18 ha. The construction camp also includes 7 ha of riparian habitat. Fire history records show that 12 ha (42% of the area) of land was burned from fires occurring in 1976 and 1994.

Borrow Sites

Borrow source locations will be located along the ROW wherever possible in order to minimize environmental effects, haul distances and cost. The potential northern borrow and excavated material placement sites occur in the Hudson Bay Lowland Ecoregion and nine cover types were identified for the borrow sites and seven for the excavation material placement sites. The cover types and combined area of borrow sites include exposed land (30 ha), shrub tall (63 ha), wetland treed (10 ha), wetland shrub (29 ha), wetland herb (2 ha), coniferous dense (98 ha), coniferous open (13 ha), coniferous sparse (8 ha) and mixedwood dense (4 ha). The cover types and combined area for the excavated material placement sites include exposed land (9 ha), shrub tall (77 ha), wetland treed (24 ha), wetland shrub (5 ha), coniferous dense (3 ha), coniferous open (9 ha), and coniferous sparse (16 ha).

Riel Converter Station & Associated Facilities

The Riel Converter Station is located in the Lake Manitoba Plain Ecoregion. The Riel Converter Station was visited during the summer of 2010 and, as the area was under

development for the Riel Reliability Improvement Initiative Project, the visit occurred along the periphery of the site, adjacent to Provincial Road 207. In the spring and summer of 2008, surveys for rare vascular plants were conducted around the area proposed for development. The site consisted of agricultural land but the surrounding ditches were surveyed for rare plants. No species of conservation concern were identified during the surveys.

The southern ground electrode is located in the Interlake Plain and Lake Manitoba Plain Ecoregions, and occupies areas of 44 ha and 227 ha, respectively. Four vegetation cover types occur at the site with annual cropland as the dominant cover (257 ha) followed by developed land, grassland, and broadleaf dense. As a result of this site being identified and selected in the winter of 2010, a field assessment at this site was not completed and therefore a pre-construction survey for species of conservation concern will be conducted for the southern ground electrode site.

6.2.6 Mammals and Habitat

6.2.6.1 Overview

Mammal species are important components of the biophysical and socio-economic environments, having roles in ecological cycles, and providing food for people. Some mammal species have unique habitat requirements for each stage of their life cycle (e.g., calving, denning), while other mammal species and groups have much broader habitat requirements for other stages of their life cycle (e.g., migration routes for caribou). As a group, mammals require a wide range of habitats to maintain healthy populations. The sustainability of habitat is an important consideration to maintain mammal species on the landscape for future generations.

Mammal habitat is comprised of several important components including climate, physiography, soils and vegetation. Together with other factors, such as predation and species competition, habitat plays a major role in determining the diversity, abundance and distribution of all species. In the southern portion of the Project Study Area, approximately half of all naturally occurring wildlife habitat has been converted from tree and native grass cover to agricultural landscapes including crops, hay lands and pasture lands. The remaining habitat is dominated by forest with scattered concentrations of wetlands (Prairie Pothole Region), shrub lands and small remnant grasslands. The western portion of the Project Study Area is a transition zone, where habitats range from agricultural landscapes, wetlands, and shrub lands to boreal forest. The northern portion of the Project Study Area is dominated by Precambrian granitic outcrops, boreal forest, lakes, wetlands, and the boreal-tundra transition zone.

This section provides information on the following:

- Mammal groups in the Project Study Area;
- Summary by ecozones;
- Species at risk;
- VECs; and
- Existing environment at Project Components.

6.2.6.2 Mammal Groups in the Project Study Area

A total of sixty-eight mammal species have been documented within the Project Study Area (Appendix 6A, Table 6A-4). Mammals are organized in one of three major mammal groupings:

- Ungulates;
- Furbearers; and
- Small mammals.

Large predator species such as the grey wolf play an important role in the overall mammal ecology in the Project Study Area, and as such are discussed separately from the three aforementioned mammal groupings.

Ungulates

Ungulates are important game and prey species for a variety of predators. In the Project Study Area, they include migratory caribou, including boreal woodland and coastal (forest tundra ecotype) caribou (*Rangifer tarandus caribou*), barren ground caribou (*Rangifer tarandus groenlandicus* Linnaeus), moose (*Alces alces)*, elk (*Cervus canadensis*), and white tailed deer (*Odocoileus virginianus*). Mule deer (*Odecoileus hemionus*) occur in the south west portion of the Project Study Area in low densities as the Project Study Area is on the fringe of known range. For the purpose for the Project EIS, ungulate VECs include boreal woodland caribou, coastal and barren ground caribou, moose and elk.

The primary ungulate species found in the northern portion of the Project Study Area include caribou and moose. Caribou are generally identified by two major sub-species and three ecotypes. These include sedentary boreal woodland caribou and migratory caribou which groups coastal or forest/tundra ecotype with barren-ground caribou. Migratory caribou are identified loosely as two major ecotypes; the forest/tundra caribou ecotype (Pen Islands and Cape Churchill herds) and the barren ground caribou ecotype (Beverly-Qamanirjuaq) (Map 6-15). The Manitoba barren ground and coastal caribou populations are located above the northern extent of the boreal woodland caribou range and are not protected under the Manitoba *Endangered Species Act*.

Moose are widespread across the northern and southern coniferous forest areas found in the Project Study Area (Map 6-16). Common ungulates found in the south portion of the Project Study Area extending towards the central portion of the area include white-tailed deer and elk; (Map 6-17). White-tailed deer are the most numerous ungulate found within the southern portion of the Project Study Area and in the Province of Manitoba (Manitoba Conservation 1997), with population estimates ranging from 150,000 to 160,000 animals (Manitoba Conservation 2010). White-tailed deer are found throughout the Project Study Area south of Red Deer Lake and likely occur at low to moderate densities near Red Deer Lake and at high densities near agricultural areas in the southern portion of the Project Study Area. White-tailed deer have been able to colonize southern and central Manitoba by following the development of agriculture (Goulden 1981). The northward expansion of the white-tailed deer range has been well documented; however their persistence is both temporally and spatially sporadic across northern landscapes.

Furbearers

Examples of mammals in the furbearer group are American marten (*Martes americana*), beaver (*Castor canadensis*), fisher (*Mates pennati*), otter (*Lutra Canadensis*), mink (*Mustella vison*), short tailed weasel (*Mustela erminia*) red fox (*Vulpes vulpes*), coyote (*Canis latrans*) and grey wolf (*Canis lupus*). There are also many species of small mammals (shrews, mice, voles, lemmings, ground squirrels, hares, and bats). The distribution and relative abundance of furbearers in the province has been well documented through fur harvest statistics. While the geographic range of most species has remained fairly consistent over the past 80 years, several species (e.g. badger [*Taxidea taxus*], fisher, and marten) expanded their range during the mid-1970's (Stardom 1986). Densities of species such as badger and long-tailed weasel (*Mustela nivalis*) have declined in southern Manitoba as a result of intensive land use within their traditional range, while species such as beaver and raccoon are present in much higher densities than they were 50 years ago (Stardom, 1986).

Trapping records obtained from Manitoba Conservation (Manitoba Conservation unpublished data 2009) identify a total of 22 furbearing species harvested in the Project Study Area. Between 1996 and 2008 the most common species trapped included beaver, marten, and muskrat (*Ondatra zibethica*). The species of greatest economic importance for the fur industry include American marten, wolverine (*Gulo gulo)*, otter and lynx (*Lynx canadensis*). Based on the VEC selection criteria), America marten, beaver and wolverine were selected as VECs for the purpose of the Project.

Small Mammals

Small mammals serve as a main food source for furbearer species, including VEC and VEC linkage species outlined in this report (marten, wolverine and wolf). The abundance and distribution of small mammals influences the distribution and utilization of habitat by VEC and VEC linkage species. The small mammal community consists of

a variety of species of bats, mice, voles, shrews, squirrels, chipmunks, hares and rabbits. In all, a total of 41 species or roughly half of all mammals expected to occur within the Project Study Area are small mammals. Small mammals are found throughout all habitats in the Project Study Area and serve as key prey species for a variety of birds and larger mammals. No small mammals in the Project Study Area are listed in protection legislation or rely on rare or endangered habitats. Small mammals are found throughout all habitats, with many species adapted to the larger contiguous areas of softwood, treed bogs, and wetlands. Bats such as the little brown bat (*Myotis lucifugus*) occur in the Project Study Area. Some important habitats for bats, including hibernacula, occur just outside the Project Study Area south of Ponton. Snowshoe hare (*Lepus americanis*) are common throughout and woodchuck (*Marmota monax*) is more dominant in the northern portion where ground squirrels such as the thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*) are commonly found (Banfield 1974).

6.2.6.3 Summary by Ecozone

The following provides detailed habitat descriptions for the various ecological regions and common mammal species found throughout the Project Study Area.

Taiga Shield Ecozone

The northwestern area of Manitoba is characterized by the features of the Taiga Shield Ecozone: rolling upland hills, lowland bog and fen peatlands, rocky outcrops, and glacial till forming eskers and kettle lakes. Stands of jack pine (*Pinus banksiana*), black spruce (*Picea mariana*), and tamarack (*Larix larciana*) cover the southern portion of this ecozone and transition to the treeless Southern Arctic ecozone in the north. White spruce (*Picea glauca*), balsam poplar (*Populus balsamifera*) and white birch (*Betula papyrifera*) are found along protected corridors lining waterways (Smith *et al.* 1998). Common mammals found in the Taiga Shield Ecozone include arctic fox, barren-ground caribou, black bear, brown lemming (*Lemmus sibiricus*), grey wolf, moose, polar bear, and weasel (Smith *et al.* 1998).

Hudson Plain Ecozone

The Hudson Plains Ecozone in Manitoba is found in the northeast corner of the province along the southern edge of Hudson Bay. Peatlands and marshes dominate this poorly drained landscape. In this transitional area that stretches between Arctic tundra and boreal forest, trees are typically sparse, scattered, and stunted. Tree species include black spruce, white spruce, and tamarack along drier ridges, and balsam poplar, white spruce, and paper birch (*Betula papyrifera*) in sheltered areas along watercourses (Smith *et al.* 1998; Natural Resources Canada 2007). Common mammals of the Hudson Plains Ecozone include American marten, arctic fox (*Alopex lagopus*), black bear, coastal

caribou, grey wolf, lynx, moose, and muskrat. Polar bears (*Ursus maritimus*) are common along the coast of the Hudson Bay (Smith *et al.* 1998; Natural Resources Canada 2007).

Boreal Shield Ecozone

The Boreal Shield Ecozone stretches across most of north-central and eastern Manitoba, and is dominated by the metamorphic gneiss bedrock of the Canadian Shield, broad expanses of conifer dominated boreal forest, and numerous lakes. Soils in this ecozone are typically thin, cool, acidic, and have low nutrient availability. Wet, oxygen poor, organic soils underlie wetland areas (Smith *et al.* 1998; Environment Canada 2000). Dominant vegetation cover includes closed stands of conifers, mostly white and black spruce, jack pine and tamarack. Broadleaf species including white birch, trembling aspen and balsam poplar are more abundant towards the south (Zoladeski *et al.* 1995). Common mammals found in this ecozone include American marten, beaver, black bear, fisher, grey wolf, lynx, mink, moose, muskrat, snowshoe hare (*Lepus americanus*), striped skunk (*Mephitis mephitis*), white-tailed deer, and woodland caribou (Smith *et al.* 1998; Environment Canada 2000).

Boreal Plain Ecozone

The Boreal Plains Ecozone comprises approximately 15% of Manitoba's landscape and extends from the south to north Interlake regions and west to the Saskatchewan border. Unlike the Boreal Shield, this ecozone is not dominated by bedrock and has fewer lakes. Although mainly forested, a considerable amount of land has been converted to agriculture including crops, hay land and pasture (Smith *et al.* 1998). Mammals common to the Boreal Plains Ecozone in Manitoba are beaver, snowshoe hare, white-tailed deer, moose, elk, red fox, coyote, black bear, American marten, fisher, and lynx (Pattie and Hoffman 1990; Smith *et al.* 1998).

Prairie Ecozone

The Prairie Ecozone, found in the south-west corner of the province, is mostly comprised of agricultural lands including crops, hay lands, and pastures, with small pockets of forested habitats located along rivers, shelterbelts, homesteads and various protected areas. Approximately 9% of Manitoba's total landscape is comprised of Prairie Ecozone, a landscape which contains numerous concentrations of wetlands. These are found in abundance in the Neepawa area and adjacent to major water bodies such as Lake Manitoba (Smith *et al.* 1998). Common mammals found in this Manitoba ecozone include: elk, white-tailed deer, coyote, red fox, badger, white-tailed jack rabbit (*Lepus townsendii*), eastern cottontail rabbit (*Sylvilagus floridanus*), striped skunk, Richardson's ground squirrel (*Spermophilus richardsonii*), red-backed vole, deer mouse (*Peromyscus maniculatus*), and northern pocket gopher (*Thomomys talpoides*) (Pattie and Hoffman 1990; Smith *et al.* 1998).

6.2.6.4 Species at Risk

Of the 68 mammal species that have been documented within the Project Study Area, seven species are provincially or federally listed (Appendix 6A Table 6A-4) (Burt 1980; Jones *et al.* 1985). Of the seven listed species, three have been extirpated (grizzly bear [*Ursus arctos*], swift fox [*Vulpes velox*] and pronghorn [*Antilocapra Americana*]) (MESA 2010; SARA 2002). However, it is important to note that these three species have been observed and are rare or occasional visitors to the Project Study Area (Pattie and Hoffmann 1990). Of the remaining listed species, two species are reviewed as VECs for the purpose of the Project: boreal woodland caribou and wolverine. Boreal woodland caribou are currently listed as threatened both federally under the *Species at Risk Act* (SARA) and provincially under MESA (*The Endangered Species Act* [Manitoba]). Manitoba Conservation currently has a caribou recovery strategy, titled *Manitoba's Conservation and Recovery Strategy for Boreal Woodland Caribou (Rangifer tarandus caribou)* (Government of Manitoba 2005), however, both Environment Canada and Manitoba Conservation are currently in the process of developing new recovery strategies and action plans for woodland caribou. Wolverine are currently listed as a species of Special Concern in Manitoba and are listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), with population considered stable to increasing (COSEWIC 2003).

6.2.6.5 Valued Environmental Components

The environmental assessment investigated Project effects on the following VECs:

Ungulates:

Coastal and barren ground caribou; boreal caribou, moose, and elk.

Furbearers:

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. The *Bipole III Mammals Technical Report* and the *Bipole III Caribou Technical Report* contain detailed information and analysis on all VECs discussed herein.

Ungulates

Coastal and Barren Ground Caribou

In the far northern extent of the Project Study Area, migratory caribou (coastal and barren ground) are occasional migrants and occupants. These include the coastal populations, which are the Pen Island and Cape Churchill herds, and the Beverley-

Qamanirjuaq barren ground caribou. Both exhibit irregular migratory behaviour into the Project Study Area during winter, with summer occupancy being observed and documented in the area. The extent of summer occupancy of caribou in the area is relatively unknown at this time.

Beverly-Qamanirjuaq

Barren ground caribou are an occasional winter resident known to migrate temporarily into the northern portion of the Project Study Area. Migratory barren ground caribou occupy their traditional calving grounds in Nunavut and exhibit a large, multi-jurisdictional migration south during winter into the northern taiga. This population is considered to be in major decline (Beverley-Qamanirjuaq Caribou Management Board 2010). Surveys conducted during the 1980s estimated the population between 125 000 and 190 000 animals. In 2009, the Northwest Territories government found fewer than 100 caribou on the traditional calving grounds, compared to 5,737 in 1994 (Beverley-Qamanirjuaq Caribou Management Board 2010). Occasionally, but not consistently, the Beverley-Qamanirjuaq herd will migrate as far south as Thompson (D. Hedman *pers. comm.*). Based on this information, it is understood that there is potential for this population to be present during the construction or operation of the Bipole III line and Project infrastructure in northern Manitoba.

Cape Churchill

During winter, the Cape Churchill animals migrate south into the Project Study Area (Manitoba Conservation 2011). In the mid 1980s this population was estimated at 1,700 animals in the area between Cape Churchill and the Nelson River (Elliot 1986). Manitoba Conservation now estimates the Cape Churchill population at approximately 3,500-5,000 animals and this herd does not typically cross the Nelson River to the south (D.Hedman pers. comm.). In December of 2010, a major migration event occurred into the northern portion of the Project Study Area and included hundreds of caribou migrating into the areas around Stephens Lake, Gull Rapids and Limestone Lake (Map 6-15). A large number of these animals were harvested by Aboriginal and licensed hunters.

Pen Island

The Pen Island population is found south of the Nelson River. Their summer range extends along the coast of Hudson Bay from the Nelson River outlet, south and east into Ontario and Pen Island area, inland across the tundra/forest ecosystem transition area. They amalgamate in fall and move north from summering areas along the Hudson Bay coast during early winter and often stage in areas south of the Nelson River, near Gillam, and west near Stephens Lake. This population was estimated to be approximately 10,000 animals in 1997, and the summer residency in Manitoba has decreased in recent years based on summer aerial surveys of known calving grounds (V.

Trim pers. comm.). Annual variation of range occupancy has been documented through current collaring and tracking studies with major movements back and forth across the Manitoba/Ontario boundary since this population has been studied in the late 1980s. Results of ongoing monitoring of satellite collared Pen Island caribou and other similar research suggest that summer range use is variable and has changed significantly (V. Trim pers. comm.; Thompson and Abraham 1990; Magoun *et al.* 2004). Conversely, at an ecoregion level, wintering areas have remained relatively constant, though the location of core winter areas in Ontario is regionally variable (Magoun *et al.* 2004). Incidental observations of Pen Island caribou have seen a decline since 2000 (D. Hedman pers. comm.). There is also some periodic use of areas in the Stephens Lake and Gillam area during the spring calving period (V.Trim pers. comm.) The Pen Island caribou move inland from the coast into Ontario and Manitoba from November to April and occasionally move into the Project Study Area (D. Headman pers. comm.).

Interim results of collaring studies being conducted for both the Cape Churchill and Pen Island herds illustrate irregular movements in and out of the Project Study Area. Summer use in the Local Study Area has been documented, suggesting sedentary behavior; however, collared animals have remained on the Hudson Bay coast during the same period, suggesting lack of site fidelity and yearly variation within the Project Study Area. Similarly, many of the Cape Churchill animals that migrated into the northern Project Study Area during the winter of 2010- 2011 may have remained in these areas and were documented during reconnaissance flights conducted during the winter of 2010/2011.

Boreal Woodland Caribou

In May 2000, boreal woodland caribou were designated as Threatened by COSEWIC and were subsequently designated as Threatened under SARA in 2003. In 2006, Manitoba also listed this species as Threatened under MESA. A *Draft National Recovery Strategy* (Hervieux 2007) addresses threats as they relate to the persistence of boreal woodland caribou throughout their respective ranges. In 2007, Environment Canada undertook a scientific review addressing the identification of critical habitat for boreal woodland caribou and in 2008 published its findings (Environment Canada 2008). This review identified several key issues and knowledge gaps at both national and regional scales. Of particular importance is that boreal woodland caribou are experiencing range recession across the southern limits of the Canadian boreal woodland caribou zone due to land use, linear development and other human disturbance (Schaefer 2003; Vors *et al.* 2007). Though climate may be contributing to range recession, the relatively high speed of range shift suggests that climate change is unlikely to explain the observed changes (Vors *et al.* 2007).

Manitoba's Conservation and Recovery Strategy for Boreal Woodland Caribou (*Manitoba Conservation 2006*)) will be updated by January 1, 2012 and is likely to include revised

strategies for boreal woodland caribou management and conservation, new population estimates, and updated conservation risk assessments for all Manitoba caribou ranges. The Manitoba Strategy provides a policy framework for boreal woodland caribou recovery in Manitoba and is considered as the regulatory policy pertaining to the protection and management of boreal woodland caribou and their habitat.

In Manitoba, there are several boreal woodland caribou ranges that are considered to be at risk to decline and are considered to be borderline sustainable (Crichton *et al.* 2006; Environment Canada 2008). Based on the current Strategy, there is only one range (Neosap) that is identified to be at high risk within the Project Study Area (Table 6.2-9). A major fire in 2010 has impacted a large portion of critical summer and winter range, of which the impacts are currently being assessed. Manitoba Conservation has identified the northern extent of boreal woodland caribou range that extends from the north shore of God's Lake in eastern Manitoba to Reindeer Lake in western Manitoba. Although this "line" is likely better defined as a general transition zone, there are no known large concentrations of wintering boreal caribou or defined boreal caribou ranges north of this line; however, based on boreal woodland caribou collaring studies, a notable and definable range exists near the Harding Lake area northwest of Thompson, which is near this defined boundary. There are six identified boreal woodland caribou ranges contained within the Project Study Area and Table 6.2-9 provides a summary of these ranges. Map 6-18 illustrates these ranges and the northern extent of sustainable boreal woodland caribou range as defined by the Manitoba Strategy. Ranges found within the Project Area include the Naosap, Kississing, Wapisu, Wabowden, Reed Lake, and The Bog Range (Map 6-18). Results of major telemetry studies will be of considerable value in refining boreal woodland caribou range boundaries.

Table 6.2-9: Manitoba Conservation Risk Assessment Ranking for Woodland Caribou Ranges in the Project Study Area

Range	Risk Rank	Intersected by transmission route
Naosap	High	No
Reed Lake	Medium	Yes
Wabowden	Medium	Yes
Wapisu	Medium	No
The Bog	Low	Yes

Based on new data acquired through specific caribou studies conducted for the Project Environmental Assessment, range delineations were updated to reflect the current understanding of caribou distribution and habitat use. The current understanding of caribou range delineation is based on extensive telemetry studies and aerial surveys. There are several important range trends that have evolved as a result of these new and current data. The range boundary for the Wapisu now includes animals associated with the WiMapedi Lake as there is considerable overlap of animals within these areas. The northern portion of the Wapisu range appears to be utilized by a well-defined grouping

of animals around the Harding Lake area with little movement into the Wapisu range. The known range boundaries for The Bog and Reed Lake have also been expanded based on the current data. The ranges and their associated boundaries used for assessment purposes in this EIS are illustrated in Map 6-19.

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 not found in large numbers, nor are they evenly distributed across boreal landscapes. They occur at very low densities across 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 such as the grey wolf are mainly associated with more evenly distributed and higher density larger prey species such as moose and white-tailed deer (Messier 1985; Messier 1991; Bergerud and Elliott 1998; Zager and Beecham 2006; Bergerud 2007). Moose and deer are typically associated with disturbed forests through human 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),* and spacing away from the main predators themselves (Bergerud *et al.* 1990). The sustainability of a population can be represented by the population growth rate, which involves 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).

Boreal woodland caribou distribution; abundance; and habitat supply, quality and availability are not typically considered limiting factors in most boreal caribou populations when predators are present in the boreal forest (Seip 1992; Rettie and Messier 2000; Johnson *et al.* 2001). The dynamics of habitat alteration from human development, including forestry and transmission line 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). This increases the biomass availability for high-end predators such as wolves and bears (Peek *et al.* 1976; Monthey 1984; Clarke *et al.* 2006; Zwolak 2009).

Moose

Moose are a common ungulate found in the prairie, boreal plain, boreal shield, taiga shield, and Hudson plain ecozones within aquatic, wetland, shrubland, deciduous forest, mixedwood forest, coniferous forest and open coniferous forest habitats (Coady 1982; Peek 2007; Banfield 1987). Moose are associated with riparian habitat, especially areas featuring willow, a key forage species. In the absence of such habitat, moose select stands that originated after fire or logging, which feature early successional vegetation (Doerr 1983). Moose are commonly found in forest, shrub and wetland habitats from Red Deer Lake, north of the Porcupine Mountain area, south to areas adjacent to the Duck Mountains and Riding Mountain (Pattie and Hoffmann 1990). Increasingly, moose are being observed in the prairie region (Government of Manitoba 2010).

Moose populations in the western portion of the Project Study Area are in decline and there are a number of conservation hunting closures that have been implemented to rehabilitate moose numbers. Game hunting areas (GHAs) which have been closed to allow for moose populations to recover from decline include GHAs 13, 13a, 14, 14A, 26, 18, 18A, 18B and 18C. Additionally, sections of GHA 2A, 4, 7A and 17A are closed to moose hunting. Other moose management options being undertaken by Manitoba Conservation include the implementation of wolf trapping/management strategies in an attempt to reduce potential effects of predation on moose populations (Manitoba Conservation, 2010). Aboriginal people have identified the moose harvest as an important component of personal and community sustenance.

Elk

Elk populations are mainly found in the western portion of the Project Study Area and are limited to several areas of upland forest in close proximity to prairie habitat (Pattie and Hoffmann 1990; Jones *et al.* 1985) (Map 6-17). Major populations occur near Riding Mountain National Park, Duck Mountain Provincial Park and Forest, the Porcupine Provincial Forest and Red Deer Lake (Dan Chranowski pers. comm. 2009; Manitoba Conservation 2010). Other elk populations are found along the southern fringe of the Project Study Area in the Spruce Woods-Shilo area. Although these populations may be limited to several areas, where they do occur they are numerous, with populations at Riding Mountain (3,500), Duck Mountain (2,000), Porcupine Provincial Forest (300) Spruce Woods (400) and Red Deer Lake (100) (Government of Manitoba 2010). Province-wide, the elk population is estimated at 7,350 animals (Manitoba Conservation n.d.). Known movement corridors are generally located in a north-south orientation along the Manitoba Escarpment, outside of the Local Study Area.

Elk distribution in the Local Study Area is affected by a number of factors, including habitat availability for calving and winter ranges, the avoidance and attraction to human features, predators, and potentially, disease (Toweill and Thomas 2002). Some elk in the Duck Mountain Provincial Forest area have been noted to use farmland areas as well as

forest areas during calving season (May-June) (Chranowski 2009). Generally, however, in the Duck Mountains Provincial Forest area elk are thought to select for deciduous forests stands, although they avoid open deciduous forest areas and roads (Chranowski 2009). Elk have also been documented to take advantage of browse along disturbed areas in forestry cut-blocks and along roadsides (Pattie and Hoffman 1990) where grasses, sedges, forbs and early seral stage browse species such as redtop (*Agrostis* sp.), sedges (*Carex* sp.), vetch (*Vicia sp.*), strawberry (*Fragaria* sp.), willow (*Salix* sp.) and aspen (*Populus* sp.) are available (Palidwor 1990). Another habitat feature that is important to elk is the availability of mineral licks; particularly during lactation for cow elk (Ayotte 1992) and when dietary mineral requirements are not being met (Toweill and Thomas 2002). Notable predators to elk that may limit elk populations in Manitoba include bears, wolves and potentially cougar (Toweill and Thomas 2002; Chranowski 2009). The general use of farmlands by elk is becoming of increasing concern to agricultural operations as elk not only feed on valuable crops but potentially spread bovine tuberculosis to domestic bovine livestock (Brook 2009). Some ranchers in the western portion of the province breed elk in captivity for sale to markets within Manitoba and elsewhere.

Elk harvesting in Manitoba is ongoing and regulated through the issuing of hunting licenses by Manitoba Conservation (2011); and as regulated by *The Wildlife Act*. A total of 3,798 elk were harvested in Manitoba from 1993-2007 (*Bipole III Resource Use Technical Report*). An average of about 300 elk are harvested annually, with a high of 427 elk in 2007. To monitor the potential spread of chronic wasting disease and bovine tuberculosis affecting elk populations, Manitoba Conservation requires the submission of biological samples from harvested elk in the western portion of the province (Manitoba Conservation, 2011). In southern and western Manitoba, Aboriginal communities have reported harvesting of elk and white-tailed deer and, in at least one case, nearly as often as moose (*Bipole III Aboriginal Traditional Knowledge Technical Report*). One elk harvest area is located northeast of Swan River and may intersect with the Local Study Area. Affiliated with this location was the sighting of elk in the Local Study Area during summer and fall tracking, and trail camera studies. This area that contained a small group of elk (*Bipole III Mammals Technical Report*). ATK and local knowledge gathered in interviews discuss migration areas, wintering habitat and summer and calving habitats that are located in or adjacent to Riding Mountain National Park and Duck Mountain Provincial Park.

Furbearers

American Marten

American marten is a species associated with upland habitats. Marten exhibit large spatial requirements but narrow habitat use and are most predictably associated with mature conifer-dominated forests of high canopy closure that exhibit complex vertical and

horizontal woody structure (Chapin *et al.* 1997). Marten are an ecological indicator of late-succession forests featuring such structural complexity, including abundant woody debris, and thus are most abundant in undisturbed older forests with large intact core areas (Webb and Boyce 2009). Their foraging behavior is facilitated by coarse woody debris which provides critical access to their winter (subnivian) prey. In the Local Study Area, marten sign were observed most commonly in pure black spruce habitats and in broadleaf habitats. The *Bipole III Mammals Technical Report* contains additional detail concerning marten habitat in Manitoba.

Marten diet is fairly diverse and does vary with prey availability. In one study, marten diet by mass consisted of 45% small mammals (voles, shrews, mice, etc.) and 31% larger mammals (grouse, hares), with the remainder consisting of small amounts of other mammals, amphibians, eggs, berries, and bait (Cumberland *et al.* 2001). American Marten are vulnerable to trapping (Webb and Boyce 2009), both because of their ease of capture and their high monetary value. However, in Manitoba levels of harvesting have been in decline since the 1970s (Hodgman *et al.* 1994). ATK gathered in interviews reported that marten is actively trapped in the Red Deer Lake and Wintering Lake areas.

Beaver

Beavers are semi-aquatic rodents associated with systems such as lakes, creeks, rivers, and other water bodies. Beavers are a keystone species known to increase habitat heterogeneity and the richness of herbaceous plants at the landscape level (Wright *et al.* 2002), largely through their dam building and water impoundment activity. Beavers will consume almost any herbaceous or woody plant for food but show preferences for a relatively small number of plants that include aspen and willow (Northcott 1971). They have few predators and can reach high densities in preferred areas. Beaver habitat occupancy is best explained by the occurrence of woody vegetation, followed by stream gradient (Curtis and Jensen 2004). The species is generally abundant in western and northern areas of Manitoba wherever water systems such as lakes, creeks, rivers, and other water bodies are present but they are less common in southern agricultural regions. In the Project Study Area, beaver are abundant and habitat is not limiting. ATK that was shared, reported that beaver are actively trapped in the project study area.

Wolverine

The wolverine is a large terrestrial mustelid with a circumpolar distribution. Most are generally associated with upland habitats and wolverines typically occupy vast areas and exist at very low densities (Dalerum *et al.* 2008). The wolverine is an important game and cultural species that is provincially regulated under *The Wildlife Act* and federally listed by COSEWIC as a species of Special Concern (COSEWIC 2003). Furthermore, existing data pertaining to wolverine habitat suggests habitat preference and distribution in the boreal plain and shield, Hudson plain, and taiga shield ecozones. This species requires an adequate year-round supply of prey including rodents, snowshoe hare, and

the carcasses of larger species such as moose, deer, elk and caribou, especially in winter (COSEWIC 2003). Solitary and aggressive, wolverines are most abundant where large ungulates are common and carrion readily available. Because of their wide ranging habits and requirements for reasonably diverse and abundant mammal prey, wolverines are considered reliable indicators of ecosystem health (COSEWIC 2003).

Denning is an essential component of the wolverine life cycle and occurs at higher elevations beneath rocks, logs, or snow, with snow cover persisting into spring (COSEWIC 2003). Given their naturally low birth rates and sparse distributions wolverines characteristically exhibit low population resiliency. Under such circumstances, natural and human induced mortality can be limiting. Natural mortality is often caused by predation or starvation. Wolverines are preyed upon by bears, wolves, cougars, golden eagles, and other wolverines, and are often killed when competing for food at carrion sites. Human-caused mortality occurs from trapping, hunting, and road/railway kills (COSEWIC 2003) all of which may increase with settlement of remote areas. Obviously, disruption to existing abundances of competitors such as wolves and food sources such as moose and caribou can have negative consequences for wolverines, which demonstrate limited capacity for repopulating areas once they are extirpated.

While the historic range of wolverine in Manitoba included the entire province, this species currently occupies the northern boreal forest (COSEWIC 2003), mostly north of 53 degrees latitude. The species remains listed by the Committee on the Status of Endangered Wildlife in Canada as a species of Special Concern in Manitoba, but with populations considered stable to increasing (COSEWIC 2003). Increases are thought to have occurred due to the cessation of wolf poisoning programs in the 1970s, the imposition of a limited winter trapping season, and increases in the numbers of some caribou herds. Furthermore, wolverine harvesting is expected to decline given the continuing decline in the number of active trappers (COSEWIC 2003). There may be some indication that wolverine distribution is expanding in Manitoba. ATK gathered in interviews did not report any current interactions between wolverine and interviewed community members.

In the Project Study Area, 107 locations of wolverine tracks and one wolverine observation were recorded during January 2010 aerial transect surveys. In addition, during the 2011 multi-species surveys in four caribou ranges along the Local Study Area route, 43 wolverine tracks were recorded. Given that this species is a wide ranging species with a large home range with few predictable habitat-use types, no habitat-modeling was conducted on this VEC (*Bipole III Mammals Technical Report*).

Grey Wolf

Grey wolves have historically occupied most of Manitoba, remaining widely distributed today where available prey exists (Map 6-20). Thus, wolves are common throughout forested and tundra habitats and are becoming increasingly common along the fringes of

agricultural areas (Manitoba Conservation 2010). Wolves generally live in packs ranging between 2-9 animals (Mech 1977; Fritts and Mech 1981; Aidell 2007) with their overall densities being determined by prey abundance (Peterson and Page 1988). Dens tend to be located near the core of a pack's range in pine-dominated forest, and located away from water bodies (Ciucci and Mech 1992).

Choice of prey is generally considered to be a result of behaviour transferred from older pack members to juveniles (Houts 2000). Although large ungulates constitute their main prey in North America, wolves are opportunistic predators and can feed on a considerable range of species (Mech 1970; Gese and Mech 1991). However, while smaller prey species such as snowshoe hare, beaver, and muskrat can form part of the diet, they represent only a small part of the biomass intake for Manitoba wolves; ungulates supply 90% of the diet. Wolves may tend to kill old animals, juveniles, and calves (Boyd *et al.* 1994) but this is highly dependent upon opportunity and availability. As large, social carnivores wolves have the capacity to predate on the full size range of terrestrial mammals.

Grey wolves are the largest frequently occurring carnivores in the northern part of the Project Study Area. In 2010 and 2011, wolf census data from aerial surveys was combined with telemetry data and used to identify pack sizes and home ranges where collared animals were observed with a pack (see wolf collaring and telemetry sections in *Bipole III Mammals Technical Report*). Pack sizes and number of collared animals per pack are shown in Table 6.2-10. In the census area (17,000 km^2), 83 wolves were observed amongst 20 packs or as lone animals. An approximate density of five wolves per 1,000 km^2 was estimated. Twenty-seven collared wolves were observed among eight of these packs during aerial surveys conducted in January 2011 and pack associations were determined for the collared animals based on these results. Wolf pack home range was delineated for these eight packs by mapping the collars associated with each pack (Map 6-21). Pack size ranged from 2 to 12, with as many as five collared wolves in a single pack.

Table 6.2-10: Pack Size and Number of Collars Deployed for Wolf Packs Surveyed in the Project Study Area

Pack Name	Pack Size	Collars
Muskego Lake	5	3
Odei River	6	3
Ridge Lake	8	4
Crowduck Bay	2	2
Riel Lake	12	5
William	1	
Smith	2	
Saw Lake	9	5
McNeal Lake	8	3
Pakwa Lake	2	
Fish Lake	2	
North Setting Lake	2	
Wabowden Dump	2	
Rosenberry Lake	2	
Egg Lake	3	
Tullibee Lake	2	
Threepoint Lake	1	
Bison Lake	5	
Burr Lake	1	
Reed Lake	8	2
Total	83	27

6.2.6.6 Existing Environment at Project Components

The following sections provide an overview of methods used to gather data, and an overview of Project components overlaping with VEC home ranges and available habitat.

HVdc Transmission Line, AC Collector Lines and Construction Power Components

Due to the spatial overlap of the HVdc transmission line, northern ac collector lines and the construction power components, these Project components are being combined for their description for VEC mammal species in the existing environment. Based on analysis outlined in the *Bipole III Mammals Technical Report* coastal and barren ground caribou, boreal woodland caribou, moose, elk, American marten, beaver and wolverine are all found in the vicinity of the HVdc Transmission lines, ac collector lines and/or construction power lines.

Based on desktop analysis, a relatively small amount of beaver habitat, approximately 8 km, is anticipated to overlap with the HVdc transmission line, ac collector lines and construction power components. Regarding American Marten, approximately 93 km of the HVdc Transmission line and 2.2 km^2 of the ac collector lines are anticipated to intersect American marten habitat.

Wolverine are documented as having large home ranges (COSEWIC 2003) and though it is anticipated that though the HVdc transmission line, ac collector lines and construction power line components may overlap with their a portion of their home range, it is anticipated that this Project component will not disturb wolverine at a population level (*Bipole III Mammals Technical Report*).

While the Manitoban elk range does not extent into the northern study area, a portion of the southern components of the HVdc transmission line, ac collector lines and construction power components are expected to overlap with elk ranges. Based on desktop analysis, it is anticipated that approximately 77 km of elk habitat will intersect with the HVdc transmission line.

Moose are relatively common within the Project Footprint of the HVdc transmission line, ac collector lines and construction power components. Aerial surveys conducted in the winters of 2010 and 2011 in the northern portion of the study area indicate that Local Study Area contains favourable habitat for existing moose populations (*Bipole III Mammals Technical Report*). Based on analysis outlined in the *Bipole III Mammals Technical Report*, approximately 234 km of moose habitat will intersect with the HVdc transmission line, ac collector lines and construction power components.

Based on aerial surveys, telemetry and desktop studies, the HVdc transmission lines, ac collector lines and construction power line components are anticipated intersect 165 km of the Wabowden caribou range, 68 km of the Reed Lake range and 120 km of the Bog range (*Bipole III Mammals Technical Report*). Additionally, coastal and barren ground caribou are anticipated to overlap with these Project components.

Keewatinoow Converter Station & Associated Facilities

In comparison to other components of the Project, the Keewatinoow Converter Station and ground electrode consist of a relatively small Project Footprint. Few VEC species overlap with this particular Project component (*Bipole III Mammals Technical Report*).

Certain species, specifically elk, will not be affected at all by this component because their range does not extent into the northern study area. Additionally, no beaver habitat and an extremely small amount of marten habitat (less than 0.1 km^2) and moose habitat (approximately 3 km^2) are anticipated to overlap with the Keewatinoow Converter Station and Ground Electrode Project Footprint.

Additionally, wolverine are documented as having large home ranges (COSEWIC 2003) and though this Project component may overlap with a small portion home range, it will generally will not disturb wolverine at a population level.

The Keewatinoow Converter Station and ground electrode fall outside the northern extent of boreal woodland caribou range in Manitoba (Manitoba Conservation 2006). With respects to coastal and barren ground caribou, the northern portion of the Project Study Area contains habitat that is occasionally occupied by coastal (Pen Islands) and barren-ground (Beverley-Qamanirijuaq) caribou. As such, there may be occasions during caribou migrations in which these ranges overlap with the Keewatinoow Converter Station and ground electrode sites.

Keewatinoow Construction Camp

In comparison to other components of the Project, the northern construction camp consists of a relatively small Project Footprint. Few VEC species overlap with this particular Project component (*Bipole III Mammals Technical Report*).

Certain species, specifically elk, will not be affected at all by this component due to the fact that their range does not extent into the northern study area. Additionally, no beaver habitat and an extremely small amount of marten habitat (less than 0.1 km^2) and moose habitat (less than 0.2 km^2) are anticipated to overlap with the northern construction camp footprint; Based on these observations, it is anticipated that beaver, marten, and moose will not interact with this project component. Additionally, wolverine are documented as having large home ranges (COSEWIC 2003) and though this project component may overlap with a small portion of a home range, it will generally will not disturb wolverine at a population level.

Based on analysis reported in the *Bipole III Caribou Technical Report,* migratory caribou are anticipated to have ranges which overlap to varying degrees with the northern construction camp project footprint.

Borrow Sites

Based on analysis and observations outlined in *the Bipole III Mammals Technical Report* and the *Bipole III Caribou Technical Report*, few VEC species overlap with borrow and excavation sites associated with the Project. Species anticipated to overlap with this component include costal and barren-ground caribou, American marten, beaver and moose. Based on species home ranges/core caribou winter habitat areas, it is anticipated that elk and boreal woodland caribou will not be affected by this project component. Additionally, while wolverine are documented as having large home ranges (COSEWIC 2003), and though this Project component may overlap with a small portion home range, it is anticipated that borrow and excavation sites will not disturb wolverine at a population level.

In comparison to other components of the Project, borrow sites consist of a relatively small Project Footprint and while some VEC species ranges are anticipated to overlap with borrow and excavation sites, this project component will result in very small amounts of habitat alternation/disturbance for VEC species (*Bipole III Mammals Technical Report*).

Riel Converter Station & Associated Facilities

Based on analysis of VEC habitat within the Local Study Area (*Bipole III Mammals Technical Report*) the Riel Converter Station and ground electrode are not expected to overlap with VEC habitat.

6.2.7 Birds and Habitat

6.2.7.1 Overview

Bird species play important roles in the biophysical and socio-economic environments, from the dispersion of seeds to providing food for people. Some bird species have unique habitat requirements for each stage of their life cycle (e.g., nesting, feeding), while other bird species and groups have much broader habitat requirements for other stages of their life cycle (e.g., staging areas). As a group, birds require a wide range of habitats to maintain healthy populations. The sustainability of habitat is an important consideration to maintain bird populations on the landscape for future generations. An important element of Manitoba's biodiversity is comprised of its many bird species.

This section provides information on the following:

- Bird groups in the Project Study Area;
- Summary by ecozones;
- Species at risk;
- VECs; and
- Existing environment at Project Components.

For other information on bird species, locations and habitats in the Project Study Area, also refer to the the *Bipole IIIAboriginal Traditional Knowledge Technical Report* and the *Bipole III Birds Technical Report*.

6.2.7.2 Bird Groups in the Project Study Area

Of the approximately 400 species of birds found in the Province of Manitoba, 371 species have ranges that overlap the Local Study Area (Appendix 6A, Table 6A-5)

(Farrand 1983; Robbins *et al.* 1983; Carey *et al.* 2003). Most of the bird species in Manitoba found in the Project Study Area are migratory, including 46 short-distance migrants and 133 long-distance migrants (or Neotropical migrants). The Project Study Area has about 43 resident species that do not migrate, or tend to migrate within the province. There are about 117 bird species that are regular migrants and pass through the Project Study Area on the way to more northerly breeding grounds, occasional visitors, rare migrants or visitors, extra-limital in records, or regular winter residents that arrive in the Project Study Area from breeding grounds in the North.

Approximately 218 species are known or expected to nest within the Project Study Area. Of the species potentially found in the Project Study Area, 35 are federally or provincially listed as Extirpated, Endangered, Threatened, and/or Species of Special Concern. Fourteen of the species are known or expected to nest within the Local Study Area are listed under the federal *Species at Risk Act* (SARA), *The Endangered Species Act* (Manitoba)[(MESA]), or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), with the majority of these species occurring in southern and central Manitoba (MESA 1998; SARA 2002; COSEWIC 2010).

For the purposes of this EIS, birds have been organized into the following groups:

- Waterfowl and other waterbirds;
- Colonial waterbirds;
- Birds of prey;
- Upland game birds;
- Woodpeckers; and
- Songbirds and other birds.

The following section provides an overview of each group.

Waterfowl and Other Waterbirds

Waterfowl and other waterbirds are primarily migratory, nesting in Manitoba in spring and wintering in the southern United States and Central and South America. These birds have few geographical restrictions in Manitoba, and can be found throughout the province. A total of 32 species of waterfowl and other waterbirds were observed in the Local Study Area (Appendix 6A Table 6A-6), 21 of which are known to breed there (Farrand 1983; Robbins *et al.* 1983; Carey *et al.* 2003). For the purpose of analysis, waterfowl and other waterbirds are ducks, geese, swans, loons, coots, rails, and cranes. Yellow rails are the only species of waterfowl and other waterbirds group found in the Local Study Area currently listed under SARA or MESA. These species, as well as mallard and sandhill crane, have been selected as VECs.

Colonial Waterbirds

Birds that form groups to breed and nest are termed colonial waterbirds (Parnell *et al.* 1988). These birds are generally migratory. For this study, colonial waterbirds are gulls, terns, grebes, pelicans, cormorants, herons, bitterns, and shorebirds. Thirty-four colonial waterbirds species were observed during bird surveys in the Local Study Area. These water-dependant species rely on the large number of island, lake and wetland habitats found throughout and adjacent to the Project Study Area. Ninety-six locations of waterbird colonies, provided by the Manitoba Conservation Data Centre (MCDC) and Ducks Unlimited (DU), were validated in July 2009. Of these, 66 locations were confirmed to be active. In addition to these sites, 52 new colonies were recorded. Least bitterns are species at risk found in the Local Study Area. Least bittern and great blue heron were selected as VECs.

Birds of Prey

Birds of prey are found throughout the Project Study Area and could include a total of 31 species including falcons, hawks, owls, osprey and vultures (Robbins *et al.* 1983; Carey *et al.* 2003). Of these, eight are year-round residents. Twenty-two species were observed during bird surveys in the Local Study Area. Many migratory species migrate to the southern United States, Central America, or South America for the winter (Kirk and Hyslop 1998). During surveys conducted in 2010, nine migration corridors were identified that exhibited high concentrations of birds of prey. These birds are found in all major habitat types within the Project Study Area, including forests, grasslands, wetlands and tundra. Winter distributions for year-round residents are generally linked to prey availability (Carey *et al.* 2003). Species at risk that could occur in the Local Study Area include ferruginous hawk, burrowing owl, and short-eared owl. These species, as well as bald eagle, were selected as VECs.

Upland Game Birds

Upland game birds are found in both forested and non-forested terrestrial habitats, and include partridges, pheasants, grouse, and turkeys. Eight species are potentially found in the Local Study Area (Appendix 6A, Table 6A-5). All are permanent residents of the Project Study Area, typically in wooded habitats with edges and openings. Often, upland game bird populations such as ruffed grouse are cyclic (Holland and Taylor 2003a). Upland game birds observed during ground and aerial surveys included ruffed grouse, sharp-tailed grouse and spruce grouse. Ruffed grouse and sharp-tailed grouse were selected as VECs. None of the upland game birds in the Local Study Area are listed by SARA or MESA.

Woodpeckers

Of the ten woodpecker species that occur in Manitoba, five are permanent residents, three are summer visitors, and two are infrequent visitors (Taylor 2003b). Eight species were observed during bird surveys in the Local Study Area. All woodpeckers excavate cavities in tree trunks for nesting and roosting purposes (Taylor 2003b). While woodpeckers as a group utilize habitats in all types of woodlands, each species exhibits a high degree of habitat specialization (Reed 2001). Red-headed woodpeckers are a species at risk, and they and pileated woodpeckers were selected as VECs.

Songbirds and Other Birds

Songbirds and other birds, including passerines, are the most abundant of all bird groups in Manitoba. Some of the bird families in this group such as chickadees, nuthatches and some finches and jays are year-round residents, while other groups including, but not limited to, flycatchers, swallows, thrushes, kinglets, pipits, vireos, tanagers, blackbirds, sparrows and warblers are mainly short-distance or long-distance migrants. A total of 120 species were observed during bird surveys in the Local Study Area. Although migration times may vary among species, the spring migration is usually in April and May, and the fall migration is generally in September. Of the 165 species potentially found within the Local Study Area, only 32 are year-round inhabitants (Carey *et al.* 2003).

Many songbird families and species exhibit strong breeding and foraging habitat preferences, often utilizing narrow niches within selected habitats (Power 1971). This group uses a wide variety of habitats ranging from agricultural lands to forest and wetlands, with densities varying according to habitat type. Due to increased vegetation diversity at edge habitats and forest openings such as transmission line ROWs, corresponding increases in passerine diversity may occur (Yahner 1988; Gates and Giffen 1991). Conversely, 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 increasingly fragmented into smaller and smaller patches (Bender *et al.* 1998). Olive-sided flycatcher, Sprague's pipit, golden-winged warbler, and Canada warbler are examples of passerines, are species at risk, and have been selected as VECs. Common nighthawks and whip-poor-wills, members of the Goatsuckers family, are also species at risk and VECs that are found in the Project Study Area.

6.2.7.3 Summary by Ecozone

The Project Study Area evaluated for birds is approximately 1,400 km long and transects five distinct ecozones: Hudson Plain and Taiga Shield, Boreal Shield, Boreal Plain, and Prairie. These ecozones comprise 3% and 3%, 37%, 35%, and 23% of the study area, respectively. A complete listing of bird species found within the five ecozones

comprising the Project Study Area, and their scientific names, is provided in Appendix 6A (Table 6A-5).

Taiga Shield and Hudson Plain

Smith *et al.* (1998) report that the Taiga Shield Ecozone is comprised mainly of stunted conifer-dominated forests, with trees becoming sparse in the north. Black spruce and tamarack are common, and dwarf birch, willows, Labrador tea, mosses, and lichens cover the ground. Representative birds in the Taiga Shield Ecozone include red-throated loons, red-necked phalaropes, northern shrike, osprey, tree sparrow, spruce grouse, and common raven (Smith *et al.* 1998).

As outlined by Smith *et al.* (1998), the Hudson Plain Ecozone is comprised mainly of fens and bogs. Permafrost is widespread, but shrubs and conifers are common. Black spruce, white spruce, shrubs, mosses, and lichens grow in areas not covered by peat. This ecozone represents major habitat for significant populations of breeding waterfowl, especially snow geese and Canada geese. Other birds include rock and willow ptarmigan and many migratory species such as shorebirds (Smith *et al.* 1998; Carey *et al.* 2003).

Ninety-three bird species were recorded in the Taiga Shield and Hudson Plain ecozones during surveys in the Local Study Area. In all, 156 species can be found in the Taiga Shield Ecozone and 161 can be found in the Hudson Plain Ecozone (Carey *et al.* 2003). Waterfowl and other waterbirds, colonial waterbirds, birds of prey, upland game birds, woodpeckers, and songbirds and other birds were observed. Songbirds made up the greatest number of species (n = 64), while only two species of upland game birds were observed. Species at risk included common nighthawk, olive-sided flycatcher, and rusty blackbird.

Many of the birds in the Taiga Shield and Hudson Plain ecozones, including the Hudson Bay Lowland Ecoregion, were predominantly associated with shrub-tall, coniferous-open, coniferous-dense, and wetland-shrub habitats. Species associated with coniferous-dense and wetland-shrub habitats included olive-sided flycatcher, gray jay, and dark-eyed junco. Pine siskin, blackpoll warbler, and rusty blackbird were associated with shrub-tall and coniferous-dense habitats, and northern flicker, American robin, and Wilson's warbler were associated with shrub-tall and coniferous-dense habitat. A detailed description of bird habitat associations can be found in the *Bipole III Birds Technical Report*.

Boreal Shield

The Boreal Shield Ecozone is the largest in Canada, extending from the southeastern corner of the province to just south of Brochet near the Manitoba-Saskatchewan border. It is dominated by bedrock and is covered with lakes, and comprises the greatest proportion of Manitoba (Smith *et al.* 1998). Bog and fen peatlands are common throughout the ecozone, with small black spruce trees and Labrador tea and sphagnum moss ground cover (Smith *et al.* 1998). A mosaic of stands of uneven-aged trees is

created by wildfire, which in an important component of the ecosystem (Smith *et al.* 1998). Jack pine commonly colonizes recently burned areas, and black spruce regenerates after some time (Smith *et al.* 1998), providing habitat for such birds as owls and songbirds.

Representative birds in the Boreal Shield Ecozone include boreal owls, great horned owl, blue jay, white-throated sparrow, and evening grosbeak. Of the 306 bird species potentially found in the Boreal Shield Ecozone (Carey *et al.* 2003), 131 were recorded during surveys in the Local Study Area. Waterfowl and other waterbirds, colonial waterbirds, birds of prey, upland game birds, woodpeckers, and songbirds and other birds were observed. Songbirds made up the greatest number of species (n = 70), while only two species of upland game birds were observed. Species at risk included common nighthawk, olive-sided flycatcher, Canada warbler, and rusty blackbird.

Many of the birds in the Boreal Shield Ecozone including the Churchill River Upland and Hayes River Upland ecozones were predominantly associated with wetland-herb, shrub-tall, wetland-treed, wetland-shrub, broadleaf-dense, and coniferous-dense habitats. In the Churchill River Upland Ecoregion, gray jay, white-throated sparrow, and fox sparrow were associated with shrub-tall and mixedwood-dense habitat, and northern waterthrush, alder flycatcher, and greater yellowlegs were associated with wetland-herb and shrub-tall habitat. In the Hayes River Upland Ecoregion, most species were associated with wetland-herb and wetland-shrub habitat, particularly red-winged blackbird, hermit thrush, and ruby-crowned kinglet. Other species were associated with broadleaf-dense, mixedwood-dense, and coniferous-dense habitat, including hairy woodpecker, Tennessee warbler, and Nashville warbler.

Boreal Plain

The Boreal Plain Ecozone is mainly forested, although a considerable amount of land has been converted for agriculture including crops, hay land and pasture (Smith *et al.* 1998). The landscape is generally level or with gently rolling plains (Smith *et al.* 1998). White and black spruce, jack pine, and tamarack are common conifer species, with northern sections of the ecozone dominated by black spruce and tamarack. White birch, trembling aspen, and balsam poplar are characteristic broadleaf species (Smith *et al.* 1998). Wetlands and peatlands cover up to 50% of the ecozone (Smith *et al.* 1998), providing habitat for a number of bird species such as gulls, birds of prey, and songbirds.

Birds representative of the Boreal Plain Ecozone include boreal owl, great horned owl, red-tailed hawk, blue jay, rose-breasted grosbeak, and evening grosbeak. Of the 344 bird species potentially found in the Boreal Plain Ecozone (Carey *et al.* 2003), 197 were recorded during surveys in the Local Study Area. Waterfowl and other waterbirds, colonial waterbirds, birds of prey, upland game birds, woodpeckers, and songbirds and other birds were observed. Songbirds made up the greatest number of species (n = 108),

and four of the eight species of upland game birds were observed. Species at risk recorded in the Boreal Plain Ecozone were yellow rail, common nighthawk, olive-sided flycatcher, golden-winged warbler, Canada warbler, and rusty blackbird.

Many of the birds in the Boreal Plain Ecozone including the Interlake Plain and Mid-Boreal Lowland ecoregions were associated with developed, herb, broadleaf-dense, broadleaf-open, and wetland-herb habitats. In the Interlake Plain Ecoregion, bird species were associated with multiple habitats. Northern flicker, common raven, black-and-white warbler, and Philadelphia vireo were associated with broadleaf-open and developed habitats, while ruffed grouse, pileated woodpecker, and cedar waxwing were associated with broadleaf-open and mixedwood-dense habitats. In the Mid-boreal Lowland Ecoregion, birds were also associated with a range of habitats. Hairy woodpecker, cedar waxwing, and common raven were associated with coniferous-dense and broadleaf-dense habitat, and yellow warbler, black-capped chickadee, and alder flycatcher were associated with broadleaf-dense and wetland-herb habitats.

Prairie

Historically, a large portion of the Prairie Ecozone consisted of tall-grass prairie; however the majority of it has been converted to cropland or otherwise altered (Smith *et al.* 1998). Trembling aspen and balsam poplar are found throughout, and this ecozone also contains significant concentrations of wetlands located in the Neepawa area and adjacent to major water bodies such as Lake Manitoba (Smith *et al.* 1998). Additionally, these wetlands provide excellent nesting and staging habitat for waterfowl. The greatest potential number of listed bird species can occur in this ecozone. Species such as ferruginous hawk can be found throughout the ecozone, although in reduced numbers due to habitat loss (Smith *et al.* 1998; Carey *et al.* 2003). Characteristic bird species include ferruginous hawk, American avocet, great blue heron, and black-billed magpie (Smith *et al.* 1998; Carey *et al.* 2003).

Of the 356 bird species potentially found in the Prairie Ecozone, 195 were recorded during surveys in the Local Study Area. Waterfowl and other waterbirds, colonial waterbirds, birds of prey, upland game birds, woodpeckers, and songbirds and other birds were observed. Songbirds made up the greatest number of species (n = 70) and four of the eight species of upland game birds were observed. Species at risk recorded in the Prairie Ecozone were least bittern, yellow rail, red-headed woodpecker, Canada warbler, and rusty blackbird. Other species at risk such as burrowing owl were also recorded in this ecozone.

Many of the birds in the Prairie Ecozone including the Lake Manitoba Plain Ecoregion were associated with broadleaf open, grassland, wetland herb, broadleaf, and wetland shrub habitats. Species associated with broadleaf-open habitat included downy woodpecker, least flycatcher, ruffed grouse, and cedar waxwing. Mallard and red-winged

blackbird were associated with wetland-shrub habitat. Sandhill crane, pied-billed grebe, and American bittern were associated with wetland-shrub and wetland-herb habitat.

6.2.7.4 Species at Risk

A total of 584 individuals from eight species at risk were observed during the bird surveys. Of these, olive-sided flycatchers and rusty blackbirds were the most common (200 and 194 observations respectively). Olive-sided flycatchers were associated with boreal forest bogs, wet areas, or recently burned stands, while rusty blackbirds were associated with grassland and agricultural areas in the south, and bogs, fens and riparian areas in the north. The only Endangered bird species observed was a burrowing owl found nesting in a pasture. Burrowing owls have, as of late, been classified as Extirpated from Manitoba, although this species periodically returns to the province. No ferruginous hawks, burrowing owls, short-eared owls, whip-poor-wills, loggerhead shrikes, or Sprague's pipits were recorded during breeding bird surveys in or near the Local Study Area. Species at risk that could be found within the Local Study Area are outlined in Table 6.2-11.

Table 6.2-11: Listed Bird Species Potentially found within the Local Study Area

Bird Group	Common Name	Provincial Listing (MESA[1])	Federal Listing (SARA[2])	COSEWIC[3] Listing
Waterfowl and	Yellow Rail	N/A	Special Concern	Special Concern
Other Waterbirds	Whooping Crane	Endangered	Endangered	Endangered
	Piping Plover	Endangered	Endangered	Endangered
	Red Knot	N/A	N/A	Endangered
Colonial Waterbirds	Least Bittern	N/A	Threatened	Threatened
	Ross's Gull	Endangered	Threatened	Threatened
Birds of Prey	Ferruginous Hawk	Threatened	Threatened	Threatened
	Peregrine Falcon	Endangered	Threatened	Threatened
	Burrowing Owl	Endangered	Endangered	Endangered
	Short-eared Owl	N/A	Special Concern	Special Concern
Woodpeckers	Red-headed Woodpecker	N/A	Threatened	Threatened
Songbirds and	Chimney Swift	N/A	Threatened	Threatened
Other Birds	Common Nighthawk	N/A	Threatened	Threatened
	Whip-poor-will	N/A	Threatened	Threatened
	Olive-sided Flycatcher	N/A	Threatened	Threatened
	Loggerhead Shrike	Endangered	Endangered	Endangered
	Sprague's Pipit	Threatened	Threatened	Threatened
	Golden-winged Warbler	N/A	Threatened	Threatened
	Canada Warbler	N/A	Threatened	Threatened
	Baird's Sparrow	Endangered	N/A	Not at Risk
	Rusty Blackbird	N/A	Special Concern	Special Concern
	Yellow-breasted Chat	N/A	Special Concern	Special Concern

Notes:
[1]The Endangered Species Act (Manitoba).
[2]Species at Risk Act.
[3]Committee on the Status of Endangered Wildlife in Canada.

Whooping crane, piping plover, red knot, Ross's gull, peregrine falcon, chimney swift, Baird's sparrow, and yellow-breasted chat are extremely unlikely to nest in the Local Study Area, are rare transients through western Manitoba, or have known breeding locations in the province that would not be affected by the Project. Additional details can be found in Section 5.4.4.7 of the *Bipole III Birds Technical Report*.

Many of the species at risk have nesting periods beginning in May and June (Table 6.2-12), similar to most other migratory bird species in Manitoba. Important exceptions include gray jay, which nests as early as February (Walley 2003), resident owl species such as great grey owl nesting as early as March (Walley 2003), white-winged crossbill and red crossbill, which can nest at any time of year, including winter (Holland and

Taylor 2003b; Holland and Taylor 2003c), and late nesters such as American goldfinch, whose nesting season corresponds with seed production of thistles, usually beginning in July and August (Parsons 2003). Other exceptions may include large-bodied bird species such as birds of prey, which have prolonged brood-rearing periods, and where fledging may occur as late as August (Carey *et al.* 2003).

Table 6.2-12: Species at Risk Abundance and Nesting Dates in Manitoba

Species	Most Abundant in Manitoba[1]	Nesting, Egg, or Fledging Data[2]
Least bittern	Late May to late August[2]	Not documented but could be similar to American bittern
Yellow rail	Mid-May to mid-September	Poorly documented; nests observed in June and July in 1962
Ferruginous hawk	Mid-March to early November	Nest late March peaking in mid-April; fledge in mid-July
Burrowing owl	Mid-April to mid September	Nest late April to early May, young emerge from nests early July. Juveniles and adults depart in September and October
Short-eared owl	Mid-March to late October	Eggs mid-April to late June; nestlings observed mid-May to early July
Common nighthawk	Late May to early September	Eggs mid-June to mid-July
Whip-poor-will	Mid-April to early June	Eggs late May to mid-July
Red-headed woodpecker	Late May to late August	Nest late May; eggs early to late June, fledge mid- to late July
Olive-sided flycatcher	Late May to late August	Eggs mid-June to early July
Loggerhead shrike	Early May to late August	Eggs mid-May; hatching early June
Sprague's pipit	Early May to early August	Eggs late May; hatch early June; second brood mid- to late July
Golden-winged warbler	Early June to mid-August	Nest late May to early July
Canada warbler	Late May to late August	No documented nests, although breeding highly probable in Manitoba, and likely to occur in June
Rusty blackbird	Early April and mid-September to mid-November	Breed late May to early July

6.2.7.5 Valued Environmental Components

As described in Chapter 4 the Approach to Assessment, birds and habitat 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* (Section 3.2) contains additional details. It should be noted that a number of species at risk in the Project Study Area, including whooping crane, piping plover, red knot, Ross's gull, peregrine falcon, chimney swift, and Baird's sparrow, were not designated as VECs. The rationale for their exclusion from a detailed effects assessment is described in the *Bipole III Birds Technical Report* (Section 5.4.4.7).

Waterfowl and Waterbirds

Mallard

Mallards are abundant and breed throughout much of Manitoba, although they are much more common in the prairie pothole region of the province (Baydack and Taylor 2003). Mallards use water bodies for breeding and foraging including permanent water bodies and semi-permanent wetlands (Rotella and Ratti 1992). Boreal forest wetlands in Canada and Manitoba are important secondary breeding grounds for mallards (Drilling *et al.* 2002). Mallards were the most frequently detected waterfowl and other waterbird species during bird surveys and were distributed generally in clusters where suitable habitat occurred along the entire length of the route surveyed (Map Series 6-2200). A total of 6,894 individuals were observed during bird surveys in the Local Study Area, all of which correspond with all known ranges and distributions of this species (Drilling *et al.* 2002; Carey *et al.* 2003).

Sandhill Crane

Sandhill cranes are common migrants and breeders in the agricultural-forest transition areas of Manitoba as well as the far north of the province (Holland *et al.* 2003a). They are widely distributed in Manitoba. During the spring migration, sandhill cranes favour habitat with grain fields interspersed with shallow wetlands for roosting (Iverson *et al.* 1987). Tacha *et al.* (1992) identified areas of tall vegetation adjacent to sloughs, and sedge

marshes in otherwise wooded areas as favoured sandhill crane nesting habitat. In Manitoba, sandhill cranes concentrate in the southeast of the province and congregate on agricultural fields to feed on young crops in spring and on stubble in fall (Holland *et al.* 2003a). A total of 774 sandhill cranes were observed throughout the Local Study Area during bird surveys, except in the agricultural area south of Gladstone and west of Winnipeg (Map Series 6-2200) in most locations where suitable habitat occurred. The locations sandhill cranes identified and recorded during the bird surveys correspond with all known ranges and distributions of this species (Tacha *et al.* 1992; Carey *et al.* 2003).

Yellow Rail

Yellow rails are widely distributed in the United States and Canada, particularly in south central and southeastern Canada during the breeding season (Bookhout 1995). This species is listed as Special Concern by SARA, and is not listed by MESA. Occurrence in Manitoba is from the end of April to mid-September (Holland and Taylor 2003d). Breeding habitat is described as wet sedge meadows where sedge species in deep water are selected for (Bookhout and Stenzel 1987; Bookhout 1995).

A total of 75 yellow rails were recorded during the breeding bird surveys, with the most southern observation occurring 16 km southeast of McCreary (Map Series 6-2200). The locations of all yellow rails identified and recorded during the 2010 breeding bird surveys correspond with all known ranges and distributions of this species (Bookhout 1995; Carey *et al.* 2003).

Colonial Waterbirds

Great Blue Heron

This species is a widespread breeder in the southern half of Manitoba, and is very uncommon in the north (Koonz 2003a). Great blue herons build their stick nests in trees, usually well off the ground (Cottrille and Cottrille 1958). These nests may be built new in the spring or reused and repaired for consecutive years (Cottrille and Cottrille 1958). Breeding habitat and colony locations are more commonly associated with undisturbed marsh, wetlands, and open water bodies than areas disturbed by human activities such as agriculture and residential development (Gibbs and Kinkel 1997). Colonies are typically located near suitable foraging habitat (Gibbs and Kinkely 1997). A total of 103 records of great blue herons, including colonies, were made during bird surveys in the Local Study Area (Map Series 6-2200), all within known ranges and distributions of this species (Carey *et al.* 2003).

Least Bittern

Least bitterns are listed as Threatened by SARA, and are not listed by MESA. They are rare breeders in Manitoba, uncommonly found in the southeast and west to Delta Marsh

in small wetlands (Koes 2003). Least bitterns arrive in Manitoba from their wintering grounds in early May and depart breeding areas in southern Manitoba to begin fall migration by the end of October. Least bitterns favour breeding habitat of small wetlands containing dense, tall, emergent vegetation, with some small areas of open water and woody vegetation (Gibbs *et al.* 1992), and particularly tall shrubs (Hay 2006).

Four least bitterns were recorded during the breeding bird surveys, three located 12 km south of Winnipegosis and one about 7 km north east of Langruth (Map Series 6-2200). These locations appear to be a northerly extension of their range in Manitoba. Least bitterns were recorded during the 2010 breeding bird, colonial waterbird, and waterfowl surveys at locations north and west of all known ranges and distributions of this species (Gibbs *et al.* 1992; Carey *et al.* 2003).

Birds of Prey

Bald Eagle

Bald eagles are common in Manitoba and nest in all forested areas of the province, with some reports of pairs nesting in agricultural areas (Koonz 2003b). Nests are commonly found in mature forests, usually within 2 km of a water body, depending on the availability of prey in the area (Buehler 2000). A total of 324 bald eagles were observed during bird surveys in the Local Study Area (Map Series 6-2200), in most locations where suitable habitat occurred, and within all known ranges and distributions of this species (Carey *et al.* 2003).

Ferruginous Hawk

Ferruginous hawks are not listed by SARA, and are listed as Threatened by MESA. Ferruginous hawks are uncommon breeders in Manitoba, and their range is limited to the southwestern corner of the province (De Smet 2003a). Ferruginous hawks are highly specialized to open mixed and short grass prairies with an abundance of prey (Bechard and Schmutz 1995). Reduced nesting populations and nesting success have been attributed to declines in ground squirrel numbers since the mid-1990s (Manitoba Conservation 2010b). Migration occurs in late summer to fall, with most ferruginous hawks departing for wintering grounds in the southern United States and northern Mexico by October (Schmutz and Fyfe 1987). The arrival of ferruginous hawks in spring typically occurs in late March to early April (Lokemoen and Duebbert 1976). No ferruginous hawks were observed during any of the bird surveys completed in the Project Study Area in 2010. A single ferruginous hawk was identified in western Manitoba during spring raptor surveys in 2009. See Map Series 6-2200 for the potential range of this species in the Province.

Burrowing Owl

Burrowing owls are rarely found in Manitoba and are at risk of extirpation; observations are restricted to the southwestern portion of the province (De Smet 2003b). They are listed as Endangered by SARA and MESA. Despite the reduced nesting success in 2009, the burrowing owl population has begun to recover in the last few years (Manitoba Conservation 2010b). Burrowing owls are commonly associated with open landscapes including grasslands, deserts, pastures, and agricultural lands (Haug *et al.* 1993). The arrival of burrowing owls from their wintering grounds in the southern United States and Mexico is typically from late April to early May (De Smet 2003b). While their departure in the fall typically begins in September, the last owls depart by the end of October (De Smet 2003b). No burrowing owls were observed during any of the bird surveys completed in 2010 (see Map Series 6-2200). In 2009, a single burrowing owl was identified in a pasture north of Carberry in the Project Study Area but far from the Local Study Area.

Short-eared Owl

Despite a largely continuous distribution ranging from northern Canada to northern Mexico (Holt and Leasure 1993), the short-eared owl is listed as Special Concern under SARA. Short-eared owl populations have declined by approximately 23% over the past decade with habitat loss and the degradation of habitat areas, particularly wintering areas, considered the primary cause (COSEWIC 2008). Short-eared owls are found throughout Manitoba, except in contiguous forested areas (Holland and Taylor 2003e). Breeding habitat consists of open landscapes with abundant small mammal prey (Holt and Leasure 1993), including grasslands, wetlands and occasionally hay land habitats. In Manitoba short-eared owls typically arrive in late March and early April and migrate after the breeding season, from August to October (Holland and Taylor 2003e).

Two short-eared owls were observed during the nocturnal owl surveys. One owl was detected 7 km south of Mafeking along PTH 10 (Map Series 6-2200). The second owl was observed 5 km south of the Overflowing River along PTH 10. These observations fell within the known range of short-eared owls in Manitoba (Holt and Leasure 1993; Holland and Taylor 2003e).

Upland Game Birds

Ruffed Grouse

Ruffed grouse are common year-round inhabitants of southern Manitoba's deciduous and mixedwood forests and of northern coniferous forests (Holland and Taylor 2003a). They are not found in the extreme north (Holland and Taylor 2003a). Habitats of continuous forested areas containing young and mature stands provide the most optimal conditions of cover and forage (Rusch *et al.* 2000). They tend to avoid clear-cut forest

(Blanchette *et al.* 2007). During bird surveys in the Local Study Area, ruffed grouse observations were limited to areas south of The Pas, and were sporadically clustered in particular areas rather than being widespread (Map Series 6-2200). A total of 226 ruffed grouse were observed, in most locations where suitable habitat occurred, and all within known ranges and distributions of this species (Rusch *et al.* 2000; Carey *et al.* 2003).

Sharp-tailed Grouse

Sharp-tailed grouse are gregarious year-round inhabitants of Manitoba, excluding areas in the far north (Taylor 2003c). In early spring, males form large groups on display grounds, called leks, to attract females (Taylor 2003c). Forty sharp-tailed grouse were observed throughout the Local Study Area during bird surveys, in most locations where suitable habitat occurred (Map Series 6-2200) and all corresponding with known ranges and distributions of this species (Connelly *et al.* 1998; Carey *et al.* 2003).

Woodpeckers

Red-headed Woodpecker

Red-headed woodpeckers are listed as Threatened by SARA and are not listed by MESA. They are uncommon in Manitoba, found south of the boreal forest (Taylor 2003d). Favoured nesting habitat includes relatively open deciduous woodlands with little to no understory (Conner 1976). Nesting in Manitoba begins in late May, with eggs reported until the end of June (Taylor 2003d).

A single red-headed woodpecker was observed along the Rat River north of Otterburne during the breeding bird surveys. The location of this red-headed woodpecker corresponds with all known ranges and distributions of this species (Smith *et al.* 2000; Carey *et al.* 2003). Three red-headed woodpeckers were recorded incidentally along the Rat River during other surveys in 2010 (Map Series 6-2200).

Pileated Woodpecker

Pileated woodpeckers are year-round residents of forested areas of central and southern Manitoba (Holland and Curtis 2003). Optimal habitat consists of mature coniferous, deciduous, or mixedwood forest, forests in early stages of succession that contain remnant large old growth trees, or standing dead trees (Bull and Jackson 1995). Pileated woodpeckers were observed in most of the Local Study Area (Map Series 6-2200) and in many locations where suitable habitat occurred. The greatest number of observations was in the Porcupine Mountain, Duck Mountain, and Riding Mountain areas and observations were less frequent between The Pas and Thompson. All 95 observations were within known ranges and distributions of this species (Bull and Jackson 1995; Carey *et al.* 2003).

Songbirds and Other Birds

Common Nighthawk

Common nighthawks are listed as Threatened by SARA and are not listed by MESA. They breed throughout Manitoba, with the exception of the extreme north (Taylor 2003c). Their habitat requirements are not highly specific; they can be found nesting on sand dunes, beaches, logged or burned areas of forests, forest clearings, prairies, farmlands, and gravel rooftops (Poulin *et al.* 1996). Common nighthawks arrive in Manitoba from their wintering grounds in mid to late May (Taylor 2003c) and begin their southward migration from Manitoba in mid August with some late departures in September (Taylor 2003c).

Seven common nighthawks were observed during bird surveys in the Local Study Area. The most southerly observation was approximately 12 km northwest of Plumas while the most northerly observation was 34 km north of Gillam (Map Series 6-2200). All common nighthawks identified and recorded during the 2010 breeding bird surveys correspond with all known ranges and distributions of this species (Bookhout 1995; Carey *et al.* 2003).

Whip-poor-will

Whip-poor-wills are common breeders throughout the southern boreal region of Manitoba, extending from the southeastern corner of the province up to central Saskatchewan (Taylor and Holland 2003). Favoured habitat consists of deciduous and/or mixedwood forests with a fairly open understory (Cink 2002). Whip-poor-wills' habitat preference is significantly associated with edge habitat of regenerating woodlands (Wilson and Watts 2008). Whip-poor-wills arrive in Manitoba from their wintering grounds in early May (Taylor and Holland 2003). No whip-poor-wills were observed during the 2010 breeding bird surveys. Thirteen whip-poor-wills were recorded incidentally during surveys in 2009 (Map Series 6-2200).

Olive-sided Flycatcher

Olive-sided flycatchers are listed as Threatened by SARA and are not listed by MESA. Olive-sided flycatchers are sparsely distributed south of the boreal forest tree-line in Manitoba and are usually found nesting and foraging near boreal forest bogs, wet areas, or recently burned stands (Altman and Sallabanks 2000; Koonz and Taylor 2003). In northern conifer forests they are most commonly found in edge habitats such as meadows, bogs, and clear-cuts, which appears to correspond to the availability of standing dead trees and remnant live trees that are important for singing and foraging perches (Altman and Sallabanks 2000). Spring migration begins around the second half of May (Altman and Sallabanks 2000).

Olive-sided flycatchers were present throughout the Project Study Area (Map Series 6-2200). Observations were much more prevalent in the North than in the area south of The Pas. South of Swan River, observations of olive-sided flycatchers were infrequent and widely separated, corresponding with their patchy distribution south of the boreal forest. All 200 olive-sided flycatchers recorded during the bird surveys in the Local Study Area correspond with all known ranges and distributions of this species (Altman *et al.* 2000; Carey *et al.* 2003).

Loggerhead Shrike

Loggerhead shrikes are listed as Threatened by SARA and Endangered by MESA. The loggerhead shrike is a rare and declining species in Manitoba, usually found in the southwest and around Winnipeg (De Smet 2003c). Loggerhead shrikes typically nest in woody vegetation such as shrubs and trees, which provide suitable cover and protection from predators (Porter *et al.* 1975). They may utilize nests constructed in previous years due to site fidelity and ease of maintenance compared to building a new nest (Yosef 1996). Loggerhead shrikes are daytime migrants, with migration occurring over a relatively long period due to short flights interrupted for feeding (Yosef 1996). Loggerhead shrikes arrive in Manitoba from their wintering grounds in late April and May, with the fall migration occurring at the end of August (De Smet 2003c). No loggerhead shrikes were observed during bird surveys in the Project Study Area (Map Series 6-2200).

Sprague's Pipit

Sprague's pipits are listed as Threatened by SARA and are not listed by MESA. Sprague's pipits inhabit southwestern Manitoba, are characteristic of mixed-grass prairie, and are associated with open grasslands (Holland *et al.* 2003b). Native and seeded pastures are favoured habitat, and hay fields are used less frequently (Davis *et al.* 1999). Sprague's pipits are more often found in moderately to lightly grazed pastures than heavily grazed ones (Davis *et al.* 1999). Sprague's pipits are short- to medium- distance migrants, arriving in the southern Canadian Prairies in the spring and departing in the fall for the southern United States and northern Mexico (Robbins and Dale 1999). No observations of Sprague's pipit were made during bird surveys in the Project Study Area (Map Series 6-2200).

Golden-winged Warbler

Golden-winged warblers are uncommon and localized breeders in Manitoba, with an estimated few hundred breeding pairs in the province (Edie *et al.* 2003). Golden-winged warbler habitat consists mainly of forest edges, shrubby fields, bogs, and marshes (Confer 1992). Bur-oak woodland, young tamarack and willow stands, and other shrubby habitat are also used (Edie *et al.* 2003). Favoured nesting habitat consists of abandoned farmland in early stages of succession and recently cut forest areas such as clear-cut

mature forest and transmission line right of ways (ROWs) that are not mowed, recent forest fires, and blowdowns (Buehler *et al.* 2007).

Golden-winged warblers return to Manitoba from mid May to late July, and have been observed outside their breeding areas as late as October (Edie *et al.* 2003). Golden-winged warbler observations were very limited, and were all made in two relatively small clusters (Map Series 6-2200). One cluster of observations was made in the Duck Mountains and another in an area east of Winnipeg, near the Riel Converter Station site. In all, 23 golden-winged warblers were recorded. No other golden-winged warbler observations were made. These locations correspond with all known ranges and distributions of this species (Confer 1992; Carey *et al.* 2003).

Canada Warbler

Canada warblers are found in the southern half of the boreal forest in Manitoba, and more commonly in west central Manitoba (Holland *et al.* 2003c). They inhabit moist mixedwood forests with dense and diverse understory growth, often near open water such as lakes or rivers (Conway 1999). Nesting habitat is usually associated with wet, mossy, forested areas; the nest itself is located in tree stumps, fallen logs, and dense ferns (Conway 1999). In spring, migrants arrive from mid May to early June (Holland *et al.* 2003c).

Canada warbler observations were made in a large portion of the Project Study Area during breeding bird surveys (Map Series 6-2200). They were most commonly found between The Pas and Swan River, in areas adjacent to the Porcupine Hills. A total of 80 individuals were recorded. The area surrounding The Pas appeared to be of some importance, as 30 Canada warbler observations were made. The locations of all Canada warblers identified and recorded during the 2010 breeding bird surveys correspond with all known ranges and distributions of this species (Conway 1999; Carey *et al.* 2003).

Rusty Blackbird

Rusty blackbirds are currently listed as a species of Special Concern under SARA. This is largely due to habitat conversion and blackbird control programs occurring in the birds' United States wintering range (COSEWIC 2006). Rusty blackbirds are not listed by MESA. While rusty blackbirds' breeding range extends over much of Canada (Avery 1995), in Manitoba they are typically found north of the 55th parallel (Nero and Taylor 2003). Rusty blackbirds are uncommon breeders in south central Manitoba, with favoured breeding habitat in wet boreal forest regions (Nero and Taylor 2003). These habitats include the mixedwood regions north to the edge of the tundra, usually found near wet areas such as bogs, fens, and riparian areas (Avery 1995). Rusty blackbirds are seasonal migrants, usually arriving in Manitoba by early April (Nero and Taylor 2003). The southward migration begins in late July in the north and September in southern Manitoba (Nero and Taylor 2003).

The most southerly rusty blackbird observation was near Briggs Spur while the northern limit was located about 23 km northeast of Limestone Generating Station (Map Series 6-2200). The locations of all 194 rusty blackbird observations correspond with all known ranges and distributions of this species (Altman and Sallabanks 2000; Carey *et al.* 2003).

6.2.7.6 Existing Environment at Project Components

HVdc Transmission Line

The HVdc transmission line is the largest Project component that had the highest potential for spatial and temporal overlap with the most number of bird species and bird habitats in the Project Study Area. Bird surveys were conducted along the proposed HVdc transmission line and included the breeding bird and rare bird, colonial waterbird, waterfowl, nocturnal owl, and raptor surveys. Bird groupings observed included waterfowl and other waterbirds (36 species), colonial waterbirds (37 species), birds of prey (25 species), upland game birds (5 species), woodpeckers (7 species), and songbirds and other birds (125 species). In rank order of abundance, the three most common bird species by group included:

- Waterfowl and other waterbirds - mallard, Canada goose, snow goose;
- Colonial waterbirds - ring-billed gull, Wilson's snipe, Franklin's gull;
- Birds of prey - red-tailed hawk, northern harrier, bald eagle;
- Upland game birds - ruffed grouse, sharp-tailed grouse, wild turkey;
- Woodpeckers - northern flicker, yellow-bellied sapsucker, hairy woodpecker; and
- Songbirds and other birds - white-throated sparrow, red-winged blackbird, Tennessee warbler.

VECs identified in proximity to the proposed HVdc transmission line included mallard, sandhill crane, great blue heron, bald eagle, ruffed grouse, sharp-tailed grouse, and pileated woodpecker, and species at risk including yellow rail, least bittern, short-eared owl, red-headed woodpecker, common nighthawk, and golden-winged warbler, Canada warbler, olive-sided flycatcher, and rusty blackbird. A variety of habitat types were modeled along the proposed HVdc transmission line and included wetland, shrubland, and mixedwood habitat areas. A diversity of bird species could be associated with habitats found along the ROW. The most commonly observed species included white-throated sparrow, red-winged blackbird, and Tennessee warbler. For more information regarding bird species, available habitat, and Project components see the *Bipole III Birds Technical Report* Section 5.4.3.

Keewatinoow Converter Station & Associated Facilities

Keewatinoow Converter Station and Ground Electrode

In comparison to other components of the Project, the Keewatinoow Converter Station and northern ground electrode consist of a relatively small Project Footprint. Bird surveys were conducted at, and in the vicinity of, the Keewatinoow Converter Station and northern ground electrode, included the breeding bird and nocturnal owl surveys. Bird groupings observed included waterfowl and other waterbirds (two species), colonial waterbirds (six species), woodpeckers (one species), and songbirds and other birds (41 species). VEC species identified in proximity to the Keewatinoow Converter Station and northern ground electrode were limited to sandhill crane, as well as species at risk including olive-sided flycatcher, and rusty blackbird. Important habitats modeled in the vicinity of the Keewatinoow Converter Station and northern ground electrode included shrubland, coniferous forest, and wetlands. Bird species associated with these habitats, such as alder flycatcher, yellow warbler, and swamp sparrow, respectively, are expected to occur frequently at the Keewatinoow Converter Station and ground electrode sites relative to bird species that select other habitat types. For more information regarding bird species, available habitat, and Project components see the *Bipole III Birds Technical Report* Section 5.4.3.

AC Collector Lines and Construction Power Lines

Bird surveys were conducted in the vicinity of the northern AC collector lines and construction power lines and included the breeding bird and nocturnal owl surveys. Bird groupings observed included waterfowl and other waterbirds (2 species), colonial waterbirds (4 species), woodpeckers (1 species), and songbirds and other birds (38 species). VEC species identified in proximity to the proposed AC collector and construction power lines included only sandhill crane, as well as species at risk including olive-sided flycatcher, and rusty blackbird. Important habitats modeled in the vicinity of the AC collector and construction power lines included shrubland, coniferous forest, and wetlands. Bird species associated with these habitats, such as alder flycatcher, yellow warbler, and swamp sparrow, respectively, are expected to occur frequently at the AC collector and construction power lines sites relative to bird species that select other habitat types. For more information regarding bird species, available habitat, and Project components see the *Bipole III Birds Technical Report* Section 5.4.3.

Keewatinoow Construction Camp

In comparison to other components of the Project, the northern construction camp consists of a relatively small footprint. Bird surveys were conducted in the vicinity of the northern construction camp and included the breeding bird, and nocturnal owl surveys. Bird groupings observed included waterfowl and other waterbirds (2 species), colonial

waterbirds (2 species), and songbirds and other birds (28 species). VEC species identified in proximity to the northern construction camp include sandhill crane, as well as species at risk including olive-sided flycatcher, and rusty blackbird. Important habitat modeled in the vicinity of the northern construction camp included shrubland, coniferous forest, and wetlands. Bird species associated with these habitats, such as alder flycatcher, yellow warbler, and swamp sparrow, respectively, are expected to occur frequently at the northern construction camp site relative to bird species that select other habitat types. For more information regarding bird species, available habitat, and Project components see the *Bipole III Birds Technical Report,* Section 5.4.3.

Borrow Sites and Excavated Material Disposal Areas

The borrow sites and excavated material disposal area and general borrow areas consist of a relatively small project component footprint. Bird surveys were conducted at, and in the vicinity of the borrow sites and excavated material disposal area and general borrow areas, and included the breeding bird and nocturnal owl surveys. Bird groupings observed at these sites included waterfowl and other waterbirds (2 species), colonial waterbirds (2 species), and songbirds and other birds (30 species). VEC species identified in proximity to the borrow sites and excavated material disposal area and general borrow areas were limited to sandhill crane, as well as species at risk including olive-sided flycatcher and rusty blackbird. Important habitats modeled in the vicinity of the borrow sites and excavated material disposal area and general borrow areas included shrubland, coniferous forest, and wetlands. Bird species associated with these habitats, such as alder flycatcher, yellow warbler, and swamp sparrow, respectively, are expected to occur frequently at many of the borrow sites and excavated material disposal area and general borrow areas sites relative to bird species that select other habitat types. For more information regarding bird species, available habitat, and Project components see the *Bipole III Birds Technical Report* (Section 5.4.3).

Riel Converter Station & Associated Facilities

In comparison to other components of the Project, the Riel Converter Station and southern ground electrode consist of a relatively small project footprint. Bird surveys were conducted in the vicinity of the Riel Converter Station and southern ground electrode and included the breeding bird, nocturnal owl and reconnaissance surveys. Bird groupings observed included colonial waterbirds (two species), birds of prey (three species) and songbirds and other birds (21 species). No VEC species were identified in proximity to the Riel Converter Station and southern ground electrode. Existing habitat at Riel and the southern ground electrode are either disturbed, or consist of agricultural land. Few bird species and no VEC species are likely to occupy the sites. Habitat types modeled in the vicinity of the Riel Converter Station and southern ground electrode included wetland, grassland, and deciduous habitat areas. Bird species associated with

these habitat types, which could occur in proximity to the Riel Converter Station and southern ground electrode, include savannah sparrow, clay-coloured sparrow, red-eyed vireo, red-winged blackbird, and brown-headed cowbird, respectively. For more information regarding bird species, available habitat, and Project components see the *Bipole III Birds Technical Report* (Section 5.4.3).

6.2.8 Amphibians and Reptiles

6.2.8.1 Overview

The assessment of the Project as it relates to the amphibians and reptiles within the Local Study Area focuses on selected VECs. Although some VEC species of interest within the Project Study Area do not have distribution ranges overlapping the Local Study Area, distribution ranges are in close proximity to the Project Footprint, and suitable habitat is present within the right-of-way, warranting inclusion. In addition to describing the general existing environment of the Project Study Area, this section will also focus on the VECs used in Project evaluation, discussed in their respective sections below. A description of the environmental assessment approach can be found in Chapter 4 (Environmental Assessment Approach), as well as the *Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report.*

This section provides information on the following:

- Amphibian and reptiles groups in the Project Study Area;
- Summary by ecozones;
- Species at risk;
- VECs; and
- Existing environment at Project components.

6.2.8.2 Amphibians and Reptiles in the Project Study Area

There are 15 amphibian and eight reptile species that occur in Manitoba (Table 6.2-13, Appendix 6A - Figures 6A-1 to 6A-7); Preston 1982). Of these, 12 amphibian and all eight reptile species have ranges overlapping the Project Study Area; not all species have distributions within the Local Study Area.

Table 6.2-13: List of Amphibian and Reptile Species found in Manitoba and their Respective Status under COSEWIC, SARA, MESA, and the Manitoba Wildlife Act

Scientific Name	Common Name	Range within Bipole III Study Area	Status Listings			
			COSEWIC	SARA	MESA	Other Status
CLASS AMPHIBIA						
Order Anura (Frogs and Toads)						
Anaxyrus americanus americanus	Eastern American Toad	YES	Not Listed	Not Listed	Not Listed	n/a
Anaxyrus cognatus	Great Plains Toad	NO	Special Concern	Special Concern	Threatened	n/a
Anaxyrus hemiophrys	Canadian Toad	YES	Not at Risk		Not Listed	n/a
Hyla chrysoscelis	Cope's Gray Treefrog	YES	Not at Risk		Not Listed	n/a
Hyla versicolor	Gray Treefrog	YES	Not Listed	Not Listed	Not Listed	n/a
Lithobates clamitans	Green Frog	NO	Not Listed	Not Listed	Not Listed	n/a
Lithobates septentrionalis	Mink Frog	NO	Not Listed	Not Listed	Not Listed	n/a
Lithobates pipiens	Northern Leopard Frog (western boreal/prairie population)	YES	Special Concern	Special Concern	Not Listed	n/a
Lithobates sylvaticus	Wood Frog	YES	Not Listed	Not Listed	Not Listed	n/a
Pseudacris crucifer	Spring Peeper	YES	Not Listed	Not Listed	Not Listed	n/a
Pseudacris maculata	Boreal Chorus Frog	YES	Not Listed	Not Listed	Not Listed	n/a
Spea bombifrons	Plains Spadefoot	YES	Not at Risk		Not Listed	Protected Spps (MB Wildlife Act, Div6)
Order Caudata (Salamanders)						
Ambystoma laterale	Blue-Spotted Salamander	YES	Not Listed	Not Listed	Not Listed	n/a
Ambystoma mavortium diaboli	Gray Tiger Salamander	YES	Not at Risk		Not Listed	n/a
Necturus maculosus maculosus	Common Mudpuppy	YES	Not at Risk		Not Listed	n/a
CLASS REPTILIA						

Order Testudines						
Chelydra serpentina serpentina	Common Snapping Turtle	YES	Special Concern	No Status	Not Listed	n/a
Chrysemys picta bellii	Western Painted Turtle	YES	Not at Risk		Not Listed	n/a
Order Squamata (Lizards and Snakes)						
Plestiodon septentrionalis septentrionalis	Northern Prairie Skink	YES	Endangered	Endangered	Not Listed	Protected Spps (MB Wildlife Act, Div6)
Heterodon nasicus nasicus	Plains Hognose Snake	YES	Not Listed	Not Listed	Not Listed	Protected Spps (MB Wildlife Act, Div6)
Opheodrys vernalis	Smooth Green Snake	YES	Not Listed	Not Listed	Not Listed	n/a
Storeria occipitomaculata occipitomaculata	Northern Redbelly Snake	YES	Not Listed	Not Listed	Not Listed	n/a
Thamnophis radix	Plains Garter Snake	YES	Not Listed	Not Listed	Not Listed	n/a
Thamnophis sirtalis parietalis	Red-sided Garter Snake	YES	Not Listed	Not Listed	Not Listed	n/a

Amphibians and reptiles are distributed within the Project Study Area ecozones in accordance with their individual niche habitats, ranging from prairie species residing in the sand prairies of southwestern Manitoba to boreal species overwintering under forest leaf litter. Additionally, Manitoba's wetlands, representing 41% of the land area in the province (National Wetlands Working Group 1988) are essential for the breeding stage of Manitoban anuran species.

6.2.8.3 Summary by Ecozones

Taiga Shield and Hudson Plain

Amphibians

Of the 12 species of amphibians and eight species of reptiles found within the Project Study Area, only the wood frog and the boreal chorus frog have distributions extending well into the Taiga Shield and Hudson Plain ecozones (Table 6.2-13). The distribution of the northern leopard frog may extend into the southernmost limits of these ecozones (Table 6.2-14). All three species have distributions that overlap the Local Study Area within these ecozones.

Reptiles

There are no documented reptile species in Manitoba with distribution ranges extending as far north as the Taiga Shield and Hudson Plain ecozones (Table 6.2-13).

Boreal Shield

Amphibians

The Boreal Shield Ecozone hosts the second largest number of amphibian species of any ecozone in Canada (CARCNET 2009). Like the Taiga Shield and Hudson Plain ecozones, the wood frog and boreal chorus frog have distributions overlapping the Boreal Shield portion of both the Project and Local Study Areas. The northern leopard frogs' northernmost limit approximately correlates with the northern extent of the Boreal Shield. Additionally, the westernmost limit of the Boreal Shield Ecozone in Manitoba approximates the westernmost distribution range limits of both the American toad (*Anaxyrus americanus*) and northern spring peeper (*Pseudacris crucifer*) (Table 6.2-14).

Reptiles

The Boreal Shield Ecozone hosts the second largest number of reptile species of any ecozone in Canada, with most of species concentrated in the extreme southern-most part of the ecozone (CARCNET 2009). Only the northern portion of the Boreal Shield is represented within the Project Study Area and, hence, species representation is limited.

The red-sided garter snake is the only reptile that has a distribution range within the portion of the ecozone overlapped by the Project Study Area (Table 6.2-14).

Boreal Plain

Amphibians

The Boreal Plain Ecozone of Canada is home to nine species of amphibians, all of which are also found further south in the Prairie Ecozone (CARCNET 2009). Within the Project Study Area, the Boreal Plain Ecozone has greater amphibian diversity than its northern counterparts, overlapping with distribution ranges of the wood frog, the boreal chorus frog, the northern leopard frog (Table 6.2-14), and the Canadian toad (*Anaxyrus hemiophrys*) (Table 6.2.8-2). Additionally, Cope's gray treefrog (*Hyla chrysoscelis*), gray treefrog (*Hyla versicolor*), gray tiger salamander (*Ambystoma mavortium diaboli*), and the common mudpuppy (*Necturus maculosus maculosus*) all have distribution ranges within the southern regions of this Ecozone (Table 6.2.8-2). The western-most distribution of the blue spotted salamander (*Ambystoma laterale*) occurs in this ecozone (Table 6.2.8-2), and the northern spring peeper has a distribution range within the Boreal Shield Ecozone extending into the Project Study Area both north and south of Lake Winnipeg (Table 6.2-14).

Reptiles

The Boreal Plain Ecozone is home to six of the eight species of reptiles found in Manitoba (Table 6.2-14). All of these are also found further south in the Prairie Ecozone (CARCNET 2009). In addition to the red-sided garter snake, found north in the Boreal Shield Ecozone, the Boreal Plains Ecozone is also home to the smooth green snake (*Opheodrys vernalis*), the northern redbelly snake (*Storeria occipitomaculata*), plains garter snake, the common snapping turtle, and the western painted turtle (*Chrysemys picta bellii*). The western painted turtle and red-sided garter snake have distributional ranges over most of the Boreal Plain Ecozone within the Project Study Area, while the common snapping turtle, northern redbelly snake, and plains garter snake inhabit the southern third of the ecozone within the Project Study Area (Table 6.2-14). The smooth green snake inhabits only the southernmost portions of the Boreal Plains Ecozone overlapping the Project Study Area (Table 6.2-14).

Prairie

Amphibians

The Prairie Ecozone of Canada represents the northern-most limit of open grasslands in the North American Great Plains (Smith *et al.* 1998). This ecozone has the greatest number of amphibian species of all Project Study Area ecozones and includes the boreal chorus frog, wood frog, northern leopard frog, Canadian toad, gray treefrog, Cope's gray

treefrog, gray tiger salamander, common mudpuppy, and the plains spadefoot (Table 6.2-14). Within Manitoba, the plains spadefoot is unique to this ecozone; an isolated population exists within the Project Study Area surrounding Dauphin Lake. This isolated population likely overlaps the right-of-way within the Local Study Area.

Reptiles

The Prairie Ecozone has the highest diversity of reptiles in western Canada with 13 species (eight within Manitoba) including turtles, lizards and snakes (CARCNET 2009). In addition to all of the Boreal Plain Ecozone reptile species, the Prairie Ecozone is also home to the plains hognose snake and the northern prairie skink. The snapping turtle, western painted turtle, northern redbelly snake, plains garter snake, and red-sided garter snake have distribution ranges overlapping the entirety of the Prairie Ecozone within the Project Study Area (Table 6.2-14). The smooth green snake has a distribution range in southwestern Manitoba, overlapping most of the Prairie Ecozone within the Project Study Area.

Sandy soils can be found in isolated patches within the prairie grassland and parkland regions of the Prairie Ecozone, including within the Local Study Area and the Bipole III right-of-way. Within the Local Study Area, habitat models estimate a total of 4.4 km^2 of sandy soil, 3.71 km^2 of which is present in the Prairie Ecozone. Sandy soils are associated with several species of reptile. The plains hognose snake and the northern prairie skink both have isolated distributions within the Prairie Ecozone of southwestern Manitoba. Although these populations do not overlap the Local Study Area, they are in close proximity to the Project footprint, where suitable sandy-soil habitat exists.

Table 6.2-14: Amphibian and Reptile Species found in the Bipole III Project Study Area by Ecozones

Scientific Name	Common Name	EcoZone within Project Study Area				
		Prairie	Boreal Plain	Boreal Shield	Taiga Shield	Hudson Plain
CLASS AMPHIBIA						
Order Anura (Frogs and Toads)						
Anaxyrus americanus americanus	Eastern American Toad			▪		
Anaxyrus hemiophrys	Canadian Toad	▪	▪			
Hyla chrysoscelis	Cope's Gray Treefrog	▪	▪			
Hyla versicolor	Gray Treefrog	▪	▪			
Lithobates pipiens	Northern Leopard Frog (western boreal/prairie population)	▪	▪	▪	▪	▪
Lithobates sylvaticus	Wood Frog	▪	▪	▪	▪	▪
Pseudacris crucifer	Spring Peeper		▪	▪		
Pseudacris maculata	Boreal Chorus Frog	▪	▪	▪	▪	▪
Spea bombifrons	Plains Spadefoot	▪				
Order Caudata (Salamanders)						
Ambystoma laterale	Blue-Spotted Salamander		▪			
Ambystoma mavortium diaboli	Gray Tiger Salamander	▪	▪			
Necturus maculosus maculosus	Common Mudpuppy	▪	▪			
CLASS REPTILIA						
Order Testudines						
Chelydra serpentina serpentina	Common Snapping Turtle	▪	▪			
Chrysemys picta bellii	Western Painted Turtle	▪	▪			
Order Squamata (Lizards and Snakes)						
Plestiodon septentrionalis septentrionalis	Northern Prairie Skink	▪				
Heterodon nasicus nasicus	Plains Hognose Snake	▪				
Opheodrys vernalis	Smooth Green Snake	▪	▪			
Storeria occipitomaculata occipitomaculata	Northern Redbelly Snake	▪	▪			
Thamnophis radix	Plains Garter Snake	▪	▪			
Thamnophis sirtalis parietalis	Red-sided Garter Snake	▪	▪	▪		

6.2.8.4 Species at Risk

The *Species at Risk Act* lists two Manitoba amphibian species, one of which can be found in the Project Study Area. The northern leopard frog (*Lithobates pipiens*) is listed by the federal *Species at Risk Act* (SARA) as a Species of Special Concern. It is not listed under *The* [Manitoba] *Endangered Species Act* (MESA). Additionally, the plains spadefoot toad (*Spea bombifrons*, hereafter called the plains spadefoot) is found within the Project Study Area and is listed as protected under Division 6 of *The Wildlife Act* (Government. of Manitoba 1987, Table 6.2-13). It is not listed under SARA or MESA.

Only one Manitoba reptile species, which can be found in the Project Study Area, is listed by SARA. The northern prairie skink (*Plestiodon septentrionalis septentrionalis*) is listed as Endangered. It is also listed as Protected under Division 6 of *The Wildlife Act* (Government of Manitoba 1987, Table 6.2-13). The common snapping turtle (*Chelydra serpentina serpentina*) has recently been designated as a species of Special Concern by COSEWIC, but is not listed under SARA. Neither species found within the Project Study Area are listed under MESA. Additionally, the plains hognose snake (*Heterodon nasicus nasicus*) is found within the Project Study Area and is listed as protected under Division 6 of *The Wildlife Act* (Government of Manitoba 1987, Table 6.2-13). It is not listed under SARA or MESA.

6.2.8.5 Valued Environmental Components

In total, three amphibian and two reptile species were selected as VECs. Selected VEC species include the following:

Amphibians:

- Plains spadefoot, wood frog, and northern leopard frog.

Reptiles:

- Red-sided garter snake, and northern prairie skink.

Plains Spadefoot

The plains spadefoot is a nocturnal toad confined to more arid regions of North America. In Manitoba, the plains spadefoot toad is restricted to the southwest region, where sandy soils occur, with an isolated population occurring north of Riding Mountain National Park near Dauphin (Preston 1982; Cook 1984; Berger pers. comm.; Appendix 6A – Figure 6A-2). Habitat associations include sand dunes, upland prairie, and short- and mixed-grass prairie, overall strongly correlated with sandy soil habitats (Lauzon 1999). Breeding occurs after heavy rains, from June through to early August. Breeding sites on the prairies consist of ephemeral pools, including partially flooded fields, ditches,

flooded dugouts, and shallow temporary wetlands in fallow fields (Preston and Hatch 1986; Lauzon 1999). During winter, the spadefoot toad burrows deeply to avoid freezing and desiccation (Baxter and Stone 1980).

Wood Frog

The wood frog (*Lithobates sylvaticus*) is primarily forest-dwelling, utilizing small ephemeral ponds for breeding and using terrestrial habitats for overwintering. It breeds after the boreal chorus frog by mid-April. Breeding of this species is explosive (Seale 1982) and eggs are laid in large communal egg mass clusters in small ephemeral ponds with females depositing up to 3,000 eggs, again on submergent vegetation (Preston 1982). While six Manitoba species occur north of Lake Winnipeg, only the Wood Frog can be found as far north as the Northwest Territories (Appendix 6A - Figure 6A-1).

Northern Leopard Frog

The northern leopard frog is widely distributed in Manitoba, inhabiting the southern two thirds of the province, with northern distribution limits in the northernmost reaches of the Bipole III Project Study Area (Appendix 6A - Figure 6A-1). Shortly after the spring thaw, the northern leopard frog emerges from hibernation. Breeding occurs in April through May in a variety of habitats, including ponds, quiet backwaters of streams (Merrell 1977; COSEWIC 2000), marshes, roadside ditches, borrow pits, channels and permanently flooded meadows (Eddy 1976). Eggs are deposited beneath the water surface, either attached to submergent vegetation or on pond bottoms. Northern leopard frogs lay eggs in large communal egg mass clusters of up to 5,000 eggs. Tadpoles transform into adult form two to three months after oviposition (Preston 1982). After the breeding season, the northern leopard frog moves to its summering range, widely dispersed in a variety of terrestrial habitats, including grasslands and wet woods (Preston 1982). Hibernation occurs up to 1.6 km from breeding ponds (Hine *et al.* 1981), at the bottom of lakes and other permanent water bodies that are well-oxygenated and do not freeze solid, such as rivers and the bottom of Lake Manitoba (Eddy 1976).

Red-Sided Garter Snake

The red-sided garter snake (*Thamnophis sirtalis parietalis*) inhabits the southern half of the province (Appendix 6A - Figure 6A-6), and is associated with grasslands and mesic vegetation, often at margins of ponds or further upland, most likely dictated by the presence of food in these areas (Preston 1982). In the fall, red-sided garter snakes congregate in the thousands in suitable hibernation sites such as limestone sinks (Preston 1982; Gregory 1977). Populations are greatest in the Interlake where an abundance of marshes, shallow lakes and poor drainage result in ideal summering habitat and abundant limestone bedrock that provide denning sites (Koonz 1991), and often share denning sites with the plains garter snake (*Thamnophis radix*) where their ranges overlap within the plains garter snakes' northern-most distribution range (i.e. central Manitoba, Appendix

6A - Figure 6A-6) (Shine *et al.* 2003). Courtship occurs in spring as soon as snakes emergence from hibernacula. Garter snake emergence from hibernacula generally occurs in late April in the Project Study Area, depending on weather. Males remain at the emergence site for approximately a month and a half to re-mate with other available females (Preston 1982). Time to hatching is 2-3 months. Females are ovoviparous, giving birth to 10-40 young between late July and October (Zimmerman 2002). Mean brood size of 16.4 has been reported in a Manitoba population (Gregory 1977).

Northern Prairie Skink

The northern prairie skink is Manitoba's only true lizard, and Manitoba's only endangered or threatened herptile. The prairie skink is limited to a small area (in southwestern Manitoba (Appendix 6A - Figure 6A-7), and requires sandy soils for nesting, overwintering and for summering burrows (COSEWIC 2004). The northern prairie skink hibernates underground for over seven months in the northern part of its range (Nelson 1963). Emergence from hibernation sites occurs from late April well into May (Breckenridge 1943, Nelson 1963, Bredin 1981), with individuals migrating to summer ranges at this time (Nelson 1963). Breeding occurs mid-May to mid-June in Manitoba (Scott 2004). Nests occur under logs, rocks and boards in small hollows, with an average clutch size of 9 eggs (Taylor 1935, Breckenridge 1943). Incubation is approximately 35 days, with hatching occurring at the end of July in Manitoba (Scott 2004), with a short forage period before initiation of hibernation.

6.2.8.6 Existing Environment at Project Components

HVdc Transmission Lines

All five VEC amphibian and reptile species have distributions or suitable habitat overlapping the Local Study Area of the HVdc transmission line and associated 66 m right-of-way (Appendix 6A– Table 6A-7).

The plains spadefoot has an isolated distribution range within the Project Study Area, limited to the HVdc transmission line corridor and right-of-way within the vicinity of Dauphin Lake, where sandy soils are found. In total, the Local Study Area contains 21 km^2 of plains spadefoot suitable breeding habitat in this area, of which 0.28 km^2 (1.4%) is located within the 66 m right-of-way. The majority of the suitable habitat falls within the Prairie Ecozone, concentrated within the Alonsa Ecodistrict. Suitable habitat also falls within the Waterhen Ecodistrict of the Boreal Plain Ecozone, and the Dauphin Ecodistrict of the Prairie Ecozone. Although anuran call surveys in 2010 did not find any plains spadefoot individuals at survey sites, incidental observations during the course of 2009 field studies have identified the presence of the plains spadefoot in the vicinity of Dauphin Lake.

Suitable breeding habitat (i.e. wetlands) and distribution ranges of northern leopard frogs and wood frogs are found throughout the Project Study Area, including within all five ecozones of the HVdc transmission line corridor and right-of-way. In total, there is 1,698 km^2 of suitable habitat present within the Local Study Area corridor, 21 km^2 of which is found along the 66 m right-of-way. Of the 170 call survey sites examined along the transmission line corridor and its vicinity, wood frogs were detected at 122 (i.e. 72%) of the sites, and northern leopard frogs at 23 (i.e. 14%) of the sites. Most wood frog observations were in the Boreal Plain and Boreal Shield Ecozones. Northern leopard frogs were detected mostly in the Boreal Plain Ecozone. In the Prairie Ecozone, northern leopard frogs were detected at only five sites, while no northern leopard frogs were detected in the Boreal Shield Ecozone.

Suitable garter snake hibernacula habitat is found in all three major Ecozones of the Local Study Area corridor and right-of-way, extending from the Dauphin Lake area to approximately 160 km north of The Pas, with the greatest concentration (88%) occurring within the Boreal Plain Ecozone (Appendix 6A – Table 6A-7). Within the Summerberry and Overflowing River Ecodistricts of the Boreal Plain Ecozone, nearly 10% of suitable habitat within the transmission line corridor is found along the 66 m right-of-way. In total, the Bipole III three mile corridor contains 57 km^2 of suitable garter snake hibernacula habitat, of which 1.2 km^2 is located within the 66 m right-of-way (Appendix 6A – Table 6A-7). Field investigations at selected garter snake hibernacula sites, as well as ATK interviews, confirmed that hibernacula habitat may in fact be present in such areas. For a more detailed description of survey results and observations, please refer to the *Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report*.

The northern prairie skink has an isolated distribution range within the Prairie Ecozone of the Project Study Area. Although the current known northern prairie skink distribution range does not overlap the Local Study Area and right-of-way, suitable habitat does exist within these areas within the St. Claude/Assiniboine River area (Appendix 6A – Table 6A-7). Suitable sandy-soil prairie habitat overlaps the Local Study Area near the Stockton Ecodistrict and both the Alonsa and MacGregor Ecodistricts, as well as the 66 m right-of-way of the Alonsa and MacGregor Ecodistricts. In total, the Local Study Area contains 4.4 km^2 of suitable prairie skink habitat, 3.71 km^2 of which is found within the Prairie Ecozone, and 0.09 km^2 (i.e. 2.1%) of which is contained within the 66 m right-of-way. Skink coverboard surveys conducted at selected suitable habitat sites within the St. Claude/Assiniboine River area did not find any prairie skinks. However, a possible skink track was observed at one of the sites.

Keewatinoow Converter Station & Associated Facilities

Wetland habitat associated with breeding wood frogs and northern leopard frogs is present within both the Keewatinoow Converter Station footprint, as well as the

northern electrode site (Appendix 6A – Table 6A-8). In total, 0.02 km² of wetland habitat is identified within the Keewatinoow Converter Station footprint, and 1.45 km² within the northern electrode footprint. No other amphibian and reptile VEC habitat was identified within the Keewatinoow Converter Station and northern ground electrode footprints.

Keewatinoow Construction Camp

A total of 0.02 km² of suitable northern leopard and wood frog habitat (i.e. wetlands) was identified within the northern construction camp footprint area (Appendix 6A – Table 6A-8). No other amphibian and reptile VEC habitat was identified at the northern construction camp.

AC Collector Lines and Construction Power Lines

A total of 2.8 km² of suitable northern leopard and wood frog habitat (i.e. wetlands) was identified within the northern AC collector lines and construction power lines right-of-ways (Appendix 6A – Table 6A-8), including 0.08 km² within the Henday to Long Spruce right-of-way, 0.01 km² within the Keewatinoow to construction power site right-of-way, 0.004 km² within the northern electrode line right-of-way, and 2.70 km² within the AC collector line right-of-way. No other amphibian and reptile VEC habitat was identified at the collector and construction power lines.

Borrow Areas

Wetland habitat associated with breeding wood frogs and northern leopard frogs is present within borrow areas and excavated material placement sites. In total, 0.411 km² of wetland habitat is identified within proposed borrow area locations, and 0.290 km² within excavated material placement sites. No other amphibian and reptile VEC habitat was identified within the borrow areas and excavated material placement site footprints.

Riel Converter Station & Associated Facilities

No amphibian and reptile VEC habitat was identified within the Riel Converter Station or the southern electrode site footprint.

6.2.9 Terrestrial Invertebrates

6.2.9.1 Overview

The assessment of the Project as it relates to the terrestrial invertebrates within the Local Study Area focuses on selected VECs. Although some VEC species of interest within the Project Study Area do not have distribution ranges overlapping the Local Study Area, distribution ranges are in close proximity to the Project footprint, and suitable habitat is present within the rights-of-way, warranting inclusion. In addition to describing the general existing environment of the Project Study Area, this section will also focus on the VECs used in the Project evaluation, discussed in their respective sections below. A description of the environmental assessment approach can be found in Chapter 4 (Environmental Assessment Approach), as well as the *Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report*.

This section provides information on the following:

- Terrestrial invertebrate groups in the Project Study Area;
- Summary by ecozone;
- Species at risk;
- VECs; and
- Existing environment at Project components.

6.2.9.2 Terrestrial Invertebrate Groups in the Project Area

Terrestrial invertebrate communities and habitats within the Project Study Area are diverse and can be examined at various scales, from the relatively homogenous broad landscape level (i.e. an ecozone) to the more heterogeneous site-specific level (e.g. a single tree snag).

Distribution and relative abundance of terrestrial invertebrates can be affected by many factors, including substrate and habitat type, season, and landscape processes such as fire regime (Saint-Germain *et al.* 2005). Associated habitats and ecological roles are also listed. Although many species are generalists and can be found across a variety of habitat types, others are specialists and have limiting habitat ranges based on restrictions of life history requirements.

Habitat for many terrestrial invertebrates is generally assumed to be abundant and widely distributed across the province. Some specialist species, however, are associated with habitats that are limiting within the Project Study Area. Loss of these limiting habitats would have negative effects to such species. Since habitat loss and degradation are the most common causes of species declines, and might occur from the development of a

transmission line, it is important to identify limiting and unique habitats for the conservation efforts of associated terrestrial invertebrates.

One of the foremost limiting habitat types within the Project Study Area is the natural grasslands within the prairie landscape, associated with many specialist terrestrial invertebrates, including several species at risk. Changes in management practices in more widespread habitats can also have major effects on existing terrestrial invertebrate populations. Logging and related activities, for example, can result in changes in carabid beetle capture rates (Saint-Germain *et al.* 2005) and assemblages (Niemelä *et al.* 1993; Beaudry *et al.* 1997).

6.2.9.3 Summary by Ecozone

In general, terrestrial invertebrate composition varies between Canadian ecozones, as each ecozone has a unique combination of temperature patterns, humidity, and available food resources.

Taiga Shield

The Taiga Shield Ecozone is classified as Subarctic, and borders with the southern arctic, where species predominantly include Diptera (flies), Hymenoptera (bees, ants, wasps, sawflies, etc.), Lepidoptera (butterflies and moths), some ectoparasites of warm-blooded vertebrates, as well as mites and Collembola (springtails).

Hudson Plain

Due to poor drainage, the Hudson Plain Ecozone has one of the largest continuous wetlands in the world. The resultant terrestrial invertebrate assemblage is known for its biting insects (Canadian Biodiversity 2010), which includes species from the order Diptera, including black flies (family Simulidae), horse flies and deer flies (family Tabanidae) and mosquitos (family Culicidae).

Boreal Shield & Boreal Plain

There are an estimated 22,000 insect species occurring in the Boreal Shield and Boreal Plain ecozones, which together comprise the boreal zone of Canada. Similar to species found in the arctic region, the predominant insects in the Boreal Shield include advanced holometabolous taxa such as Lepidoptera (characterized by species such as the spring azure, American copper, monarch butterfly and mourning cloak), Hymenoptera, Diptera, and Coleoptera (beetles) (Biological Survey of Canada 1988). At the family level, about a third of Canadian families of Coleoptera and Lepidopotera are found within the boreal zone, while at the species level, about half to two-thirds of Canadian species occur in and around the boreal zones (Danks and Foottit 1989).

Within the boreal zone, invertebrate habitats include tree canopies, understory vegetation, leaf and needle litter, dead wood, soil, as well as aquatic habitats (Danks and Foottit 1989). Variation of these habitat types determines variation in invertebrate abundance and composition. Each stand type may contain a number of sub-habitats, including those areas where either a single fallen tree or a forest fire has altered gap dynamics. Subsequent open areas and forest edges develop a unique composition of plant communities and areas, such as clearings with an abundance of shrubs and herbs. This type of habitat can contain a better representation of Hemiptera (true bugs) than forest trees. In combination with deciduous trees, these open area and edge plant communities act as shelter and refuge for diverse leaf miners such as agromyzids and anthomyiids (Diptera), gall makers such as tenthredinid (Hymenoptera) sawflies, and other phytophages, as well as their predators and parasites (Danks and Foottit 1989).

At the forest floor, dead wood and habitats under bark are colonized by many characteristic species, including beetles (Coleoptera). Soil and leaf layers contain many species of mites and many species of dipteran (fly) larvae such as tipulids, mycetophilids, and sciarids (Danks and Foottit 1989).

Some groups, such as soil dwelling oribatid and prostigmatid mites, and dipteran larvae, have a greater number of representative individuals in the boreal zone than in other zones and contribute significantly to total soil biomass (Peterson and Luxton 1982). Biting flies such as black flies, mosquitos, midges and horse flies are very abundant in the boreal region (Biological Survey of Canada 1988).

Some economically important phytophagous species including moths, sawflies, scolytid beetles, and cerambycid beetles, show periodic outbreaks within the boreal region (Biological Survey of Canada 1988). Species considered forest pests play a significant role in the overall health of forests (Ives and Wong 1988). Damaged forests may have limited functions for wildlife habitat or commercial use, and biodiversity may be altered as a result of such damage (Hall 1996).

As with the Hudson Plain Ecozone, the high prevalence of standing and running water due to the melting of accumulated winter snow, low evaporation, and poor drainage results in an abundance of wetlands in the region. A fifth of the Boreal Shield is covered in wetlands and bogs, providing some of the most diverse and productive areas in this ecozone (Canadian Biodiversity 2010). Insect taxa with aquatic juvenile life stages subsequently occur in the area as emergent terrestrial adults (Kovats *et al.* 1996).

Prairie

Herbivorous terrestrial invertebrate taxa tend to predominate in grasslands and the Prairie Ecozone. Groups include Hemiptera, Lepidoptera, Orthoptera (grasshoppers, crickets, cockroaches, etc.), and many Coleoptera (Hayes 1927; Biological Survey of Canada 1988). While many species are generalists and can be found in agricultural landscapes, some species, such as the Dakota skipper, are specialists associated with the

intermittent patches of native grasslands found within the Prairie Ecozone. Additionally, some terrestrial invertebrate species, such as the Ottoe and Uncas skippers, are specialists of sandy soils, uncommon within Manitoba and predominantly found within the Prairie Ecozone. Within the Local Study Area, habitat models estimate a total of 4.4 km² of sandy soil, 3.71 km² of which is present in the Prairie Ecozone. Native grasslands and associated sandy soil habitats are considered unique or limiting terrestrial invertebrate habitats within both the Project and Local Study Area.

6.2.9.4 Species at Risk

Currently there are eleven terrestrial invertebrate species in Manitoba considered as species at risk, nine of which have present or historical distributions overlapping the Project Study Area (Table 6.2-15).

Eight of the terrestrial invertebrate species at risk have restricted to fragmented populations or population centres within the Prairie Ecozone: the Uncas skipper (*Hesperia uncus*), Dakota skipper (*Hesperia dacotae*), Dusky Dune moth (*Copablepharon longipenne*), Ottoe skipper (*Hesperia ottoe*), Pale Yellow Dune moth (*Copablepharon grandis*), Verna's Flower moth (*Schinia verna*), White Flower moth (*Schinia bimatris*) and Golden-Edged Gem (*Schinia avemensis*). The Monarch butterfly (*Danaus plexippus*) is more widespread, with a distribution that corresponds with both the Prairie and Boreal Plain Ecozones, present wherever its host plant milkweed is found.

Table 6.2-15: List of Terrestrial Invertebrate Species at Risk Found in Manitoba

Scientific Name	Common Name	Range within Project Study Area	Status Listings[1]		
			COSEWIC	SARA	MESA
CLASS INSECTA					
Order Lepidoptera (Moths and Butterflies)					
Copablepharon grandis	Pale Yellow Dune Moth	YES	Special concern	Special concern	not listed
Copablepharon longipenne	Dusky Dune Moth	YES	Endangered	Endangered	not listed
Danaus plexippus	Monarch	YES	Special concern	Special concern	not listed
Hesperia dacotae	Dakota Skipper	YES	Threatened	Threatened	Threatened
Hesperia ottoe	Ottoe Skipper	YES	Endangered	Endangered	Threatened
Hesperia uncas	Uncas Skipper	YES	not listed	not listed	Endangered
Neominois ridingsii	Riding's Satyr	N/A			Extirpated
Oarisma powesheik	Poweshiek Skipperling	NO	Threatened	Threatened	Threatened
Schinia avemensis	Gold-edged Gem	YES	Endangered	Endangered	not listed
Schinia bimatris	White Flower Moth	YES	Endangered	Endangered	not listed
Schinia verna	Verna's Flower Moth	YES	Threatened	Threatened	not listed

[1.] Although distribution range does not fall within the Project Study Area, preferred habitat is present on the routes and the species proximity to the routes suggests these species need to be taken into consideration.

Several issues may contribute to declines of terrestrial invertebrate species. For species at risk, habitat loss is one of the biggest concerns, with activities such as grazing, urbanization and agricultural development resulting in a loss of natural habitat. Terrestrial invertebrates are typically very sensitive to microclimatic changes (Klein 1989; Holmquist 1998). As a result, habitat fragmentation can have large effects on invertebrate communities by creating edge effects, inhibiting movements and altering dispersal patterns (Haynes and Cronin 2006). Flightless species and other poor dispersers, such as carabid beetles, are especially vulnerable to fragmentation effects (De Vries and den Boer 1990; Niemelä *et al.* 1998). Additionally, the collecting of specimens such as butterflies (Lepidoptera) and tiger beetles (Carabidae: Cicindelinae) is a world-wide concern (Slone *et al.* 1997).

6.2.9.5 Valued Environmental Components

In total, three species were selected as VECs. These species have current or historical distribution ranges within the Project Study Area and in close proximity to the Local Study Area, in particular, the ROWs. Although known populations do not overlap the Local Study Area, suitable habitat exists for these species within the Local Study Area. Selected VEC species include the following:

- Dakota skipper;
- Ottoe skipper; and
- Uncas skipper.

Dakota Skipper

The Dakota skipper is currently listed as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and under SARA and MESA (Table 6.2-15). Historically, the Dakota skipper has been found in seven isolated populations or population centers in Manitoba. In 2002 the Dakota skipper was present at only two of these centers, including the Inwood and Lundar area in the inter-lake region between Lake Winnipeg and Lake Manitoba, and southwestern Manitoba near Griswold (COSEWIC 2003; Appendix 6A - Figure 6A-9). Historical records exist for Miniota, Brandon, Stuartburn, Tolstoi, and the Winnipeg area. Extant populations do not fall within the Bipole III Local Study Area. There has been a historical sighting recorded for the Winnipeg area, which is in the proximity of the study boundaries. However, this record is from the 1930s with an unknown exact location, and no recent records are available from the Winnipeg area (COSEWIC 2003).

An obligate resident of native prairies, all extant populations of the Dakota skipper within Manitoba are associated specifically with wet-to-mesic tall-grass prairies. Currently, less than 1% (i.e., 3 km^2) of Manitoba's tall-grass prairie remains (Samson and Knopf 1994; Hamilton 2005), and it is unlikely that any of it exists within the Local Study Area. Plant species associated with the presence of the Dakota skipper include the wood lily (*Lilium philadelphium*), smooth camas (*Zigadenus elegans*), harebell (*Campanulata rotundifolia*), and black-eyed susan (*Rudbeckia hirta*) (Klassen *et al.* 1989, COSEWIC 2003). Flight times for the Dakota skipper are late June to mid-July. The Dakota skipper is very sensitive to the conversion of remnants of prairie to cropland, spring and summer haying, heavy grazing, controlled burns, and drainage of natural sites (COSEWIC 2003).

Ottoe Skipper

The Ottoe Skipper is found in upland, dry, mixed-grass (bluegrass) prairies and sand prairies (COSEWIC 2005)(Appendix 6A – Figure 6A-9. Flight time for this species is typically late June through early August. Manitoba is the only province in Canada where

the species has been found. Currently, it is listed as Endangered by COSEWIC and under SARA, and as Threatened under MESA (Table 6.2-15). Historical populations include Spruce Woods Provincial Park, Aweme (10 km north of Wawanesa), and Rounthwaithe (COSEWIC 2005). No historical populations are known within the Local Study Area. The last documented occurrence of the Ottoe skipper was in the late 1980s and it is possible that the species may be extirpated in Canada (COSEWIC 2005).

Although the species has not been documented in recent years, intact sand prairie habitats in Spruce Woods Provincial Park could potentially support a population of Ottoe skipper (COSEWIC 2005). Outside of the park, there is little suitable habitat due to overgrazing and invasion of exotic plants (COSEWIC 2005). Light rotational grazing can be beneficial for the Ottoe skipper, creating or maintaining preferred prairie-plant structure (Dana 1991). Agricultural habitats are unsuitable for the survival of the Ottoe skipper; many mixed-grass and sandy-soil prairie remnants likely have survived because poor soils (sandy) or steep terrain make them unsuitable for row-crop agriculture (COSEWIC 2005). Where suitable remnant sandy-soil prairie habitat does occur, alteration of plant communities may result in the loss of suitable resources for the Ottoe skipper.

Uncas Skipper

The Uncas skipper is a potentially extirpated species with a historical population within the Prairie Ecozone near the Project Study Area, around Westbourne, Manitoba. Additionally, as with the Uncas skipper, suitable sandy soil prairie habitat was found within the Local Study Area.

The Uncas skipper is a Great Plains species, with a distribution range extending into the southern part of the three prairie provinces. It is listed as Endangered under MESA (Table 6.2-15). It is not listed by COSEWIC or under SARA. Habitat includes dry sandy prairie hillsides and pastures with a flight season of late June through early July (Klassen *et al.* 1989). The Uncas skipper appears to be declining as a result of habitat loss, and is rare or uncommon in the northern part of its range. There are no recent records from Manitoba and it may no longer occur here (ITIS 2009). Historically, Manitoba records have included Beulah, Brandon, Carberry, Glenboro and the vicinity of Westbourne, Manitoba (Klassen *et al.* 1989, Appendix 6A - Figure 6A-8). A historical record is also available for the vicinity of Winnipeg (Canadian Biodiversity Information Facility 2009).

6.2.9.6 Existing Environment at Project Components

HVdc Transmission Lines

All three VEC terrestrial invertebrate species have distributions or suitable habitat overlapping the Local Study Area of the HVdc transmission line and associated 66 m right-of-way (Appendix 6A – Table 6A-9).

Suitable Dakota skipper habitat was identified within the Project Study Area, but field surveys found the habitat at selected study sites to be sub-optimal. In total, within the Prairie Ecozone, with which the Dakota skipper distribution range overlaps, suitable habitat was identified at nine of the 10 ecodistricts overlapping the Local Study Area and five of the ecodistricts overlapping the right-of-way. This means that within these sites, there is a possibility that native prairie habitat suitable for Dakota skipper may be present, although unlikely, as true suitable tall grass habitat is rare in Manitoba and its identification, as based on models, is difficult. Sweep-net surveys conducted at selected suitable habitat sites along the right-of-way in the St. Claude/Assiniboine River area did not find any Dakota skippers. Furthermore, only two of six survey sites contained any of the plant species associated with the presence of the Dakota skipper. For a more detailed description of survey results and observations, please refer to the *Bipole III Terrestrial Invertebrates, Amphibians and Reptiles Technical Report*.

As with the northern prairie skink, the Ottoe and Uncas skippers have isolated distribution ranges within the Prairie Ecozone of the Project Study Area where sandy-soil prairies exist. Although no known population centres of either species overlap the Local Study Area and right-of-way, suitable habitat does exist within the St. Claude/Assiniboine River area of the transmission line (Appendix 6A – Table 6A-9). The sandy-soil prairie complexes which fall within the Prairie Ecozone of the Local Study Area are concentrated within the area between St. Claude and the Assiniboine River and are in close proximity to historical populations of both of these species; suitable sandy-soil prairie habitat overlaps the Local Study Area near the Stockton Ecodistrict and both the Alonsa and MacGregor Ecodistricts, as well as the 66 m right-of-way of the Alonsa and MacGregor Ecodistricts. In total, the Local Study Area contains 3.7 km^2 of suitable Ottoe and Uncas skipper habitat is present within the Prairie Ecozone, of which 0.09 km^2 (i.e. 2.1%) is contained within the 66 m right-of-way (Appendix 6A – Table 6A-9). Sweep-net surveys conducted at selected suitable habitat sites within the Project Study Area did not find any Ottoe or Uncas skippers.

Keewatinoow Converter Station & Associated Facilities

No terrestrial invertebrate VEC habitat was identified within the Project footprints for the Keewatinoow Converter Station and associated facilities.

Riel Converter Station & Associated Facilities

No terrestrial invertebrate VEC habitat was identified within the Riel Converter Station or the ground electrode site project footprint.

6.3 SOCIO-ECONOMIC ENVIRONMENT

6.3.1 Land Use

6.3.1.1 Overview

The following section documents an overview of land use in the Project Study Area. A detailed description can be found in the Bipole III Land Use, Bipole III Agriculture, Bipole III Lands of Special Interest and TLE Lands, and the Bipole II Forestry Technical Reports. This section provides information on the following topics:

- Land tenure and residential development;
- Private forest lands;
- Aboriginal lands;
- Designated protected areas and Protected Areas Initiative;
- Infrastructure; and
- Agriculture.

6.3.1.2 Land Tenure and Residential Development

Property and Lands

With the exception of the river lot survey system, the Province has generally been surveyed according to a section-township-range system. Beyond the limits of agricultural settlement and those surveys conducted to locate specific land interests (e.g., railway rights-of-way), large portions of northern Manitoba have not been formally surveyed. However, land descriptions are still based on the section-township-range system.

The Project Study Area includes unorganized Crown-owned and/or public lands in parts of the north and south, and rural agricultural privately-owned lands with farmsteads in the south. Throughout the Project Study Area, there are cities, towns and villages although there are more in the south. Approximately half the Project Study Area is characterized as having property holdings that are privately-owned.

Crown lands are defined as provincial lands designated under Order-in-Council that are administered under *The Crown Lands Act* and include lands such as provincial parks, provincial forests, wildlife management areas, community pastures and ecological reserves). The distribution of Crown land within the Project Study Area encompasses unorganized lands north and east of the Porcupine Mountains to the Gillam area, and varies from municipality to municipality across southern agro-Manitoba.

Throughout rural Manitoba, Crown lands are classified in each municipality by the Province through the Crown Lands Assistant Deputy Ministers Committee, utilizing a comprehensive coding system. The system assigns a permitted land use and identifies whether the Crown land is encumbered by legal instruments (i.e., leases, permits, or agreements with private interests). Crown leased land is found throughout the Project Study Area. The amount of Crown leased land decreases in the southern portion of the Project Study Area through agricultural Manitoba. Central portions of the Project Study Area have the largest concentrations of Crown leased lands. The Rural Municipalities (RMs) of Mountain and Ethelbert are two examples where there are numerous parcels of land primarily leased from the Crown.

At the municipal level, there are publically-owned lands within the Project Study Area that can be used for a variety of purposes, including agriculture, historical municipal sites, landfills, cemeteries, municipal infrastructure, wildlife areas or future development (infrastructure or otherwise). Certain lands can also be dedicated to towns and villages within municipalities for specific development purposes.

Aside from provincial Crown land, large-scale federal Crown land ownership in the Project Study Area principally includes First Nation Reserves) Riding Mountain National Park, and Canadian Forces Base Shilo (or CFB Shilo) located east of Brandon. Other federal military lands include the St. James Rifle Range, located west of the City of Winnipeg (RM of Headingley) and an abandoned site of a former munitions plant located in the RM of Springfield. Smaller parcels of dedicated Federal Crown land are found in some RMs in the Project Study Area including some lands within community pastures and other individual parcels.

Municipal Jurisdictional Authority

Local government jurisdiction is divided primarily between RMs and urban centres (incorporated cities, towns and villages). Sparsely settled or northern areas may be organized as Local Government Districts (LGDs), while many smaller settlements and communities have no independent municipal status.

There are 60 RMs and one LGD in the Project Study Area (Table 6.3-1). With the exception of the RM of Kelsey, RMs in the Project Study Area are located south of the 53rd parallel. The LGD is located in the northern part of the Project Study Area and includes the City of Thompson. Additional municipal jurisdictions in the northern part of the Project Study Area include the Cityof Flin Flon, and the towns of Gillam, Snow Lake and The Pas. South of The Pas, major centres include the cities of Dauphin, Portage la Prairie and Winnipeg. There are also a number of towns and villages in the southern part of the Project Study Area including the towns of Gladstone, Neepawa, MacGregor, Roblin, Swan River, Minnedosa, Carmen, Hamiota, Erikson, Treherne, and Niverville. There are a total of 41 incorporated cities, towns and villages in the Project Study Area, most being located in the southern part.

Each municipal jurisdiction is governed by a Reeve or Mayor and an elected council, and is responsible for a broad range of infrastructure, services and land use planning within their jurisdiction. The municipalities derive their authority from the Provincial government which retains direct control over certain higher order regional services (e.g., Provincial Trunk Highways [PTHs] and Provincial Roads [PRs]). Map 6-23 shows RMs, the LGD and northern towns and cities in relation to the Project Study Area.

Table 6.3-1: RMs and LGD in the Project Study Area

RM of Alonsa	RM of Lakeview	RM of Russell
RM of Birtle	RM of Langford	RM of Saskatchewan
RM of Blanshard	RM of Lansdowne	RM of Shell River
RM of Cartier	RM of Lawrence	RM of Shellmouth-Boulton
RM of Clanwilliam	RM of MacDonald	RM of Shoal Lake
RM of Cornwallis	RM of McCreary	RM of Silver Creek
RM of Daly	RM of Miniota	RM of South Cypress
RM of Dauphin	RM of Minitonas	RM of South Norfolk
RM of Dufferin	RM of Minto	RM of Springfield
RM of Ellice	RM of Mossey River	RM of St. Francois Xavier
RM of Elton	RM of Mountain	RM of Ste. Anne
RM of Ethelbert	LGD of Mystery Lake	RM of Ste. Rose
RM of Gilbert Plains	RM of North Cypress	RM of Strathclair
RM of Glenella	RM of North Norfolk	RM of Swan River
RM of Grandview	RM of Ochre River	RM of Tache
RM of Grey	Rm of Odanah	RM of Victoria
RM of Hamiota	RM of Park	RM of Westbourne
RM of Hanover	RM of Portage la Prairie	
RM of Harrison	RM of Ritchot	
RM of Headingley	RM of Rosedale	
RM of Hillsburg	RM of Rossburn	
RM of Kelsey	RM of Rosser	

There are 23 Northern Affairs Communities (NACs) in or adjacent to the Project Study Area. All are recognized communities under *The Northern Affairs Act* and are either governed by a Mayor and Council or have a contact person that is responsible for operation (Chapter 5, Map 5-1). The NACs in the Project Study Area are as follows: Baden, Barrows, Camperville, Cormorant, Crane River, Dawson Bay, Duck Bay, Easterville, Herb Lake Landing, Ilford, Meadow Portage, Moose Lake, National Mills, Nelson House, Pelican Rapids, Pikwitonei, Powell, Red Deer Lake, Sherridon, Spence Lake, Thicket Portage, and Wabowden, Westgate.

Municipal Development Controls

Land use planning responsibilities in municipal jurisdictions in the Project Study Area fall under the jurisdiction of the respective municipalities or planning districts. Municipal jurisdictions may adopt development plans and zoning by-laws to guide land use decisions within their boundaries. Municipalities can become members of planning

districts to work together with respect to land use planning (i.e., development plans). There are 24 planning districts in the Project Study Area (Map 6-24). With the exception of the Thompson Planning District, the remaining planning districts in the Project Study Area are located south of Red Deer Lake. The remaining planning districts are as follows: Roblin, Lakeshore, Agassiz, Rossburn, Swan Valley, Mountainview, Ste. Rose, Tri-Roads, Carlton Trail, Shoal Lake, Mid-West, Neepawa & Area, Brandon & Area, Nor-Mac, Portage la Prairie, White Horse Plains, South Riding Mountain, Tanner's Crossing, Big Grass, Cypress, South Central, Grey-St. Claude, and Macdonald-Ritchot.

Municipalities that do not fall under a planning district or are without a development plan are subject to Provincial Land Use Policies (Regulation 184/94). These policies are currently being reviewed and updated. Within the Project Study Area, development in the RM of Alonsa is subject to the Provincial Land Use Policies.

Much of the land in the northern part of the Project Study Area is unorganized Crown land and therefore not subject to municipal zoning or development control regulations. Some of the NACs have land use plans in place to govern use and development of lands within their jurisdiction including Cormorant, Sherridon and Wabowden.

A summary of land use regulations and their status in the municipalities in the Project Study Area is found in Appendix 6B, Table 6B-1. From a development control perspective, the majority of lands designated within the municipal jurisdictions in the southern part of the Project Study Area, outside of urban centres or general development areas are either Agricultural or Rural policy areas. In all cases, development plans provide that utilities should be permitted in any land use designation subject to requirements in a municipal zoning by-law and should be developed in a manner to minimize any incompatibility with neighbouring land uses. As a Crown Corporation, Manitoba Hydro is not formally subject to municipal land use and development controls, but generally adheres to them in developing new facilities.

With respect to the Town of Gillam, the Harmonized Gillam Development (HGD) committee is a working group made up of representatives from Fox Lake Cree Nation, the Town of Gillam, Manitoba Hydro and the Province of Manitoba. The HGD committed provides a forum for Gillam stakeholders to meet and discuss issues of mutual interest or concern. The process has been ongoing since 2007 and has been successful in terms of fostering improved relationships and more open communications among Gillam area stakeholders. One of the objectives of the HGD is to implement a collaborative and cooperative approach to planning and development in Gillam. In early 2008, the HGD committee initiated the Gillam Land Use Planning process to consider existing and future development needs for the Town of Gillam. The first stage of the Land Use Planning process concluded that there is sufficient land in Gillam to satisfy the estimated needs of all parties over the next 20 years. The Land Use Planning process is ongoing, and is currently working towards the development of a Gillam subdivision

layout to meet the needs of Fox Lake Cree Nation, Manitoba Hydro and other area stakeholders.

Residential Development

Although southern portions of the Project Study Area have the majority of the population, there are a number of communities and settlements in the northern portion. Portions of the Project Study Area north of the Porcupine Mountains to The Town of The Pas, and from The Pas eastward to Manitoba Hydro's generating stations on the Nelson River have fewer communities and settlements. Larger urban centers located in the Project Study Area include The City of Thompson, The Town of The Pas, The City of Dauphin, The Town of Neepawa, The City of Portage la Prairie, and The City of Winnipeg.

The southern portion of the Project Study Area from Winnipeg south and west to the Red River is characterized by a dense settlement pattern, fragmented property ownership, complex transportation networks, and a diverse land use character. Aside from urban centres, rural (non-farm) residential development and farmsteads are evident throughout the region. West of the Red River to Portage la Prairie, rural farmsteads predominant across the south-central region of the Project Study Area. North of Portage la Prairie through the Parkland Region north to Swan River and Mafeking, the settlement pattern is similar but not as dense. Marginal agricultural lands located along the west side of Lakes Manitoba and Winnipegosis are characterized by a relatively sparse settlement pattern, as is the area north of Mafeking to The Pas, and the portion of the Project Study Area further north to Gillam. NACs are more prevalent in the Project Study Area north of Mafeking to the Town of Gillam.

Hutterite colonies are found throughout the southern Project Study Area, primarily in the vicinity of urban centers such as the cities of Winnipeg and Portage la Prairie, and the Town of Neepawa. Within the Project Study Area, there are 17 Hutterite colonies. Land use on Hutterite Colonies can vary but agriculture is the primary resource activity, primarily grain or livestock production. Infrastructure commonly found on lands owned by these colonies includes grain elevators, livestock barns (hog/cattle), and residences.

6.3.1.3 Private Forestlands

While the majority of the land in the northern and western portion of the Project Study Area is Crown-owned, private lands are dominant in the southern agricultural area of the province. Many privately owned lands are forested, some of which may be registered as woodlots with Manitoba Agriculture, Food and Rural Initiatives or the Manitoba Forestry Association (MFA). Private forestlands have been inventoried by Manitoba in the past, but are not included in new inventory work due to cost and uncertainty regarding their management. Forest companies, both internal to Manitoba and external (Ontario, Minnesota, Wisconsin) have purchased timber from private landowners in the

past. The demand for these resources fluctuates considerably due to economic realities. Registered woodlots within the Project Study Area are shown on Map Series 6-2500.

6.3.1.4 Aboriginal Lands

Reserve Lands

First Nation Reserve lands are Federal Crown lands that have been set aside for the sole use of a particular First Nation. There are 26 First Nations with Reserve Lands in the Project Study Area or which undertake traditional activities in the Project Study Area (Table 6.3-2; Map Series 6-2600). Indian and Northern Affairs Canada (INAC) is responsible for Federal government involvement in land claims, self-government agreements, social services, education, and economic development.

Table 6.3-2: First Nations with Reserve Lands in or Undertake Traditional Use in the Bipole III Project Study Area

Birdtail Sioux First Nation	Opaskwayak Cree Nation
Chemawawin First Nation	Pine Creek First Nation
Dakota Plains First Nation	Rolling River First Nation
Dakota Tipi First Nation	Sandy Bay Ojibway First Nation
Ebb & Flow First Nation	Sapotaweyak Cree Nation
Fox Lake Cree Nation	Sioux Valley Dakota Nation
Gamblers First Nation	Swan Lake First Nation
Keeseekoowenin Ojibway First Nation	Tataskweyak Cree Nation
Long Plain First Nation	Tootinaowaziibeeng Treaty Reserve
Mathias Colomb First Nation	Waywayseecappo First Nation
Mosakahiken Cree Nation	War Lake First Nation
Nisichawayasihk Cree Nation	Wuskwi Sipihk First Nation
O-Chi-Chak-Ko-Sipi First Nation	York Factory First Nation

Treaty Land Entitlement

Treaty Land Entitlements (TLEs) refer to land owed to certain First Nations under the terms of the Treaties signed by the First Nations and Canada between 1871 and 1910. The amount of land provided is based on the First Nations population size. However, not all First Nations received their full allocation of land. Table 6.3-3 lists the Treaties signed by each First Nation in the Project Study Area, together with outstanding TLEs. Map Series 6-2600 identifies TLEs in the Project Study Area. Appendix 6B, Table 6B-2) lists all TLEs in the Project Study Area.

Table 6.3-3: Outstanding Treaty Land Entitlements (TLEs) In the Bipole III Project Study Area

First Nation	Treaty Number	Total TLE Acres Outstanding (as of May 2006)
Fox Lake Cree Nation	Treaty No. 5	24,525
Nisichawayasihk Cree Nation (NCN)	Treaty No. 5	9,928
York Factory First Nation	Treaty No. 5	18,367
Opaskwayak Cree Nation	Treaty No. 5	8,402
Mathias Colomb Cree Nation	Treaty No. 6	17,729
Rolling River First Nation	Treaty No. 4	40,334
Sapotaweyak Cree Nation	Treaty No. 4	30,472
Wuskwi Sipihk Cree Nation	Treaty No. 4	12,627

(Source: Treaty Land Entitlement Committee Manitoba, 2006).

In Manitoba, the process of approving TLEs has been determined by a Framework Agreement (1997) signed by 19 First Nations along with the Governments of Canada and Manitoba. Under the Framework Agreement, Manitoba is to transfer up to 1,100,626 acres of land to Canada to be held in reserve. Each entitled First Nation may select up to its agreed share of 985,949 acres of Crown land, while up to 114,677 acres may be purchased by certain entitled First Nations where insufficient Crown land is available for selection. With respect to land selection and acquisition, the Framework Agreement stipulates that any acquisition is to be undertaken on a "willing buyer and willing seller" basis and that neither Canada nor Manitoba can expropriate any land or interest in land.

An entitled First Nation may select Crown land or acquire other land from its treaty area within the Province. An entitled First Nation can select Crown land or acquire other land outside of its treaty area if it can establish a reasonable social or economic development objective. In general, parcels of land selected are to be 1,000 acres in size or more. Exceptions to this include: where suitable Crown land is not available in the location preferred by the entitled First Nation, where the land is located in reasonable proximity to a Reserve of the entitled First Nation, or where the purpose of the selection (whether for historical, cultural, economic or social reasons) requires a smaller parcel. The land selected or acquired cannot deprive access to another parcel of land where there is a different owner or lawful user.

Past Hydro Development Agreements

In 1977, as a result of the effect of hydro-electric development on the Nelson and Churchill Rivers, and the Lake Winnipeg Regulation Project, the Government of Canada, the Province of Manitoba, Manitoba Hydro and the Northern Flood Committee Inc. (NFC), representing five directly affected First Nations (Cross Lake First Nation, Nelson House - now Nisichawayasihk Cree Nation (NCN), Split Lake - now

Tataskweyak Cree Nation (TCN), York Factory First Nation and Norway House Cree Nation) signed the Northern Flood Agreement (NFA).

To address outstanding issues with respect to implementing the NFA, in 1986, the Northern Flood Committee proposed that a Comprehensive Implementation Agreements be developed. Through the 1990s, TCN, York Factory Cree Nation, NCN, and Norway House Cree Nation signed CIAs with Canada, Manitoba and Manitoba Hydro. In 1997, Cross Lake First Nation decided not to continue with negotiations toward a CIA and requested that Canada, Manitoba and Manitoba Hydro continue to implement the NFA directly. Cross Lake First Nation and Norway House Cree Nation are outside of the Project Study Area.

In addition to the implementation agreements, in 2004, the Province of Manitoba and Manitoba Hydro signed an Impact Settlement Agreement (ISA) with the Fox Lake Cree Nation (FLCN) to address effects of past hydro-electric development in the lower Nelson River area on their community. The agreement also outlines a process to address the adverse effects of certain types of furture developments in the Fox Lake Traditional Territory and Resource Management Area as defined as areas that are used intensively by Fox Lake members in the ISA.

In 1992, TCN, Manitoba Hydro, Manitoba and Canada signed the 1992 Implementation Agreement to guide the implementation of the Northern Flood Agreement with TCN. This agreement included a range of provisions, including compensation for adverse effects, and led to the creation of the Split Lake Resource Management Area.

Resource Areas and Resource Management Areas

Resource Area is a term that is found in Article 15 of the Northern Flood Agreement (NFA) related to Wildlife Resources Policy. In the NFA, Resource Area meant the Trapline Zones of the NFA First Nations and the rivers and lakes which were traditionally available to those residents, and used by them as a source of food supply, income in kind, and income.

Trapline Zone in the NFA means the Registered Trapline Zone set aside by Manitoba generally for the use of the community as at the date of the NFA as shown on maps attached to the NFA. As a consequence, the land within a Resource Area is defined by the map, but the extent of the rivers and streams "traditionally available" is less certain. There is nothing that restricts those rivers and streams to the boundaries of the Registered Trapline Zones or otherwise defines the limits of what was available.

Within the NFA, the term Resource Area defines where Manitoba is granted a first priority to wildlife resources to residents of the NFA First Nation. The term Resource Area is generally used in the Comprehensive Agreements except in provisions related to resource management. Since the Resource Areas are based on Registered Trapline Zones allocated to communities, there is a link between the traditional areas used by a First

Nation and their Resource Areas. This link has increased in importance with the consultation obligations related to Section 35 of the Constitution of Canada.

Resource Management Areas (RMAs) arose out the 1992 Split Lake Comprehensive Implementation Agreement. RMAs are defined by maps based on the Registered Trapline Zones and are more definitive than Resource Areas. RMAs are established for purposes of facilitating local review of application for Provincial permits and to develop long-term planning land and resource use development plans.

The review of permit applications and the development of long term plans falls on the Resource Management Board (RMB) appointed in relation to the RMA. Half the members of an RMB are appointed by the Province and half by the NFA First Nation or Aboriginal community that is party to the Agreement. An RMB primarily functions as a recommending body while format jurisdiction remains with the Province, on Crown Lands, and with Chief and Council on Reserve Lands. Manitoba has entered into resource management agreements creating RMAs and RMBs with non NFA First Nations and other Aboriginal communities.

Map Series 6-2600 shows the RMAs in the Project Study Area. This includes the Fox Lake RMA, Split Lake RMA, Nelson House RMA, Cormorant RMA, Moose Lake RMA, and Cedar Lake RMA. Fox Lake's community is located at Bird in the Split Lake RMA. Approximately 345,000 acres of the Fox Lake RMA is located in the Project Study Area. Approximately 4.5 million acres of the Split Lake RMA is located in the Project Study Area. The Nelson House RMA covers an area totaling approximately 3.8 million acres within the Project Study Area. Approximately 465,640 hectares of the Cormorant RMA is located within the Project Study Area. Approximately 42,660 hectares of the Moose Lake RMA is located within the Project Study Area, while approximately 9,360 hectares of the Ceder Lake RMA is located within the study area.

In addition, a settlement agreement with OCN recognized a Resource Area traditionally used by members of the First Nation including the following: The Pas Registered Trapline district (RTL), the commercial and domestic fisheries in The Pas RTL, and the portion of the area known as the Summerberry Marsh.

6.3.1.5 Designated Protected Areas and Protected Areas Initiative

The status of various lands throughout the Project Study Area is subject to special designations intended to ensure sound conservation practice and/or to minimize potential conflict with resource use.

Federal Designated Lands

Riding Mountain National Park (RMNP), located south of Dauphin, covers 297,300 hectares of rolling hills and valleys in the Manitoba Escarpment (Map Series 6-2800). Established in 1933, RMNP lies within the southern Boreal Plains, the Plateaux Natural

Region and a portion of the Manitoba Lowlands Natural Region, including the Manitoba Escarpment. This park includes expanses of boreal (northern) forest, a strip of eastern deciduous forest along the foot of the escarpment, meadows of rough fescue grasslands in its west end, and significant tracts of marsh and river-bottom wetland. This park is home to wolves, moose, elk, black bear, hundreds of bird species, countless insects and a captive bison herd. Common recreational activities in the park include: hiking, backpacking, cycling, horseback riding, horse-drawn wagon rides, cross-country skiing, snowmobiling, fishing, boating, canoeing, sailing, swimming, scuba diving, camping, tenting, car touring, picnicking, golfing and tennis.

The Riding Mountain Biosphere Reserve (RMBR), established by UNESCO (the United Nations Educational, Scientific and Cultural Organization) in 1986, includes RMNP and 15 surrounding RMs. The RMBR is intended is intended to foster and encourage a sustainable, community-based regional economy with high biodiversity, landscape and social values associated with the park (Parks Canada, 2007). It encompasses approximately 1,381,000 hectares (13,810 square km), incorporating RMNP (3,000 km^2 as the protected core) and is one of 12 biosphere reserves that presently exist across Canada as part of the Canadian Biosphere Reserves Association.

RMBR is a non-profit organization that seeks to balance the conservation of natural and cultural heritage with sustainable resource development in the area surrounding RMNP. The RMBR has no formal legal jurisdiction. It relies on voluntary support which comes from businesses, communities and educational and government partners. It is managed by a committee of area residents composed of municipal council appointees and supported by Parks Canada and Provincial government program staff. Activities undertaken by the RMBR are mostly related to research, education and community-based planning (Riding Mountain Biosphere Reserve, 2011).

Other Federally designated lands in the Project Study Area include CFB Shilo Operations and Training Base, located 35 km east of the City of Brandon, and CFB and National Defence Department sites at the James Armstrong Richardson International Airport in the City of Winnipeg (i.e., 17 Wing) and within the RM of Headingley (i.e., St. Charles Rifle Range).

Provincial Designated Lands

Manitoba's Protected Areas Initiative (PAI) is a government program, administered by Manitoba Conservation, which began in 1990 and is dedicated to establishing a network of protected areas to capture the biological diversity of Manitoba's varied landscapes. Manitoba's protected areas network is made up of a collection of Crown lands (or portions thereof) with different land designations including ecological reserves, provincial parks, wildlife management areas, and provincial forests (excluding forest

reserves). Protected areas[3] are lands, freshwater or marine areas, where logging, mining, hydroelectric development and oil and gas development, are prohibited through legislation. Other activities that can adversely affect habitat (i.e., intensive agriculture, urban or major recreational developments) are prohibited in protected areas and are avoided during the selection process for establishing new protected areas under the PAI.

However, activities such as hunting, trapping and fishing, as well as activities associated with First Nation rights and agreements are permitted in protected areas (Manitoba Conservation 2011).

Ecological Reserves

Ecological reserves are created to preserve unique and rare examples of plants, animals, and geological features. Since 1987, all ecological reserves, ecologically significant areas and other natural and cultural heritage sites have been brought under the umbrella of the Provincial Government's Special Places Strategy and PAI. Ecological reserves are established under *The Ecological Reserves Act* and are permanently protected. Areas that contain rare or sensitive habitats can be set aside as ecological reserves with accompanying restrictions on uses and activities to ensure their enjoyment by future generations. Designated reserves are owned by the Province of Manitoba and managed by Manitoba Conservation. There are seven ecological reserves in the Project Study Area as follows: Lake Winnipegosis Salt Flats, Palsa Hazel, Red Rock, Armit Meadows, Birch River, Cowan Bog, and Jennifer and Tom Shay. These are illustrated on Map Series 6-2800 and, in total, consist of 3,642 hectares of protected land.

Provincial Forests

Provincial forests are Crown lands owned by the Province of Manitoba and managed by Manitoba Conservation. They are managed on a sustain yield basis by calculating the Annual Allowable cut for an area and serve a number of uses including as timber reserves, places for wildlife, recreation and research. There are five provincial forests in the Project Study Area as follows: Cormorant, Swan-Pelican, Porcupine, Duck Mountain and Spruce Woods (Map Series 6-2800). In total, the provincial forests in the Project Study Area encompass approximately 11,915 km^2.

Provincial Parks

There are 30 provincial parks found within in the Project Study Area (Map Series 6-2800). Manitoba's provincial parks are governed by *The Provincial Parks Act*. Provincial

3 The goal of Manitoba's Protected Areas Initiative is to create a network of protected lands that represents the biodiversity in each of Manitoba's 18 natural regions. This is achieved by establishing areas that contain rare or sensitive habitat as ecological reserves that have greater restrictions on uses and activities so that the natural region features for which they are set aside endure for future generations (Manitoba Conservation 2011).

Parks fall into several categories: heritage parks, natural parks, recreational parks, and wilderness parks. Designated provincial parks within the Project Study Area include: eight natural parks, eighteen recreational parks, and four heritage parks (Table 6.3-4).

Table 6.3-4: Provincial Parks in the Project Study Area

Natural Parks	Recreational Parks	Heritage Parks
Paint Lake	Pisew Falls	Criddle/Vane Homestead
Grass River	Sasagiu Rapids	Memorial
Clearwater Lake	Bakers Narrows	Trappist Monastery
Kettle Stones	Neso Lake	St. Norbert
Duck Mountain	Twin Lakes	
Asessippi	Rocky Lake	
Spruce Woods	Wekusko Falls	
Beaudry	Primrose	
	Overflowing River	
	Red Deer Lake	
	North Steeprock Lake	
	Bell Lake	
	Whitefish Lake	
	Swan River	
	Springwater	
	Rainbow Beach	
	Portage Spillway	
	Seton Wayside	

The various classifications of provincial parks, and the subsequent land use categories within each specific provincial park, include differing conservation priorities. A park is classified as a wilderness park if the main purpose is to preserve representative areas of a natural region. The main purpose of a natural park is both to preserve areas of a natural region and to accommodate a diversity of recreational opportunities and resource uses. A recreation park's main purpose is to provide recreational opportunities. The main purpose of a heritage park is to preserve an area of land containing a resource or resources of cultural and heritage value.

Wildlife Management Areas

Wildlife Management Areas (WMAs) are Crown lands designated by the Province of Manitoba for the protection of wildlife habitat and for wildlife-related forms of outdoor recreation such as hunting. WMAs are managed by Manitoba Conservation. There are 22 WMAs within the Project Study Area, encompassing 458,000 hectares of land (Table 6.3-5 and Map Series 6-2800). All or parts of eleven of the WMAs contribute in whole or in part to Manitoba's protected areas network (i.e., are permanently protected under *The Wildlife Act*) prohibiting resource extraction activities. All or parts of two WMAs are

permanently protected except for petroleum activities (i.e., Upper Assiniboine and Parklands). All or parts of seven WMAs are candidates for protection under the PAI, while four WMAs are not protected.

Table 6.3-5: Wildlife Management Areas (WMA) in the Project Study Area

Name	Legally Designated Status
Alonsa	Permanent Protection for part; not protected for part
Assiniboine Corridor	Not protected
C. Stuart Stevenson	Permanent Protection
Churchill	Candidate for Protection for part; not protected for part
Harrison	Candidate for Protection
Hilltop	Candidate for Protection
Langruth	Permanent Protection
Little Saskatchewan	Permanent Protection
Onanole	Permanent Protection for part; Candidate for Protection for part
Otter Lake	Permanent Protection
Parkland	Permanent Protection for part; Protected Excluding Petroleum for part
Point River	Not Protected
Portage Sandhills	Permanent Protection
Proven Lake	Permanent Protection
Saskeram	Candidate for Protection
Spruce Woods	Permanent Protection
Steeprock	Candidate for Protection
Tom Lamb	Candidate for Protection
Upper Assiniboine	Protected Excluding Petroleum
Weiden	Not Protected
Westlake	Not Protected
Whitemud Watershed	Permanent Protection

Areas of Special Interest and Other Protected Areas

Areas of Special Interest (ASI) are an important component of the PAI, and are identified on the basis of enduring features (i.e., combinations of soils and surficial geology) that are representative of the biodiversity within Manitoba's Natural Regions. Analysis of enduring features enables identification of ASIs as "candidate sites". Areas supporting rare or endangered plant and animal species, unusually high biodiversity, extremely sensitive sites and unique landscapes are also considered (Manitoba Conservation, 2008). There are 11 ASIs in the Project Study Area (Table 6.3-6 and Map Series 6-2800). None of the identified ASIs are currently formally protected or legally designated.

Table 6.3-6: Areas of Special Interest (ASIs) in the Project Study Area

Name	Hectares (ha)
Stephens Lake	375,114
Amisk South Addition	194,494
Burntwood River	284,464
Kipahigan Lake	70,215
Cormorant	51,223
McCreary Pasture	16,212
Alonsa Pasture	13,517
Tom Lamb Addition	36,078
Red Deer Lake	221,516
Earls Block	102
Pelican Lake	13,166

The Project Study Area contains two legally designated portions of Provincial Forests which are permanently protected under the PAI. These are the Bell and Steeprock Canyons Protected Provincial Forest Area, which is located north of Swan River, the Douglas Marsh Protected Forest Area located near Spruce Woods Provincial Park, to the east of Brandon.

Park Reserve designations are used to assist in the creation of protected areas. Lands can be designated as Park Reserves for up to five years to provide time for the Province to consult with those potentially affected by the creation of a protected area. The southeast corner of Amisk Provincial Park Reserve is located in the Project Study Area (Map Series 6-2800). This park reserve is located approximately 90 km north of Thompson. The total park reserve area is 1,980 km^2 or 198,000 ha (489,251 acres) and makes up roughly 9.5% of Manitoba's total lands in Park Reserves and roughly 5% of Manitoba's protected park lands. The Amisk Park Reserve was first established in December 1994.

Heritage Rivers

The Red River was nominated in 2005 as a Historic River, under the Canadian Heritage Rivers System (CHRS). CHRS is a cooperative program of the federal, provincial, and territorial governments, established in 1984 to give national recognition to the important rivers in Canada, to conserve them and to educate the public about them (Hilderman Thomas Frank Cram 2006).

A Management Approach for the Red River has been prepared by Rivers West - Red River Corridor Association Inc. The associated management area includes the 175 km stretch of the Red River from the United States-Canada border at Emerson, to Netley Marsh at Lake Winnipeg. The Management Area is essentially representative of the remnant river lot system, and extends as a 3.5 km corridor on either side of the river, including the river itself, the City of Winnipeg, the Red River Floodway and the natural landscapes of Netley Marsh, which is outside of the Project Study Area.

Non-Governmental and Crown Corporation Conservation Programs

There are four principal non-government conservation agencies and Crown Corporations working to identify and manage lands for habitat conservation in the study area: Ducks Unlimited Canada (DUC), Manitoba Habitat Heritage Corporation (MHHC), the Manitoba Wildlife Federation (MWF) and Nature Conservancy of Canada (NCC). These conservation program sites in the Project Study Area are illustrated in Map Series 6-2900.

DUC is a national, private, non-profit organization committed to conserving Canada's wetlands and has been working in Manitoba since 1938. Within the Project Study Area some of their projects include: wetland conservation project at Big Grass Marsh near Gladstone; Brandon Riverbank protection program as part of a 25-year Assiniboine River Corridor Master Plan; and Carberry waste water lagoon revitalization. Other DUC initiatives include priority efforts in boreal wetland conservation, particularly in the Saskatchewan River Delta which is North America's largest inland river delta and efforts in addressing wetland loss and conserving wetlands in prairie "pothole" country. DUC maintains numerous smaller parcels of land as project/program sites under conservation agreements which are scattered throughout the Project Study Area, with the majority concentrated in the parkland and Interlake regions of southern Manitoba.

MHHC is a non-profit Crown corporation established by proclamation under *The Habitat Heritage Act* (Manitoba Habitat Heritage Corporation, 2010). MHHC was established to conserve, restore and enhance fish and wildlife habitat and works in partnership with private landowners, farm organizations, corporations, conservation groups and government agencies. MHHC focuses on the agricultural regions of Manitoba, to promote conservation practices that not only benefit wildlife habitat, but also help to sustain farm family income and productive use of land. MHHC focuses on private land and uses voluntary incentives to encourage private landowners to maintain ecosystem health and biodiversity. MHHC works through two major program areas: North American Waterfowl Management Plan (NAWMP) and Managing the Waters Edge. Its program under the NAWMP focuses on the area west of Lake Manitoba between Neepawa, Russell, Minnedosa and Brandon. MHHC also maintains numerous parcels of land in the Project Study Area under conservation agreements, particularly in the parkland region southwest of Riding Mountain National Park.

MWF is a conservation organization comprised of hunters, anglers and outdoor enthusiasts. Their mandate is to encourage and foster the propagation of game and fish species, encourage the enforcement of the game laws and to educate the public on conservation and safety. The MWF also manages over 90 properties (11,400 acres of land) throughout southern agro-Manitoba as part of a land trust.

The NCC is a private, non-profit organization working for the direct protection of Canada's biodiversity through purchase, donation or the placement of conservation agreements on ecologically significant lands. Project activities are focused on the Riding

Mountain Aspen Parkland (RMAP) and the prairie pothole region south of RMNP, which houses one of Manitoba's most prolific bird habitats. The RMAP is located in one of only 12 Biosphere Reserves (a UNESCO designation for natural areas of concern) in Canada. In Manitoba, less than 10% of the original high quality Aspen Parkland remains in small, isolated pockets. NCC is working with landowners to protect a 25 km remnant of wilderness between RMNP and Duck Mountain Provincial Forest/Park, known as the Riding Mountain Wildlife Corridor (approx. 9,000 ac [3,642 ha]). Within this area are migration corridors for a wide variety of migratory and prairie birds, as well as far ranging mammals who reside in both regions. In addition to this initiative, NCC owns several smaller parcels of land scattered throughout the parkland region.

Conservation Districts

There are eighteen Conservation Districts covering 85% of rural Manitoba — fifteen of which are in the Project Study Area (Table 6.3-7 and Map Series 6-2900). Conservation Districts are created to provide technical and financial assistance to area residents in the planning and delivery of watershed programs. The conservation districts program facilitates investigation and evaluation of riparian management practices, provides leadership and capacity building skills to Conservation District board members and staff, and is intended to ensure a consistent unified voice to influence decision making in environmental stewardship sustainability, and to build and enhance relations with public and private partners in the promotion and understanding of strong watershed-based programs. Member municipalities of a Manitoba Conservation District are eligible for support of programs that focus on management and rehabilitation of riparian areas, establishment and maintenance of field shelterbelts, triple row wildlife belts and block plantings.

Table 6.3-7: Conservation Districts in the Project Study Area

Conservation District	Conservation District
Kelsey	Little Saskatchewan River
Intermountain	Turtle River Watershed
Lake of the Prairies	Upper Assiniboine River
Swan Lake Watershed	Whitemud Watershed
Alonsa	Cooks Creek
Assiniboine Hills	East Interlake
Seine – Rat River	LaSalle Redboine

Source: Manitoba Conservation Districts Association 2010.

Community Pastures

The Community Pastures Program (CPP) is an initiative of the Agri-Environment Services Branch (AESB) of Agri-Food and Agriculture Canada. The CPP is governed by a series of Federal-Provincial agreements, under which the Province acquires and places marginal land under Federal administration and control. For the most part, the land remains under Provincial ownership, either under Order-in-Council or as unpatented Provincial Crown land. In some instances, parcels of land within community pastures are under Federal ownership or are in the name of a municipality. The mandate of the program is to conserve the land resource, protect it from future deterioration due to drought while utilizing the land primarily for the grazing and breeding of livestock. The program uses cattle grazing as the primary tool, supported by the latest range management science, to maintain a healthy, diverse landscape, which is representative of the natural functional prairie ecosystems. Map Series 6-2900 illustrates the location of twelve community pastures in the Project Study Area through western and southern Manitoba. They are Pasquia, Birch River, Lenswood, Cote-San Clara, Duck Mountain, Bield, Dauphin-Ethelbert, McCreary, Alonsa, Westbourne, Lakeview and Langford.

6.3.1.6 Infrastructure

The Project Study Area is affected by several infrastructure installations and networks. Facilities and networks include airports/aerodormes, communication towers, lagoons and waste disposal sites, and linear corridors and rights-of-way for provincial and municipal roadways, railways, hydro transmission and distribution lines, telephone lines, oil and natural gas pipelines and water pipelines/aqueduct. Principal elements of the study area infrastructure are discussed below and illustrated on Map Series 6-3000.

Provincial Trunk Highways and Provincial Roads

There are 26 Provincial Trunk Highways (PTHs) within the Project Study Area. All PTHs are paved in Manitoba and either two or four lane roadways with exception of PTH 19 which is gravel upon entry to RMNP. These highways serve as major routes to access most regions throughout Manitoba and tend to link larger urban centers. Provincial Roads (PRs) are found throughout Manitoba and act as arteries into many communities. Within the Project Study Area there are a total of 119 provincial roadways. All provincial roads in Manitoba are two-lane highways and are either gravel or paved. Provincial road density is higher in the southern portions of the Project Study Area, most noticeably between the cities of Dauphin and Winnipeg. Due to distance between communities in the north, most are found along major provincial roads (e.g., PR 280 – connecting Thompson to Gillam).

Resource roads are used principally to access mining areas and forest harvest sites. These resource roads are largely concentrated in northern and north-central Manitoba, between

Thompson and the Duck Mountains. Map Series 6-3000 illustrates the network of resource and other unclassified roads within the Project Study Area which principally consist of access roads, closed/abandoned resource roads, unclassified resource roads, and in-block roads (referring to roads within forest harvest sites).

Railways

Railway companies that currently maintain rail lines in the Project Study Area include: Canadian National Rail (CNR); Canadian Pacific Railway (CPR); Greater Winnipeg Water District Railway; Keewatin Railway Company; and Hudson Bay Railway (HBR) Company. These lines are principally concentrated in agro-Manitoba. HBR and the Keewatin Railway Company are the only companies that provide services to northern communities in the Project Study Area between The Pas and Gillam, and The Pas and Pukatawagan respectively. Pukatawagan is outside of the Project Study Area. There are numerous abandoned rail rights-of-way throughout the Project Study Area as illustrated on Map Series 6-3000.

Transmission and Distribution Lines

Manitoba Hydro transmits electricity over nearly 100,000 km of transmission and distribution lines. The approximate lengths of transmission lines connected to Manitoba Hydro's transmission network include the following: 2,000 km of 500 kV transmission (ac and HVdc); 5,000 km of 230 kV transmission (ac); 1,400 km of 138 kV transmission (ac); 2,900 km of 115 kV transmission (ac); and 7,200 km of 66-69 kV sub-transmission. Aside from these lines, there are numerous distribution lines (25 kV and below) located throughout the Project Study Area. The location of the existing transmission lines in the Project Study Area are shown on Map Series 6-3000.

Oil and Gas Pipelines

The main natural gas, oil pipelines and smaller distribution pipelines are shown in Map Series 6-3000. A major underground natural gas pipeline (i.e., TransCanada Pipeline mainline) spans the southern portion of the province, crossing west to east from Elton to Ste. Anne with numerous stations located at urban centres along the route. Both larger urban centres, such as the cities of Winnipeg and Portage la Prairie, and towns such as Carmen and Starbuck receive natural gas from smaller distribution pipelines which stem from the TransCanada Pipeline mainline. As the primary provider of natural gas in the province, Manitoba Hydro also maintains distribution stations in smaller urban centres.

Water Pipelines and Reservoirs

The City of Winnipeg currently receives water through an aqueduct system that transports water from Shoal Lake in Ontario, to the Deacon Reservoir, immediately east of the City of Winnipeg in the RM of Springfield. The water crosses in an east-west

direction from Shoal Lake to the Deacon Reservoir. The Deacon Reservoir consists of four retention cells, and is located at the junction of PR 207 and Mission Road just east of PTH 101.

Other municipal communities are supplied with potable water from various sources such as water treatment plant systems, including booster and pressure stations, underlying aquifer wells, water storage reservoirs, and a series of distribution pipelines. The Cartier Regional Water Co-op provides water to the communities of Ste. Eustache, Elie, Lido, Plage, Dacotah and Springstein. The Co-op also provides water to the RM of St. Francois-Xavier and the RM of Portage la Prairie. In the parkland region, the Yellowhead Regional Water Co-op Inc. provides treated water to surrounding municipalities, towns and villages and includes a reservoir located at Gladstone. As well, the Town of Neepawa maintains a drinking water reserve around Lake Irwin. The City of Dauphin/RM of Dauphin's water supply consists of the Edwards Lake/Creek system and Vermillion Reservoir and includes distribution to three private water systems.

Airports/Aerodromes and Float Plane Bases

There are several licensed airports/aerodromes in the Project Study Area. Many of the smaller aerodromes are associated with settlements and include aerodromes with either hard surface runways or without hard surfaced runways, as well as other land, water and heliport facilities (Nav Canada, 1997, 2005, 2007). A listing of the facilities in the Project Study Area is in Appendix 6B Table 6B-3.

Some are used as a primary mode of access to some remote communities in northern Manitoba. In addition, lodges and outcamps in the Project Study Area use landing strips to access remote cottages for fishing and hunting expeditions. In addition to these licensed facilities, unlicensed private facilities exist in the Project Study Area, including those utilized by aerial spray applicators.

Communication Facilities

There are a number of communication facilities in the Project Study Area. Most are located close to communities and provide services such as cellular phone, wireless internet, cable and radio. Towers and antennas have been erected across the province for a variety of technical and transportation services. The major licenses issued for these communication facilities are held primarily by:

- Telephone / communication companies (e.g., MTS Allstream, Telus Communications, Rogers Wireless, Wiband Corporation);
- Broadcast companies/radio stations (e.g.s Astral Media, CBC/Radion Canade, CTV Ltd., Canwest Ltd., Golden West, Rogers Ltd., Corus Entertainment, CJOB/CJKR-FM Ltd.);
- Corporations (e.g., CN Rail, CP Rail);

- Government of Canada (e.g., Nav Canada, Environment Canada);
- Provincial and municipal governments; and
- Utility companies (e.g., Manitoba Hydro).

Communication facilities consist of microwave towers, broadcast antenna sites, cell towers, and UHV and VHF point to point towers. Towers located in the Project Study Area are listed in Appendix 6B Table 6B-4. Appendix 6B, Figure 6B-1 shows the section that the facilities have been divided into.

Waste Disposal Sites and Sewage Lagoons

Waste disposal sites and sewage lagoons are located throughout the Project Study Area. These facilities are located near most major urban centres, and towns and villages, including many northern communities. They are also associated with numerous industrial sites and facilities (e.g., generating station sites, mine sites and abandoned mine sites). A listing of waste disposal sites and sewage lagoons located in the Project Study Area is found in Appendix 6B Table 6B-5. shows the sections that the facilities have been divided into.

6.3.1.7 Agricultural Land Use/Productivity

Agriculture is important in Manitoba, as an income-generating sector, directly and indirectly contributing about 12% of the province's GDP. For the Province as a whole, Manitoba's 2006 farm population continued its steady decline in numbers, dropping by 8.1% between 2001 and 2006. Provincially, 1 in 18 Manitobans lived on a farm, accounting for 5.5% of the population in 2006 compared to 6.2% in 2001. Manitoba's rural population of 327,490 people accounted for 28.5% of the total provincial population in 2006, 18.6% of which lived on a farm. The proportion of farmland rented or leased from others has increased steadily to 2001 and had increased again by 2006 (Manitoba Conservation, 2009).

Provincially, there were 26,625 farm operators managing 19,054 farms in 2006, which was down slightly from 2001. In 2006, about 40% of farm operators reported their main occupation as non-agricultural compared to 35.1% in 2001. Within the Project Study Area, the total number of farm operators in the vicinity of the Carrot River valley at The Pas was approximately 145. South of The Pas to the Swan River valley and Duck Mountain, there were approximately 1,640 farm operators. Between the Roblin-Dauphin area and the Westbourne area, there were approximately 8,035 farm operators and from Portage la Prairie area to the Springfield area, there were approximately 4,033 farm operators.

In 2006, Manitoba's total farm area was 19.1 million acres, up from 18.8 million acres in 2001 (an increase of 1.5%). Of the total farm area, there were 11.6 million acres of cropland, slightly down from 2001. In reviewing land use historically, less land has been

held in summerfallow as producers move to greater use of continuous cropping. The area allocated to improved pasture has slightly increased. Land use by agricultural region indicated that the percentage of land use in crops varied from just under 60% to over 80% across southern agri-Manitoba. The greatest regional cropped areas are the Gladstone-Portage la Prairie-Starbuck, Carmen-Morris-Altona, and Beausejour-Dugald-Steinbach regions. The only region where less than 50% of land was under continuous cropping was the area west of Lake Manitoba to Dauphin Lake and the Duck Mountain area. The focus in this region is more intensely on livestock than grains and oilseeds. Agricultural regions in the Brandon-Carberry area, Roblin-Russell area and Swan River area indicate the greatest improved pasture area with cattle production constituting a major portion of agricultural operations.

The 2006 Census indicated there were 19,054 census farms in Manitoba, a decline of 9.6% from the reported total of 21,071 farms in 2001. The number of farm operators also declined 7.5% from 2001 to 2006. While the overall number of farms in Manitoba has been declining, the size in terms of area has increased. The average Manitoba farm was 1,001 acres in 2006, an increase of 12.3% from 891 acres in 2001.

Within the Project Study Area in the vicinity of The Pas, there were approximately 109 farms in 2006. The average farm was 423 ha (1,044 ac) in size. Between The Pas and Duck Mountain, the number of farms in 2006 was approximately 1,246. The average farm was 461 ha (1139 ac) in size. The area from Roblin-Dauphin to Westbourne had approximately 5,777 farms in 2006. The average farm was 681 ha (1682 ac) in size. Between Portage la Prairie and the Springfield area, there were 2,770 farms in 2006. The average farm was 321 ha (793 ac) in size.

The majority of agricultural regions in Manitoba, with the exception of regions encompassing the Carmen-Morris-Altona area and the Beausesjour-Dugald-Steinbach area, have more than 50% of farms reporting having livestock. Regions in the Brandon-Carberry, Swan River, Gladstone-Portage la Prairie-Starbuck, and Carmen-Morris-Altona areas indicate more than 40% of the farms in wheat production. Farms reporting hog production are concentrated in the Carmen-Morris-Altona and Beausejour-Dugald-Steinbach areas. Canola production is concentrated in the Swan River, Birtle-Shoal Lake-Neepawa, and Carman-Morris-Altona areas.

Spring wheat (excluding durum) is still the largest single crop in Manitoba with 3.0 million acres in 2006, a decrease of 19.3% in area since 2001. It made up 25.7% of the Province's cropland in 2006, compared to 31.7% in 2001. In 2006, Manitoba's canola area had increased 21.7% from 2001 and accounted for 19.6% of the province's cropland with 2.3 million acres. Soybean area increased to 141,358 ha (350,567 ac) from 20,176 ha (50,037 ac) in 2001. Total vegetable area rose to 2,275 ha (5,641 ac), up 11.2% from 2001. In 2006, 4.2% of all farms reported organic production; 61.8% of Manitoba's 809 organic farms produced hay and field crops. Although farms often have more than

one organic status depending on their commodity mix, 24.2% produced certified organic products, 6.8% were in transition to becoming certified and 74.2% were not certified.

In the area southwest of The Pas, canola, alfalfa and mixtures and spring wheat were the principal crops grown (primarily located at The Pas). Between The Pas and Duck Mountain (primarily in the Swan River valley), canola, alfalfa and mixtures, tame hay and fodder, oats, barley and spring wheat were the major crops grown. The principal crops grown between the Roblin-Dauphin area and Westbourne area consisted of spring wheat, canola, alfalfa and mixtures, barley, oats, tame hay and fodder, flaxseed, and potatoes. Smaller amounts of sunflowers and dry white beans were also grown in this area. Between Portage la Prairie and Springfield, the major crops grown were spring wheat, canola, oats, soybeans, alfalfa and mixtures, corn, barley, winter wheat, and flaxseed.

Manitoba has the largest hog farms in Canada, with an average of 2,468 animals per farm. In 2006, Manitoba reported 2.9 million hogs, an increase of 15.4%; 1.6 million cattle and calves, an increase of 10.4%; 68,096 sheep and lamb, a decrease of 19.7%; 46,580 horses, a decrease of 25.8%; and 19,609 bison, an increase of 45.9%.

The Project Study Area encompasses a large portion of agri-Manitoba. Production is diverse with intensive cropping to the south, east and west of Winnipeg, in the Red River Valley, as well as along PTH 5, and south, east and west of Dauphin, and through the Swan River Valley (Map Series 6-3100). Active and potential irrigation areas are found from Carman to Elm Creek, St. Claude, Rathwell, across the Assiniboine River to Austin, MacGregor, Bagot and Portage la Prairie, and north to Arden, Gladstone and Beaver.

From the Riel Converter Station site to the east side of the Red River, the Project Study Area encompasses flood prone lacustrine clay soils where intensive crop production is prevalent. Wheat, oats, barley, canola, soybeans and alfalfa are the main crops produced. Between PTH No. 1 east of Winnipeg and the Red River, there are several towns and villages, numerous farms with residences, other rural non-farm residences (i.e., rural residential developments), and intensive livestock facilities. Irrigation potential for the area is low.

To the west of the Red River, the lacustrine clay soils continue to the west of Sperling and Brunkild, in the RMs of Macdonald and Morris, to Carman and Elm Creek, in the RMs of Dufferin and Grey. In this area, the soils are not as flood prone compared to the areas east of the Red River. Fewer towns and villages, farm yards, rural residences, and large scale livestock operations are present west of the Red River. The irrigation potential is low and intensive crop production is normal for the area with similar types of crops being produced.

The clay soils turn to sandy soils between Carman and Elm Creek. The sandy soils have irrigation potential and quarter-section irrigation pivots are common for the production of potatoes and other crops. The land use pattern contains numerous smaller farms and

many rural residences. These are found in the sandy treed areas from Carman to Elm Creek, St Claude and, from Rathwell in the RM of South Norfolk, to the Assiniboine River. All types of crops are produced from potatoes, corn, wheat, oats, barley, canola, sunflowers, alfalfa, peas and other pulse crops. Mixed farming is common with the utilization of tame pasture and alfalfa hay, as well as native grazing and haying in sandy duned soil areas. There are active pivot irrigations systems in place north of Carman and west of St Claude.

The sands with irrigation potential continue across the Assiniboine River and north of PTH 1 to Gladstone in the RM of Westbourne. Active pivot irrigation systems are found on both sides of the Assiniboine River on the lower side of the Arden Ridge, as well as south and north of Bagot, MacGregor and Austin and south to the community of Beaver in the RM of North Norfolk. North of Beaver, the soils are more clay based with less potential for irrigation.

The Project Study Area east of Riding Mountain crosses PTH 16 and follows PTHs 5 and 50, continuing north of the Big Grass Marsh in the RM of Alonsa and through the RMs of Langford, Lawrence, Rosedale, Westbourne, Lakeview, Glenella, McCreary, and Ste. Rose. From Neepawa north along PTH 5, there is more intense agricultural crop production which continues north of the Town of Ste. Rose du Lac to Rorketon (east of Dauphin Lake), and northwest to the City of Dauphin to Cowan. Intensive cropping with some mixed farming is found on the east side of Riding Mountain National Park to PTH 5. East of PTH 5, soils have lower agricultural capability and are mainly used for hay and pasture with a few cultivated fields producing annual crops. Comparatively, land use in the RM of Ste. Rose, past the Cty of Dauphin to the community of Cowan, in the RM of Mountain (South), varies from areas with intensive use for crop production to areas of native hay and pasture.

The east side of the Westlake area (so termed as it is on the west side of Lake Manitoba) has less productive agricultural soils and less intensive livestock farming activities. Agricultural use is more sporadic and limited primarily to livestock production (i.e., haying and grazing with the odd cultivated field). Many soils along PTH 50 have lower agricultural capability and are mainly used for hay and pasture with a few cultivated fields producing annual crops. Through the RMs of Lawrence and Alonsa, large tracts of land have little to no agricultural activity although some grazing and haying does occur. In the RM of Mossey River, agricultural activities are somewhat more intense with more cultivated fields intermixed with native haying and grazing. The Lake Winnipegosis area has more intensive agricultural use with more cultivated fields found nearer to the Village of Winnipegosis.

From the Neepawa area west, the Project Study Area extends south of Riding Mountain National Park (RMNP) along PTH 16 and north to PTH 45 and through the western parkland region north to the Swan River Valley. The area south of RMNP is characterized by many permanent potholes and small lakes. West of RMNP, the soils

landscape is more rolling with numerous small lakes. Agricultural crop production through this area is intensive with mixed farming and little to no irrigation potential.

A large bog area found west of the Village of Winnipegosis through the RMs of Mountain (South) limits the extent to which agricultural usage occurs except for small areas at the community of Pulp River and east of Cowan. Through the RM of Minitonas to Lenswood at the northern edge of the Swan River Valley, lands are under intensive annual crop production with some mixed farming. Forest cover dominates two areas along the west side of the Duck and Porcupine Mountains to the Saskatchewan border, separated by the Swan River Valley, where there is no agricultural production. From Lenswood along PTH 10 north to Mafeking and north to PTH 77, most soils are in bogs with only a few areas cultivated.

In the RM of Kelsey, a limited portion of the alluvial soils of the Saskatchewan River delta are cultivated for cereal grains, oilseeds and hay crops in the agricultural area at The Pas. West of The Pas, a limited portion of the clayey soils are cultivated for cereal grains, alfalfa seed and hay crop. Most of the land is Crown land and some of it has been leased for native hay and pasture. A limited extent of the soils at Ralls Island is cultivated for the production of cereal grains, oils seeds and hay crops. Most of the land in this area is Crown-owned and/or leased for native pasture and hay.

Soil Capability and Agricultural Use

The Project Study Area consists of seven major agricultural categories of use as determined on the basis of soil type, present and potential agricultural use, and the intensity of present agricultural use (Map Series 6-3100). Soil type and soil capability is discussed in the physical environment section. A description of the categories of agricultural productivity is as follows:

- Category 1 – **Limited Agricultural Use Areas** – Most of these lands are located in areas generally with trees, swamp and lakes where there is little or no agricultural activity. Where the land is being used for agriculture, the main activity is grazing and hay production with small amounts of land in cultivation. Many areas have ridge and swale topography with small amounts of developed crop land. Soils are mostly bogs or glacial till soils that have thin surface soil horizons, are stony, and have limited agricultural potential. These soils are generally found north of PTH 16 from the east side to the center of the Westlake area, north past the north side of Rorketon, and then past Winnipegosis, Cowan, Lenswood, Mafeking and north to The Pas.
- Category 2 – **Mixed Farming Areas** – These lands are generally found intermixed with limited agricultural use lands in pockets between PTH 16, Plumas, Ste Amelie, Eddystone, and Rorketon north, Winnipegosis, Cowan, Lenswood, the Swan River Valley, Mafeking and The Pas. These types of lands are also found northwest of Laurier, along PTH 10 from Dauphin to Cowan and around Boggy Creek. Some of the lands are in native grass and trees and the rest have been broken and are in tame

forage, go-back native forage or cereal crops. Farmers in the area produce crops and livestock on cultivated and native, hay and pasture lands. Many of these areas are high lime glacial till plains in the eastern and central part of the Project Study Area. Soils in these areas have limited agricultural capability.

- Category 3 – **Cereal, Special Crop and Mixed Farming Areas** – These areas include lands where cereal and special crops are grown, with limited row crop production, low irrigation potential, and where there is a mixed farming presence. Areas with this production pattern include all of the lands south and west of RMNP, west of the Duck Mountains and the east side of the Swan River Valley.
- Category 4 – **Cereal and Special Crop Areas** – These lands are intensively cropped areas with limited row crop production. There is less potential for row crop production or irrigation. The soils of these areas are the highly productive lacustrine clay soils found in the Red River Valley, south and west of the City of Dauphin, the central and western parts of the Swan River Valley and other smaller areas in between McCreary and Neepawa. Wheat, barley, canola, alfalfa for hay and seed, specialty crops such soybeans and peas are produced.
- Category 5 – **Cereal, Special and Row Crop Areas** – These lands consist of high value row crops, such as soybeans, sunflowers and corn, and includes areas where there is more potential for expansion in the future. This includes higher elevation lands in the Red River Valley where there are increasing efforts to produce row crops such as corn, soybeans and sunflowers. The lands along the Arden Ridge north of Austin also fall into this category. The soils of the Dauphin area south and west, the Swan River Valley and other smaller areas in between McCreary and Neepawa are also trending towards more row cropping.
- Category 6 – **Existing and Potential Irrigation Areas** – These lands consisting of sandy soils from Carman to Elm Creek to St Claude and Rathwell are located in the southern part of the area with active quarter section pivot irrigation that mainly produces potatoes. Pivot irrigation for potato production is also found on both sides of the Assiniboine River and at PTH 1 West from Austin to Bagot and north to Beaver. The area has potential for additional irrigation activities. The existing irrigation area continues north of the Assiniboine River along the Arden Ridge to Arden and east of Gladstone, and around Portage la Prairie. North and east of Beaver, soils have more clay and therefore have less irrigation potential. Row crops of potatoes and some corn are produced. There is potential to grow more row crops in this area.
- Category 7 – **Intensive Livestock Production Areas** – This area is found between PTH 1 East and east the Red River. There are many intensive livestock operations, including livestock barns and numerous farm yards. Hog and poultry production are very common in the area east of the Red River. This area also has the greatest

concentration of people in the Project Study Area, including towns and villages, farm yards, and rural residential development.

Organic Farm Production

In Manitoba, the Organic Producers Association of Manitoba (OPAM), has been established to promote organic agriculture as a co-operative. OPAM grants certification to individuals who wish to manage their agricultural processes without the use of prohibited inputs (such as herbicidal agents). OPAM is accredited by the Canadian Food Inspection Agency as recommended by the Standards Council of Canada in order to provide organic certification services. Concerns related to transmission line development would principally extend to the sensitivity of organic farming to right-of-way vegetation control and the use of herbicides.

In Manitoba, a crop is marketed as "Certified Organic" where the land on which it is grown has been free of synthetic fertilizers, herbicides and pesticides for at least three years prior to crop harvest. The third harvest on that parcel of land can be recognized as an organic product. Land will be inspected during this transitional period. Prohibitive inputs will not be used on these parcels once certification has been granted and if contamination is suspected, adequate measures must be taken to abate the contaminant. Fees are also paid to apply as an organic producer and to market products as organically grown. Certification is not guaranteed over time. Inspections of crops and livestock can occur to assure that compliance is being followed. Certification can be retracted if prohibitive inputs have been used or have not been adequately treated once exposed. Certification can be granted for any of the following crop types and agricultural processes: grains, oilseeds, forage crops; wild crops (such as rice); beekeeping and honey production; herb and horticultural production; and livestock, dairy or poultry facilities. Challenges facing organic farm production systems include: fertility, weed management, insect management, disease management, and soil conservation.

As of 2009-10, there were 49 organic producers, processors and handlers registered with OPAM that are in the Project Study Area (outside the City of Winnipeg). Most are located in the south-central and Western regions near the communities of Ste. Agathe, St. Claude, Portage, Gladstone, Brandon, Neepawa, Miniota, Erickson, Shellmouth, Inglis, Dauphin, Valley River, Gilbert Plains, Grandview, and Swan River.

6.3.2 Resource Use

6.3.2.1 Overview

The following section documents an overview of resource use in the Project Study Area. A detailed description can be found in the *Bipole III Land Use, Bipole III Forestry, Bipole III Resource Use, Bipole III Aquatics, Bipole III Terrestrial Ecosystems and Vegetation and Bipole III*

Aboriginal Tradtional Knowledge Technical Reports. This section provides information on the following:

- Commercial forestry;
- Mining/Aggregates;
- Trapping;
- Amphibian/reptile commercial harvesting;
- Commercial fishing;
- Wild rice harvesting;
- Recreation and Tourim; and
- Domestic resource use

6.3.2.2 Commercial Forestry

The Province of Manitoba is responsible for administration of all resources on Crown lands. Forestry falls within the mandate of Manitoba Conservation and for timber resources, Forestry Branch. Manitoba Conservation is under the mandate of sustainable management and must balance the multitude of user needs and demands on public lands and resources between consumptive resource use and ecosystem integrity. There are five provincial forests — Cormorant, Porcupine, Duck Mountain, Swan Pelican and Spruce Woods — in the Project Study Area (Map 6-31). Provincial Forests were originally established to maintain forested areas and ensure wood fibre sustainability. With the exception of Duck Mountain Provincial Park, all provincial parks prohibit commercial timber harvesting. Timber harvesting in Duck Mountain Provincial Park is administered by Timber Sale Agreements and Timber Permits.

On Crown land, Forestry Branch is responsible for inventory, monitoring, protection, and administration of all forest resources. It maintains a forest inventory (Forest Resource Inventory and the newer Forestlands Inventory) for the Commercial Forest Zone including private lands. No forest inventory exists for the northern non-commercial Forest Zone. For forest management purposes, the province has been divided into administrative units of Forest Sections (FS) which are subdivided into Forest Management Units (FMU) (Manitoba Conservation website 2009). The FSs and FMUs found in the Bipole III Project Study Area are shown on Map 6-31.

The non-commercial forest zone, which is known as FMU 76, is located north of the Churchill River, Nelson River and Hayes River FSs. Manitoba Conservation is responsible for the administration of resource use in the area but does not provide forest management planning or conduct forestry specific operational activities in this zone. Accordingly, a forest inventory for FMU 76 has not been developed. The area is deemed

non-commercial in terms of forestry due to lack of infrastructure, distance to mills and markets for forest resources and environmental conditions (climate) that limit tree growth rate and size. Although FMU 76 covers a large landmass and includes some forest resources of commercial quality, these are generally scattered, often with considerable distance between them.

The forests are managed on a sustained yield basis where the Annual Allowable Cut (AAC) is calculated and extraction rates are regulated accordingly. The Forestry Branch has the primary responsibility for the determination of sustainable harvest volumes (AAC) in conjunction with Forest Management License (FML) holders. The Manitoba Conservation AAC/Sustainable Wood Supply (SWS) levels for the Project Study Area are provided in Table 6.3-8.

Table 6.3-8: Manitoba Conservation Annual Allowable Cuts (AAC)/Sustainable Wood Supply (SWS) Levels for the Project Study Area

	AAC/SWS* (m^3/year)				
	Net Merchantable**		Operable***		
FMU	Softwood	Hardwood	Softwood	Hardwood	Productive Area (ha)
1	1,010	24,530	-	-	171,460
2	410	18,870	-	-	119,605
4	1,410	21,050	-	-	148,910
5	550	19,210	-	-	105,146
6	0	19,830	-	-	87,516
7	260	12270	-	-	102,622
10	1,730	112,290	-	-	349,498
11	20,480	138,870	-	-	249,219
12	93,350	118,130	-	-	192,957
13	-	-	146,280	348,823	312,133
14	-	-	110,022	119,180	180,673
52	33,540	31,090	17,960	-	65,146
53	182,220	69,270	134,600	-	210,708
54	15,830	1,410	7,060	-	90,976
55	39,980	13,660	26,300	-	51,745
56	95,670	63,190	67,250	-	122,536
57	29,870	6,320	22,330	-	44,784
60****	-	-	-	-	106,466
61	51,250	19,400	38,830	-	87,896
62	143,660	33,900	98,490	-	205,650
63	155,570	45,890	124,000	-	277,227
64	234,390	64,480	179,160	-	487,900
65	127,610	24,640	100,180	-	318,257
66	108,140	34,100	84,220	-	380,650
73	31,290	960	10,900	-	473,379
74	3,060	0	0	-	244,092

	AAC/SWS* (m^3/year)				
	Net Merchantable**		Operable***		
FMU	Softwood	Hardwood	Softwood	Hardwood	Productive Area (ha)
75	9,430	0	0	-	110,847
83	246,710	93,040	195,550	-	290,148
84	217,560	72,420	180,330	-	215,424
85	156,220	46,690	129,610	-	184,712
86	14,080	3,650	11,240	-	106,555
87	164,630	46,740	130,900	-	215,017
88	14,560	8,720	9,900	-	80,533
89	61,330	21,300	38,920	-	243,490

*AAC/SWS based on old inventory and wood supply analysis process (except FMU 13 and 14).

**Net merchantable volumes do not consider operational considerations.

***Operable volumes are based on NET OP I standards (>55 m^3/ha commercial softwood); except for FMU 13 and 14 which are based on recent wood supply analysis.

****Volumes not reported for FMU 60 due to provincial policy to exclude harvesting from parks.

Tenure of Forested Crown Land

In Manitoba, there are three vehicles under which tenure of forested Crown lands may occur: Forest Management License Agreements (FMLAs); Timber Sale Agreements (TSAs); and Timber Permits (TPs).

Forest Management License Agreements

Under *The Forest Act*, provision is made for the establishment of a Forest Management License (FML). A FML is an area-based agreement between the Province and a company that provides a long-term fibre supply to a wood-using industry in exchange for accepting forest management responsibilities that include planning, supervising and administrating of both timber harvesting and forest renewal activities. The Project Study Area overlaps the FMLs of two companies in Manitoba (Map 6-31), Tolko Industries Ltd. (FML #2) and Louisiana Pacific (LP) Canada Ltd (FML #3). A company holding a FML is required, under *The Forest Act*, to develop a long-term (20 year) Forest Management Plan (FMP) [Manitoba Conservation, 2007]. FMPs identify long-term timber harvesting plans, access development, and forest renewal activities throughout the FML area.

A Forest Management Licensee must also develop an Annual Operating Plan (AOP) within the framework of the long-term FMP. The AOP provides a detailed description of the timber harvesting, access development, and forest renewal activities proposed for the current year. In addition, the AOP identifies, in lesser detail, the proposed forest management activities for the following two years to provide a general projection of the company's planned operations and activities.

Forest management and forest renewal are the responsibility of Manitoba Conservation on Crown forestland outside of FML areas and within FML areas where the wood is used by a facility other than that operated by a holder of a FML.

Tolko's FMP expired in 2009 and the development of a new FMP has been delayed. In May 2010 Forestry Branch provided an extension to the submission of the FMP until May 31, 2013.. LP and Manitoba Conservation are currently analyzing the sustainability of the wood supply. A new FMP is expected to be submitted by December 2011. Both Licenses are currently operating under authority of AOPs (Keenan, pers. comm. 2011).

Timber Sale Agreements

A Timber Sale Agreement (TSA) is a legal document describing the softwood and/or hardwood volume to be harvested, the specific locations and any special conditions for that harvest. TSAs may be issued under a number of circumstances by way of auction, direct award, community allocation, special allocation, or quota. In most cases, the responsibility for planning and forest renewal activities resides with Manitoba Conservation (Manitoba Conservation 2006). The quota system is governed by a Timber Quota Policy established in 2005 and scheduled for review in 2010. Although each quota holder possesses an annual allocation of wood, either a TSA or a TP is required as the legal authority to harvest the quota. One-year TPs are issued for annual quota volumes less than or equal to 300 m^3. Five-year TSAs are issued for annual volumes greater than 300 m^3. There were 18 Timber Sale Agreement Holders in FML #3 and #11 in FML #2 in 2010 (Manitoba Conservation 2010a). Quota Holders operating in the Project Study Area and the quota allocations are identified in Appendix 6B Tables 6B-6 and 6B-7.

Timber Permits

Timber permits (TPs) are issued on a one-time basis for both commercial and personal harvests of less than 300 m^3 per year. These most commonly apply to domestic needs for firewood, fence posts, or for small lumber/sawmill operations. Forest management planning and forest renewal requirements for areas harvested under TPs are the responsibility of Manitoba Conservation. TPs are issued by Manitoba Conservation District Offices and often, due to their small volumes, are not area specific. There were 12 Timber Permit Holders in FML #3 in 2010 (Manitoba Conservation 2010a).

Forest Resource Utilization

Tolko Industries Limited (Manitoba)

Tolko Industries Limited (Manitoba) is based in The Pas where it owns and operates a kraft pulp and paper mill and a modern small-dimension sawmill. Its license area (FML #2) includes the northern portions of the Mountain and Interlake Forest Sections, the Saskatchewan and Highrock Forest Sections and most of the Nelson River Forest Section (Map 6-31). The volume of wood available to Tolko as stated in their Forest

Management License Agreement is 2,000,000 m^3 per annum of timber consisting of up to 1,600,000 m^3 of softwood and up to 600,000 m^3 of aspen to meet the requirements of the plant, as well as a proposed expansion. As the proposed expansion has not taken place, the volume of wood available to Tolko currently consists of up to 1,600,000 m^3 per annum of softwood species only (Keenan 2010. pers. comm.) In Tolko's Annual Harvest and Renewal Plan for 2010/2011, the planned volume of softwood was estimated at 1,754,066 m^3 of softwood in 2010 with an additional 961,973 m^3 planned for the first five months of 2011 to meet the requirements of their operations (Tolko Industries Ltd., 2010). For 2008 and 2009, the planned volume of softwood harvest was estimated at 1,545,566 m^3. However, the actual consumption was 1,138,074 m^3 due to slumping market demand. Acceptable softwood species used in the operation are black spruce, white spruce, jack pine and, to a limited extent, balsam fir.

Tolko's forest management and planning responsibilities for FML #2 include administrative duties and reforestation, as well as third party administration and supervision for all wood delivered to their mills. The company also provides planning services for Quota Holders that operate within the FML but Manitoba Conservation supervises these operations (Hunt, pers. comm., 2010). Those third party operations from which timber is delivered to Tolko are also included in the company's forest renewal program. Manitoba has the authority to withdraw land from the FML holder for other land use purposes.

Louisiana Pacific Canada Ltd.

In 1994, LP Canada Ltd. (LP) constructed an $80 million oriented-strand board plant in the RM of Minitonas in the Swan River Valley. The plant was designed to use 900,000 m^3 of hardwood and produce 310,000 tonnes of oriented strand board (OSB) annually.

The Forest Management License Agreement for LP provides for 900,000 m^3 per annum of hardwood to meet the requirements of the OSB mill. The company has agreed from the onset to secure its annual timber requirements by accessing timber from both Crown and private lands, from within and outside of FML #3. FML #3 includes FMUs 10, 11 and 13 within the Mountain Forest Section and lies between the Saskatchewan border to the west, Lake Manitoba/Lake Winnipegosis to the east, Riding Mountain National Park to the south, and the Porcupine Provincial Forest and Township 40 to the north (Map 6-31) LP also has rights to hardwood in FMUs 12 and 14 even though these are within Tolko's FML Area.

All commercial timber resources are in high demand in the Mountain Forest Section. This is variously due to the high quality of resources, the level of infrastructure development, distance to mills and markets and the long history of forest industries in the area. The available wood supply is fully committed to existing industries as a result of demand for timber resources and increasing pressures from the public to conserve and protect areas from logging. Sustainable wood supply values have been reduced sharply from previous AAC values in the area (Carlson, pers. comm., 2009). The tight demand

for timber resources is split between softwood and hardwood users, and pulpwood, sawlog and chipwood users. As products are harvested, they are sorted and shipped to their respective manufacturing facilities filling the respective allocation volumes (Cable, pers. comm., 2010). Recognizing the demand for softwood, LP has refrained from using its allowable softwood volume thereby limiting its consumption to hardwood.

LP is responsible for all forest management, planning and supervision of forest harvesting and renewal activities within FML #3, including third party activities. Spruce Products Ltd. is the largest softwood allocation holder (Quota) within the Mountain Forest Section and operates a saw mill, planer and kiln operation in Swan River. Given the size of its operation, the company works jointly with LP to plan and supervise harvesting operations in FML #3. While LP is responsible for all hardwood renewal activities within their license area, a Spruce Products Ltd. subsidiary (Mountain Forest Section Renewal Company) is currently responsible for all softwood renewal work within the Mountain Forest Section. Manitoba Conservation, Forestry Branch is responsible for hardwood renewal activities in FMUs 12 and 14 (Cable, pers. comm., 2010). The Province has the authority to withdraw land from LP Canada's FMLA where required for other land use purposes.

Third Party Operators (Timber Quota Holders & Special Allocations)

Third Party Operators have individual timber allocation agreements with Manitoba Conservation independent of Forest Management License holders. Associated timber volumes are regulated through Timber Sale Agreements with the Province, but forest management planning requirements for quotas held on FMLAs are the responsibility of the FML holder. Quota Holders and Special Allocations outside of FML areas are administered and supervised by Forestry Branch. The Province is also responsible for all silvicultural activities unless assigned to the FML holder or, in the case of FML #3, assigned to the Mountain Forest Section Renewal Company. Quota volume allocations assigned to quota holders within the Project Study Area include: 286 m^3 of softwood in the Aspen Parkland Forest Section; 265,396 m^3 of softwood and 71,351 m^3 of hardwood in the Mountain Forest Section (FML #3); and 57,362 m^3 of softwood and 329 m3 of hardwood in the Saskatchewan River, High Rock and Nelson River Forest Sections (FML #2). The total volumes were 323,044 m^3 of softwood and 71,680 m^3 of hardwood.

Vale Inco holds a timber allocation within the geographic boundaries of FML #2 and portions of the Project Study Area (Map 6-31). This allocation was provided to Vale Inco circa 1956 to ensure the company a secure supply of mine timbers (Holmes, pers. comm., 2010). The allocation was selected to provide easy access, and borders PTH #6 and PR #391 in the vicinity of Thompson. Vale Inco maintains right of first refusal to timber greater than 20.3 cm in diameter within this area but has never exercised its right. Instead, the Company has and continues to allow the FML holder and third party operators to harvest timber within the allocation boundaries (Holmes, pers. comm.,

2010). Tolko and Manitoba Conservation continue to track harvest volumes and calculate an AAC for the Vale Inco allocation (also known as the INCO Strip).

Aboriginal-Owned Forestry Operations

There are an estimated ten Aboriginal forestry-related companies operating in the Project Study Area. Some of these companies also provide transmission line right-of-way clearing services to Manitoba Hydro. On such projects, merchantable timber is salvaged where economical to do so. Nelson House Forest Industries (NHFI) owns and operates a sawmill. In 2010, it was processing salvaged timber from the construction of the Wuskwatim Generating Station (Gwazuik, pers. comm., 2010). Pukatawagon has also received an allocation in support of a community owned sawmill, as have other First Nation communities in the past (Chapman, pers. comm., 2010). As of 2010, few remain in operation.

Forest Research / Monitoring Activities

There are a number of forest research and monitoring activities ongoing in the Project Study Area. These include: plantation sites; forest resource inventory permanent sample plots (PSPs); tree improvement sites; ecosystem monitoring plots; forest health research plots; and climate and atmospheric study sites. Potential issues concerning development relate to potential conflicts or infringement on research and monitoring sites, the most important of which are the tree improvement program sites, which have seen a substantial level of investment and are now bearing results.

Manitoba Conservation and its partners through the Trees for Tomorrow program are planting one million trees per year as part of Manitoba's Kyoto and Beyond action plan to reduce the Province's greenhouse gas emissions by 2012. Forestry Branch has an ongoing growth and yield study program that aims to more accurately quantify forest growth and incremental volume relative to time. This is accomplished through the establishment and periodic measurement (usually at 5-year intervals) of permanent sample plots (PSPs) in a wide variety of forest stands throughout the province. Tolko and LP have also established PSPs on their FMLs. Within the Project Study Area, PSPs have been established in FMUs 55, 61, 83 and 89 (Carlson, pers. comm, 2010).

Manitoba Conservation has established tree improvement cooperatives with Tolko Industries Ltd. and LP Canada Ltd. to evaluate field performance of seed collected from genetically superior stock. Seed orchards have been established to provide seed for forest renewal programs. Twenty-five tree improvement sites within the Mountain, Saskatchewan River, Highrock and Nelson River Forest Sections were established between 1990 and 2001, including 17 white and black spruce family test sites, six seed orchards, one jack pine family test site, and one jack pine seed orchard. Several Manitoba Conservation long-term ecosystem monitoring plots are located within the Project Study Area including: smelter monitoring conducted at 27 sites established in the early to mid 1980's to monitor the effects of atmospheric emissions from HudBay and Vale Inco

smelters on forest plant species composition, tree and shrub growth, and soil chemistry; and Aspen Forest Baseline monitoring sites established in 1995 on 5 sites in the Minitonas/Swan River area to collect baseline vegetation, soil, and bird data in aspen forest stands (situated in FML #3 on privately owned lands).

The Canadian Forest Service (CFS) has established numerous forest research plots within Manitoba. The Acid Rain National Early Warning System (ARNEWS) is a nation-wide study, initiated in 1984, with the objective of detecting early signs of air pollution damage to Canada's forests (Environment Canada website, 2010). Six monitoring sites were originally established across Manitoba, four of which are being monitored by Manitoba Conservation. The Forest 2020 Plantation and Assessment Demonstration Initiative is part of the Climate Change Action Plan for Canada. The initiative's focus is on improving Canada's capacity to create a strategic carbon reservoir and increase fibre supply. The CFS was delivering the program in cooperation with the Manitoba Forestry Association.

The Boreal Ecosystem-Atmosphere Study (BOREAS) was a collaborative study initiated in the early 1990s supported by a number of American and Canadian agencies. The BOREAS Northern Study Area encompassed approximately 875 km^2 of the boreal forest located northwest of Thompson, and north and northeast of Nelson House. Although the study has been completed and the site decommissioned, some research projects are continuing in the Project Study Area.

Tolko Industries Ltd. is involved in various research initiatives within FML #2. Tolko's Growth and Yield Program has established permanent sample plots (PSP) to collect growth and yield and forest succession data. Similarly, LP, in partnership with other organizations, has conducted numerous research programs as part of its sustainable forest management program. Since 1997, 450 ecological monitoring permanent sample plots (PSP) have been established within FML #3 to collect ecological, growth and yield successional data (LeBlanc, pers. comm., 2010).

Forestry Support Programs

Maintenance of forest cover in the Project Study Area is important for both commercial and environmental sustainability reasons. Increasing awareness of non-traditional forest values are opening up new opportunities and markets. Many of the related programs emphasize conservation, environmental protection and habitat maintenance or enhancement, and target southern Manitoba where woodlands and forests are less dominant on the landscape. The Manitoba Woodlot Program is delivered by the MFA and MAFRI who provide woodlot management support for landowners, including those within the Project Study Area (Fosty, pers. comm., 2010).

The Manitoba Hydro Forest Enhancement Program promotes and offers support to non-profit, non-government organizations and educational institutions that have identified projects of benefit to a community, region or the province. The program

encourages cooperative community projects and focuses on tree plantings, public forest education and innovative forest projects (Carruthers, pers. comm., 2010). The majority of the projects that have been undertaken are within the boundaries of towns, communities or First Nation Reserves, which are avoided by the Project. Projects outside of the community boundaries tend to be recreational or educational based.

The federally funded Agri-Environment Services Branch (comprised of the former Prairie Farm Rehabilitation Administration and two other Federal branches) promotes Agro-forestry as an approach to land use that incorporates trees into farming systems to maximize shelterbelt biodiversity and habitat value and is limited to agricultural areas in the Project Study Area.

6.3.2.3 Mining/Aggregates

Minerals

There is a wide range of minerals and other commodities (including aggregate) mined in the Project Study Area (i.e., silver, gold, cobalt, copper, nickel, lead, zinc, lithium, palladium, platinum, uranium and tungsten). In general, mineral deposits are divided into categories including current producers, past producers, and developed prospects (or important mineral properties).

Considerable mineral exploration activity is being undertaken by mining companies or joint ventures, as well as by individual prospectors in the Project Study Area. In Manitoba, provisions within *The Mines and Minerals Act* and Provincial Land Use Policies (Regulation No. 184/94) acknowledge the importance of areas of high metallic mineral deposits, as well as areas of high metallic mineral potential. Such areas include greenstone belts and the Thompson Nickel Belt. The Act, specifically Section 13, provides for provincial designation of mineral management areas (i.e., areas of high mineral potential). The intent is to give priority to mineral exploration and development in these areas. In addition, the Land Use Policy Regulations states that lands containing high mineral potential, such as greenstone belts and the Thompson Nickel Belt, be protected from land uses that would prohibit or unduly restrict exploration, development and extraction of metallic minerals.

Mining

Mines operating in the Project Study Area include: VALE Inco Ltd. (nickel, copper, gold, silver, cobalt and platinum at the Birchtree Mine in the vicinity of Thompson), HudBay Minerals Inc. operated by the Hudson Bay Mining and Smelting Co. Ltd. (copper, zinc, gold and silver at Mine 777 and Trout Lake Mines in Flin Flon, and Chisel North Mine in Snow Lake). There are also numerous past producing properties in the Project Study Area.

HudBay Minerals Inc. has also recently identified a new mining site near Lalor Lake with the potential of 15 to 20 years of gold and copper mining resources. This mine would be located near the community of Snow Lake. Other potential specific mineral interests were identified by mining companies in the Thompson Nickel Belt during the course of research and the EACP for the Project (Chapter 5). Crowflight Minerals Inc. identified four areas of interest with respect to potential or ongoing development, including the old Manibridge mine site, Bucko Lake mine (both south of Wabowden), MIIA and Bowden properties (at Wabowden) and Half Mile Lake (north of Wabowden). Crowflight also identified the potential for an open pit mine in the area north of Wabowden). VALE Inco identified two properties of further development interest in the Thompson Nickel Belt outside of its existing mines in Thompson. The South Mystery Lake property north of Thompson on Mystery Lake is a site for potential open pit mining development. In addition, the existing Pipe Mine site, south of Ospwagan Lake and west of PTH 6, is an active exploration target for possible expansion as an open pit mine.

Mining Claims, Leases and Permits

A mineral exploration license is issued for the purpose of exploring for minerals, other than quarry minerals, on, in or under Crown land. Exploration licences can be held for period of three to five years with options to renew depending on location within the Province. Mineral exploration license areas, mining claims and mineral leases are numerous throughout the Project Study Area (Map 6-32). As of 2010, approximately 67 license areas involving some 16 separate companies were registered within the Project Study Area.

A mining claim is a parcel of Crown mineral land that is staked out, acquired or held as a claim to explore for and develop minerals. Under *The Mines and Minerals Act*, mining claims vary in size from 16 ha to 256 ha. Once a claim is recorded and remains in good standing for two years, it can be renewed annually for an indefinite period. As of 2010, there were approximately 4,364 mining claims scattered throughout the Project Study Area. These are principally concentrated between Thompson and The Pas. The Project Study Area also includes extensive mineral leases particularly surrounding Wekusko Lake and the Town of Snow Lake. In addition, virtually all of the land surrounding PTH 6 between Setting Lake and the City of Thompson is subject to mineral leases. Mineral leases grant exclusive rights to Crown minerals and mineral access rights including the right to work, mine and erect buildings as required for mining and production of minerals. Producing leases are granted 21 year renewable terms. As of 2010, there were approximately 3,812 mineral leases in the Project Study Area.

A quarry permit grants the right to explore for, mine and produce quarry mineral for a period of three years, renewable on a yearly basis. A quarry lease conveys a leasee the exclusive right to Crown quarry minerals as specified in the lease for a period of 10 years. Within the Project Study Area, there were 426 quarry leases registered in 2010.

Aggregate Resources

The Province, through the Provincial Land Use Policies, designates aggregate deposits and quarry mineral potential areas based on importance of the resource. The intent is to protect aggregate and other quarry mineral resources from conflicting land uses. An area designated as "High" is of high quality where no conflicting land uses are allowed. An area designated as "Medium" is considered not of high quality or has not had its full potential proven, and hence a potentially conflicting land use may be permitted in these areas. Areas designated as "Low" indicate a deposit or area of little or no present recognized value where conflicting land uses are permitted. The Province undertakes periodic revisions to the designation of deposits based on continuing exploration, changing economic conditions and improved geological knowledge.

Potential aggregate resources with high, medium and low designations are widely scattered throughout the Project Study Area (Map 6-33). Between Gillam and The Pas, alluvial, glaciofluvial (outwash and ice-contact) and glaciolacustrine deposits are the primary features with sand and gravel. Glaciofluvial deposits are good sources of aggregate, followed by ice-contact deposits (good source of mainly sand and some gravel) and alluvial deposits (good to poor source). The predominant glaciofluvial ice contact deposits with sand and gravel extend from the Bird area, north of Stephens Lake, to Waskaiowaka Lake, north of Split Lake, and are situated at Gillam, southeast along Stephens Lake (Klassen et al., 1985).

In the Thompson area, sand and gravel resources are located on either the Burntwood or Settee moraines. Quality of reserves of sand and gravel are predominantly rated as medium-high to medium[4]. Several deposits located in the vicinity of the Thompson Airport and along the Burntwood moraine (i.e., north of Mystery Lake and Moak Lake) have been identified for protection for mineral extraction (Young, 1982). Aggregate resources in Herb Lake area (around the Town of Snow Lake) include bedrock (dolostone quarries), and sand and gravel deposits. Undeveloped sand and gravel deposits with economic development potential have been identified to the southwest of Wekusko Lake (west of PR 392). Of the aggregate reserves in the Snow Lake area, the majority are of poor quality (Mihychuk, 1993).

North of The Pas, the main sand and gravel deposits include the Reed Lake moraine and the northern extension of The Pas moraine, northeast of Wanless. Several bedrock quarries in the area that have been used as a source of aggregate material (Clarke, 1989), specifically the carbonate bedrock. Most are adjacent to PTH 10 and all have been past producers of crushed stone (Groom, 1989). Surficial deposits of potential economic value in The Pas area include sand and gravel, till and peat. Aggregate resources are

4 Estimated quality of sand and gravel resources are based on percentage of sample gravel content analysis as follows: 80-100 High, 60-80 Medium High, 40-60 Medium, 20-40 Medium Low, and 0-20 Low.

widespread in the southern and western parts of this area, but are scarce in the northeastern quadrant (Clarke, 1989). The majority of all sand and gravel reserves extracted within The Pas region is from beach ridges on The Pas moraine and are classified as either high or medium-high quality (principally along PTH 10 north of The Pas and south of Westray to the junction with PTH 60). Till deposits are also utilized by the RM of Kelsey as fill material, resulting in numerous water-filled pits adjacent to roads. Three such pits have been used in the vicinity of Rahl's Island and Rocky Lake. Sphagnum peat occurs in most bogs and fens in The Pas area. Two locations with sphagnum moss sufficient quality for economic extraction have been identified in the Big Bog area, 80 km south of The Pas along PTH 10 (Singhroy and Werster, 1980).

In the area of Swan Lake to Dauphin, aggregate deposits occur within ice-contact, deltaic and beach deposits, valley terraces and outwash plains adjacent to spillways and meltwater channels. High quality reserves are found in the RM of Park North (west of the Duck Mountains) in the Shell River valley (Mihychuk, 1988). Other high to medium quality aggregate reserves are located in the RM of Shell River, largely within or adjacent to major spillway channels (i.e., Assiniboine River valley, Shell River valley, and Big Boggy Creek valley), and in the RMs of Hillsburg and Boulton associated with the large meltwater channels through the west and central parts of the area (Groom, 1987 and 1992). There are ample reserves of both sand and gravel deposits in the Dauphin area, between the Duck Mountains in the north and RMNP to the south, and stretching to Dauphin Lake and lakes Winnipegosis and Manitoba, including the RMs of Ethelbert, Grandview, Gilbert Plains, Mossey River, Dauphin, Lawrence, Ochre River, Ste. Rose du Lac, McCreary and Alonsa. The majority of these reserves occur in the glaciolacustrine beach ridges (Garnter Lee Associates Limited and Proctor & Redfern Limited, 1978).

Aggregate resources between Russell/Shoal Lake to the Riding Mountain area are principally located in outwash plains, spillway and meltwater terrace deposits, and kame moraines. Sizeable aggregate reserves occur in the RM of Russell of moderate gravel content (i.e., sand and gravel – 40 to 60% gravel), mostly within the Assiniboine River valley. Medium to high deposits (i.e, mainly gravel – more than 60%) gravel content is located along the Birdtail Creek and Heron Creek valleys in the RM of Rossburn. Other deposits consist of a large outwash plain associated with the Assiniboine River valley in the RM of Ellice, with gravel contents ranging from low (i.e., contains mainly sand – less than 40% gravel) to high and a very large aggregate reserve in the RM of Birtle consisting of low to moderate gravel content.

The most important sources of gravel within the RM of Miniota that have been developed are associated with the Arrow River and upper Minnewasta Creek but are only used intermittently (Groom, 1986). The RM of Shoal Lake has no aggregate deposits that are commercially viable (Gartner Lee Associates Limited, 1983). Aggregate resources in the south Riding Mountain area, including the RMs of Park, Strathclair, Harrison, Clanwilliam and Minto, have no high quality reserves, although there are

substantial reserves of medium to high quality sand and gravel. The largest reserves are located within the RM of Park (Young, 1982).

Sand and gravel resources in the Neepawa and Westlake areas, encompassing the RMs of Rosedale, Langford, Glenella, Lansdowne, Lakeview, Westbourne and North Norfolk, are found mainly in glaciolacustrine beach ridges and ice-contact deposits. Several small aggregate resource deposits in the RM of Langford are classified as high (principally in the western half of the municipality). In the RM of Rosedale, the majority of deposits are classified as either medium or high principally between Kelwood and Eden. In the RM of Lansdowne, the aggregate resources are primarily classified as low or medium quality. Only two deposits, in the vicinity of Arden, are classified as high. The extensive beach ridges in the Westlake area contain the majority of sand and gravel reserves, a number of which are of high quality. Most of the sand and gravel reserves are located in two municipalities, Lansdowne and Glenella. The ice-contact deposits, principally found near the community of Glenella, have a lower overall quality as they contain high silt content (Western Groundwater Consultants Ltd., 1981). Low to medium quality sand and gravel resources occur within the RM of North Norfolk.

Large quantities of high, medium, and low quality sand and gravel occur in the Assiniboine Delta region, comprising portions of the Langford, North and South Cypress (The UMA Group, 1977). The largest single sand and gravel feature is the Assiniboine Delta. Sand and gravel beach ridges, deposited near Arden and the community of Edrans, contain significant quantities of medium quality gravel. Other important sources of medium quality gravel are deltaic sand and gravel deposits west of Neepawa and isolated deposits along the Assiniboine River. The overall sand and gravel potential of this region is high. Sizeable sand and gravel deposits are found in the Minnedosa River valley associated with the Minnedosa Till Plain, encompassing portions of Langford, Elton, and Daly and all of Odanah, Saskatchewan, Blanshard and Hamiota. The quality of the material associated with deposits formed by the Minnedosa River spillway ranges from medium to high. Overall, sand and gravel potential of the entire Minnedosa Till Plain is moderate. The largest and most complex sand and gravel occurrence in the Souris Basin region extends into the RMs of Elton and Daly and is associated with the Minnedosa River outwash delta, extending southwest from Rivers to the Assiniboine River valley. The quality of sand and gravel ranges from high to medium to low.

The south central area and portions of the region around Winnipeg, including the RMs of Victoria, South Norfolk, Portage la Prairie, Grey, Dufferin, Macdonald, Ritchot, Cartier, St. Francois-Xavier, and Rosser have relatively limited aggregate resources. Only the RMs of Victoria, South Norfolk and Rosser have sand and gravel deposits of potential. In the RM of Victoria, deposits are primarily located within the alluvial floodplain of the Assiniboine River and are generally of poor quality (i.e., less than 25% gravel content) with limited zones of medium to high quality material (i.e., greater than 25% gravel content), with the latter deposits largely depleted. Other sources of aggregate

include shale bedrock deposits located south of Holland (The UMA Group, 1984). Within the RM of South Norfolk, sand and gravel resources are associated with the Assiniboine River, beach deposits and the Darlingford Moraine. Sand and gravel reserves within six glaciofluvial deposits located in the southern portion of the municipality have the highest potential for development, including one bedrock deposit just south of Treherne (Young, 1988). Five aggregate resource areas in the RM of Rosser have been classified with moderate potential. The RM of Ritchot has no identified aggregate resources.

Sand and gravel resources in the RMs of Hanover, Ste. Anne and Tache comprise beach ridges, glaciofluvial deposits and deltaic deposits. The beach ridges deposits are largely depleted. Larger quantities and better quality gravel is normally associated with the glaciofluvial deposits. Glaciofluvial deposits in the Blumenort area in the RM of Hanover are kame terraces that have been largely depleted. A kame terrace deposit in the RM of Ste. Anne, north of PTH No. 1 and east of Town of Ste. Anne, contains medium high quality gravel that is being mined. Deposits in the RM of Tache are concentrated in the eastern part of the municipality. One deposit located east of PTH 12 in Township 9, Range 7E is the centre of sand and gravel extraction within the municipality. Other deposits of medium quality beach gravel and eskers are located further to the east at Ste. Genevieve (Manitoba Department of Energy and Mines, 1979). Energy and Mines has further assigned development status to aggregate deposits within the RM of Tache, based on "stop, caution, go" criteria. Forty-two deposits have either been classified as either "stop" or "caution".

In the RM of Springfield, outside of the Birds Hill complex, sand and gravel resources in the Anola, Vivian, Ostenfeld and Monominto areas are of low to high quality, many of which have been depleted (Manitoba Department of Energy and Mines, 1979). Aside from one high quality deposit just north of PTH 15 (east of PR 207), the remaining high quality deposits are either within the Birds Hill complex further north or in the eastern portion of the municipality.

6.3.2.4 Trapping

The registered trapline system is a provincially (Manitoba Conservation) administered commercial furbearer harvest management system whereby the registered trapline holder is granted the exclusive opportunity to harvest furbearing animals in an individual trapline. The system is intended to facilitate sustainable furbearer populations by controlling the number of trappers harvesting in a trapline and by making the registered holder the steward of the resource. In Manitoba, the trapping season generally extends from October to May.

The registered trapline system identifies trapline districts within which trapline sections are identified surrounding communities. There are 21 trapline sections either partially or entirely in the Project Study Area as follows: Limestone, Camper Duck, Camper Duck

A, Camper Duck B, Duck Mountain, Easterville, Flin Flon, Porcupine, Split Lake, Snow Lake, Moose Lake, Pikwitonei, Cormorant, Nelson House, Sherridon, Cranberry Portage, Thicket Portage, Pukatawagan, Red Deer/Shoal River and Wabowden. Within each trapline section, individual traplines are identified and can be allocated to registered trapline holders. The trapline sections of Red Deer/Shoal River, Camper Duck, Camper Duck A and Camper Duck B do not have associated individual traplines.

There are approximately 343 Registered Traplines (i.e., smaller administrative units given to trapline holders) either partially or entirely located within the Project Study Area. Included as part of the registered traplines within the Project Study Area are several youth traplines in the vicinity of the communities of Flin Flon, Snow Lake, Cormorant and The Pas, as well a community trapline around Pukatawagan.

Trapping records obtained from Manitoba Conservation identify relatively common and uncommon furbearer species found south of the Red Deer/Shoal River and Porcupine Mountain area in the west-central part of the Project Study Area (i.e., east of Lake Winnipegosis [Dawson Bay]). In all, seventeen different species, including the listed species wolverine, have been identified on traplines in this area. In descending order of occurrence, the most common species trapped in southern Manitoba between 1996 and 2008 included beaver, muskrat, and marten. Species that were rarely trapped included wolverine, badger, and raccoon.

In addition, in the Project Study Area, there are four Special Trapping Areas (STAs) as follows: Saskeram, Clearwater, Easterville and Summerberry. The SPA designation allows for greater flexibility in the regulation of trapping related matters unique to the local environment. For example, the Summerberry STA was established to allow for unique administrative and regulatory requirements directed at muskrat management within the Saskatchewan River Delta.

The Project Study Area contains 8.9 million hectares of RTLs, as well as STAs. The sections included in the Project Study Area are illustrated in Map 6-34. Trapping records obtained from Manitoba Conservation identify eighteen furbearing species harvested from registered traplines in the Project Study Area. In descending order of occurrence, the most common species trapped in the northern portion of the study area between 1996 and 2008 included beaver, marten, and muskrat. Species that were rarely trapped included black bear, and wolverine.

With the exception of the Western RTL District, there are no registered trapline sections in the southern portion of the Project Study Area. The south is covered by four Open Trapping Zones (1, 2, 2A and 3). There is also an Open Trapping Zone (5) surrounding The Pas. In descending order of occurrence, the most common species trapped between 1996 and 2008 in the Open Trapping Zones included beaver, marten, and muskrat (Manitoba Conservation unpublished data 2009).

6.3.2.5 Amphibian and Reptile Commercial Harvest

In Manitoba, commercial amphibian harvesting has occurred since at least 1920 (Seburn & Seburn 1998). Historically, species such as the tiger salamander, northern leopard frog, and the plains spadefoot were harvested, the former two commercially and were sold to biological supply houses and dealers in Canada, the United States and Europe. In 1988, commercial harvesting of snakes was suspended due to concerns of low garter snake population concentrations. Since 2004, only one Amphibian and Reptile Dealer Licence has been issued annually by Manitoba Conservation, and only for the collection of northern leopard frogs. Manitoba Conservation also sells several Family and Individual Licences to catch and sell amphibians, and these harvests are generally sold to dealers. Although harvest locations are unknown, harvesters from 2007 to 2009 resided in the communities of St. Laurent, Crane River, Vogar and Ebb and Flow. It is likely that most of the harvesting would have occurred in the vicinity of these communities, of which Ebb and Flow and Crane River are located in the Project Study Area.

6.3.2.6 Commercial Fishing

Aquatic resource use within the Project Study Area is diverse (Section 6.2.4) with multiple stakeholders and/or interest groups. Factors that dictate resource use include: water body type (e.g., riverine versus lacustrine), accessibility, desirability of fish species, water abundance, and water quality.

Commercial fishing is an important industry in Manitoba and is a major source of income for northern Manitoba and some interlake communities. The industry is controlled by Federal and Provincial jurisdictions that govern the allocation of licenses, determine fishing periods, establish quotas, and sanction specific types of fishing gear. Within the Project Study Area, the water bodies of the Nelson and Saskatchewan river basins, and lakes Manitoba and Winnipegosis represent a significant part of the Manitoba commercial fishing industry.

In the Nelson River basin, water bodies in the Project Study Area that support round weight commercial fishing quotas ≥ 20,000 kg are: Split Lake, Setting Lake, Wekusko Lake, and Pakwa Lake. In the Saskatchewan River basin, water bodies meeting these criteria include: North and South Moose Lake, Cormorant Lake, Cedar Lake, and the Saskatchewan River. Lake Manitoba and Lake Winnipegosis both support substantial Manitoba commercial fisheries. In the 2006/2007 season, these lakes produced 6.3% and 9.7% of Manitoba's summer seasons production, and 28.7% and 27.2% of the winters production, respectively. These lakes also employed, on average, 817 and 324 individuals (26% and 10% of all commercial fishing employees), respectively, in the 2006/2007 season (Manitoba Water Stewardship 2010a).

Commercially fished lakes are governed by restrictions on seasons, mesh size extensions, and quotas per fish species harvested. The primary fish species subjected to commercial

quota restrictions in the Project Study Area include lake whitefish, pickerel, sauger, northern pike, lake trout, and goldeye. Species such as lake cisco (classified as tullibee), longnose sucker, and white sucker (both classified as mullet), and carp are not subject to quotas, but contribute significantly to the total commercial harvest of some lakes (Manitoba Water Stewardship 2010a).

Bait Fishing

Bait fish include a number of smaller fish species such as ciscoes (sub-family Coregoninae), minnows (family Cyprinidae), and suckers (family Catostomidae). Licensed commercial bait fishermen may collect, buy, and sell bait fish from assigned bait-fish blocks. In 2009, active bait-fish blocks in the Project Study Area included Reed Lake, Wekusko Lake, Cormorant Lake, Lake Winnipegosis, Cooks Creek, the Red River, and the Saskatchewan River.

6.3.2.7 Wild Rice Harvesting

Wild rice is Manitoba's only native cereal. Lakes that are suitable for the production of wild rice are generally shallow, sheltered, have good water flow, provide minimal competition from other species of aquatic macrophytes, and have relatively good water clarity. The highest concentration of wild rice leases are found between the 53rd and 56th parallels, north of Cranberry Portage, and adjacent to Sherridon Lake road. Dyce, Cormorant, Dolomite, Hargrave, North Moose, South Moose, Reed, and Wekusko are lakes within the Project Study Area licensed for commercial wild rice harvesting. Wild rice harvesting generally occurs from August to October, weather and crop depending. Rice harvesting is done via mechanical or hand harvesting methods.

Manitoba's wild rice harvesting is governed by *The Wild Rice Act* (1984). The Act states that persons harvesting rice require a license to harvest, excluding First Nation members, who may harvest rice for household purposes in areas designated for harvesting. The Province of Manitoba issues two types of wild rice licenses to anyone interested in wild rice production: development license and production license. Development licenses are initially issued to all applicants for a three-year period during which the licensee has the right to test seed and develop the license area. A development license can be converted to a production license if production meets or exceeds 500 pounds of wild rice per year. In addition, ten-year block licenses are issued to First Nation community areas with provision for issuance of sub-licenses. There are 40 development licenses, 108 production licenses and 1 block license within the Project Study Area (J. Bannerman, Crown Land and Property Agency, pers. comm. 2010).

6.3.2.8 Recreation and Tourism

Lodges, Campgrounds and Resort Areas

There are numerous lodges operating within the Project Study Area (Map 6-35). Table 6.3-9 provides a listing of the lodges, their capacity, along with the services they provide. A number of lodges offer guiding, fishing, and hunting for bear, moose, waterfowl and upland game birds. In addition, a few lodges offer nature tours. Some have outcamps, which offer accommodations, located away from the main lodge, as well as campgrounds.

A large number of the lodges are located between The Pas and Flin Flon, as well as in the vicinity of the Grass River Provincial Park and Wekusko Lake. There are also several lodges in Paint Lake Provincial Park, on the Nelson River, as well as in the vicinity of Waskaiowaka Lake. In the southern portion of the Project Study Area, there are lodges in the vicinity of Duck Mountain Provincial Park, as well as Dauphin Lake and to the west of Lake Winnipegosis.

Table 6.3-9: Active Lodges and Outfitters Located in the Project Study Area

Name of Lodge	Main Lodge Location	Capacity / Services	Lake / Outcamp Location
Dunlop's Fly-in Lodge and Outpost (Fly-in)	East side of Lake Waskaiowaka at the mouth of the Little Churchill River	Capacity - 16 Guiding, fishing for northern pike, walleye, whitefish; hunting for non-resident bear.	Waskaiowaka Lake
Mystery Country's Paint Lake Resort	Paint Lake Provincial Park	Capacity – 34 Guiding, fishing for northern pike, walleye, perch, whitefish and burbot; hunting for resident and non-resident bear and moose.	Paint Lake
Sasagiu Rapids Lodge	Wabowden	Capacity – 34 Guiding, fishing for northern pike, walleye, whitefish and sauger; hunting for non-resident bear and moose and waterfowl and upland game bird.	Setting Lake
Burntwood Lake Lodge (Fly-in)	Burntwood Lake	Capacity – 28 Fly-out service, outcamps on Niblock, Dow and McGhee lakes, guiding, fishing for walleye, northern pike, perch and whitefish.	Niblock, Dow and McGhee Lakes
Kississing Lodge (Fly-in)	Kississing Lake	Capacity – 36 Fishing for northern pike, walleye and lake trout.	Kississing Lake / Allen Lake Twin Falls, Barnett, Cairns, Siers, Crow, Tait, and Hasset Lakes
Kenanow Lodge (Fly-in)	Kississing Lake	Capacity – 20 Fishing for lake trout, northern pike and walleye	Kississing Lake
Grass River Lodge	Grass River Provincial Park	Capacity – 42 Fly-out service, outcamps at Dolomite, Takipy, Moody and File lake, fishing for northern pike, walleye and lake trout.	Reed Lake / Dolomite, Takipy, Moody and File Lakes
Sharron's Outfitting Services	Kississing Lake	Capacity – 16 Fishing for lake trout, walleye and northern pike.	Kississing Lake
Wekusko Falls Lodge	Snow Lake	Capacity – 28 Guiding, fishing for walleye, northern pike, whitefish, rainbow	Snow Lake

Name of Lodge	Main Lodge Location	Capacity / Services	Lake / Outcamp Location
		trout and lake trout; hunting for non-resident black bear; winter ice fishing and snowmobile packages.	
Tawow Lodge	Snow Lake – Herb Lake Landing	Capacity – 28 Outcamps at Woosey Lake, guiding, fishing for walleye, northern pike, sauger and perch.	Wekusko Lake / Woosey Lake
Westwood Lodge	Flin Flon – Big Island Lake	Capacity – 27 Outcamps at Kisseynew and Kipahigan lakes, guiding, fishing for lake trout, northern pike and walleye; hunting for non-resident bear.	Kisseynew and Kipahigan Lakes
Bakers Narrows Lodge	Athapapuskow Lake	Capacity – 90 Fly-outs to day lakes, guiding, fishing for walleye, northern pike, lake trout, burbot, perch, smallmouth bass and rainbow trout.	Fly out to day lakes
Neso Lake Adventures	Cranberry Portage	Capacity – 12 Fly-outs available, guiding, fishing for walleye, northern pike and lake trout.	Athapapuskow Lake
Paradise Lodge	Flin Flon	Capacity – 47 Guiding, fishing for lake trout, walleye and northern pike.	Athapapuskow Lake
Aberdeen Lodge	Athapapuskow Lake	Capacity – 25 Guiding, fishing for lake trout, northern pike, walleye, speckled trout, rainbow and burbot.	Athapapuskow Lake
Viking Lodge & Campground	Grass River Provincial Park	Capacity – 17 cabins Fly-out, guiding, fishing for walleye, northern pike and lake trout, hunting for non-resident spring and fall bear and waterfowl and upland game bird.	First Cranberry Lake / Pothier and Nokomis Lakes
Caribou Lodge	Grass River Provincial Park	Capacity – 46 Guiding, fishing for northern pike, walleye, brook, rainbow and lake trout; hunting for non-resident bear.	First Cranberry Lake
Northern Spirit Lodge	Cranberry Portage	Capacity – 27 Guiding, fishing for lake trout, northern pike, walleye and	Athapapuskow Lake

Name of Lodge	Main Lodge Location	Capacity / Services	Lake / Outcamp Location
		rainbow trout.	
Simon Nabess Wayside Park	Cormorant Lake	Capacity – 12 Guides, ice fishing, trap line and ecotourism tours. Fishing for northern pike, walleye, smallmouth bass, rainbow trout and lake trout. Hunting for non-resident bear, resident moose, waterfowl and upland game bird	Cormorant Lake
Kum-Bac-Kabins	Rocky Lake	Capacity – 56 Guides, private boat launch and docks, campground, fish processing, tackle, bait, licences. Fishing for walleye, northern pike, tullibee and smallmouth bass.	Rocky Lake
Rocky Lake Cabins	Wanless	Capacity – 24 Fishing for walleye, northern pike, smallmouth bass, whitefish and tullibee.	Rocky Lake
Carpenter's Clearwater Lodge	Clearwater Lake Provincial Park	Capacity – 29 Guides, winter ice fishing. Outcamp at Heming Lake. Fishing for lake trout, northern pike, smallmouth bass, walleye, brook trout and rainbow trout. Hunting for waterfowl.	Clearwater Lake / Heming Lake
Evergreen Resort	Clearwater Lake Provincial Park	Capacity – 26 Fishing for lake trout and northern pike. Hunting for non-resident bear and waterfowl.	Clearwater Lake
M & M Outfitting	The Pas	Capacity – 16 Hunting guides, nature tours, snowmobiling, cross-country skiing. Hunting for resident black bear, resident moose, waterfowl and upland game	The Pas
Trapper Don's Lodge and Outfitting Services	Cowan	Capacity – 12 Guides, hunting licences, game processing. Hunting for waterfowl and upland game bird.	Pelican Lake
Wellman Lake	Duck Mountain	Capacity – 38	Wellman Lake

Name of Lodge	Main Lodge Location	Capacity / Services	Lake / Outcamp Location
Lodge	Provincial Park	Fishing for lake trout, rainbow trout, smallmouth bass, northern pike, walleye, perch and arctic char.	
Childs Lake Lodge	Duck Mountain Provincial Park	Capacity – 28 Guiding, hunting for non-resident bear and whitetail deer.	Childs Lake
Blue Lakes Resort	Duck Mountain Provincial Park	Capacity – 29 Fishing for lake trout, rainbow trout, brook trout, perch, walleye, smallmouth bass, northern pike and splake.	East Blue Lake
Einarsson's Guide Service	Gypsumville	Capacity – 16 Guiding, fishing for walleye, northern pike; hunting for non-resident black bear.	Dauphin River
Kilman Resort	Lake of the Prairies	Capacity – 34 Fishing for northern pike, walleye, rock bass and perch.	Lake of the Prairies
Prairie Lake Lodge	Lake of the Prairies	Capacity – 30 Guiding, fishing for walleye, northern pike, perch, fly-fishing for trout; hunting for waterfowl and upland game birds	Lake of the Prairies

Source: Travel Manitoba 2011.

Resorts and campgrounds are generally found within or in the vicinity of parks and communities in the Project Study Area. In terms of campgrounds, many offer accommodations for recreational vehicles and tents, and operate primarily during the summer months between May and September. Locations of resorts and campgrounds in the Project Study Area are listed in Appendix 6B Table 6B-8. Most are located in the southern part of the Project Study Area.

Hunting and Outfitting

There are numerous outfitters operating in the Project Study Area. These include those offering big game hunting services such as those with non-resident bear, moose and deer hunting allocations. There are also numerous waterfowl and game bird outfitters that operate throughout the Project Study Area. Allocation areas for black bear and moose are regulated by Manitoba Conservation with specific lands or licences allocated to outfitters for this purpose. Deer outfitters are allocated non-resident licenses on a Game Hunting Area (GHA) basis and waterfowl outfitters can operate anywhere in the province where seasons permit. In order to outfit non-resident big game hunters, outfitters must acquire an allocation of non-resident licences from Manitoba Conservation. For outfitters that engage in fishing activities, lakes are allocated to the applicant. In Manitoba, all outfitters operating as a business require a Resource Tourism Operators Licence with the exception of those engaging only in ecotourism activities on private land (Manitoba Conservation, 2008). Outfitting businesses tend to involve either the consumption of wildlife or fisher resources, or ecotourism activities such as rafting, canoeing, hiking, wildlife viewing, horseback riding, and boat tours. Currently, there are 78 known outfitters operating in the Project Study Area. Outfitters that wish to construct lodges, outcamps, portable camps, campgrounds, or related facilities must apply for a permit to do so (Manitoba Conservation 2008).

In Manitoba, a licence is required in order to hunt big game and game birds. Licenses are not required for small game such as rabbits. Furbearing animals, such as fox and red squirrel, may only be taken in season under a trapping licence (Government of Manitoba, 2009). Hunting is allowed on all open Crown land, as well as specified wildlife management areas, leased Crown lands, provincial parks, provincial forests. Hunting on private land, community pastures and some Federal lands is also permitted when permission is obtained from the owner.

The regulated hunting season generally begins in early September, though specific hunting seasons vary based on species, Game Hunting Areas (GHAs) and Game Bird Hunting Zones (GBHZ) where hunting takes place and method of hunting (ie. Rifle, archery, etc.). Methods of hunting may include Centrefire Rifles, Shotguns, Muzzleloaders, Bows, Crossbows, depending on game hunted and season (Manitoba Conservation, 2011). Big game seasons (including black bear, white-tailed deer, gray wolf, coyote, elk, caribou, and moose) generally begin at the beginning of September and

end in December. Licenses for hunting white-tailed deer, gray wolf, coyote, and black bear are based on season, not area. Other species licenses are only valid in the specified GHA. Bag limits are normally one animal (e.g,, bull elk, bull moose, wolf, ect) in a GHA, though some exceptions exist in specific areas. As of 2011, a number of GHAs have been restricted or closed for moose hunting to allow populations to recover from decline, including GHAs 13, 13A,14, 14A, 26, 18, 18A, 18B and 18C and parts/sections of GHAs 2A, 4, 7A and 17A. Based on game hunting statistics for Manitoba's GHAs, 12,818 black bears, 3,798 elk, 9,435 moose and 78 caribou were harvested between 1993 and 2007.

Across the Province, areas for bird hunting are broken into Game Bird Hunting Zones (GBHZs) 1, 2, 3, and 4. Upland and game bird seasons (including Gray (Hungarian) partridge, grouse, ptarmigan, wild turkey, and migratory game birds including other ducks, coots and snipe, dark geese, white geese, snow geese, and sandhill cranes) begin in September and end in late December (with exception ptarmigan, which ends in February). Wild turkey hunting season also differs from other bird hunting seasons, with turkey hunting running from April to May, and the first two weeks in October. Total bag possession for birds for resident hunters per season varies from 8 to 20 upland game birds, 1 turkey, and 15 to 80 migratory game birds, with ranges varying based on species and time of year.

A number of GHAs and GBHZs are in the Project Study Area [Map 6-36]. Within Manitoba Conservation's Northeast Region, including GHAs 3, 9, 9A and 10 (part), there are seven outfitter allocations in the Project Study Area. Manitoba Conservation's Northwest Region includes GHAs 6A, 7, 7A, 8, 10 (part) and 11. There are eight outfitter allocations in these GHAs encompassing the Project Study Area. The Western Region of Manitoba Conservation includes GHAs 12, 14, 14A, 18B, 19A, 19B, and 24. There are 48 outfitter allocations in these GHAs encompassing the Project Study Area. In Manitoba Conservation's Central Region, which includes GHAs 25B, 30, 31, 32, 33 and 34A, there are 18 outfitter allocations within the Project Study Area. Parts of GBHZs 1, 2, 3 and 4 are in the Project Study Area.

Sport Fishing

Sport fishing occurs throughout the Project Study Area. Fish species in the Project Study Area targeted by sport fishers include pickerel, sauger, northern pike, yellow perch, lake trout, brook trout, rainbow trout, goldeye, cisco, lake whitefish, brown bullhead, channel catfish, burbot, and freshwater drum. A survey undertaken in 2000 of licensed anglers in Manitoba estimated that $120 million was directly spent on recreational fishing, and that $60 million of the total was spent by tourists.

In particular, stocked lakes attract sport fishers targeting rainbow trout, pickerel, sauger, and brook trout. Lakes with naturally occurring lake trout populations, such as Clearwater, Paint and Cormorant lakes, also attract fishers for the angling experience.

Much of the sport fishing in the northern portion of the Project Study Area is limited by lack of road access. However, water bodies in this area are accessible for sport fishing via fly-in lodges and outfitters.

Adventure Travel and Eco-tourism

Many adventure travel and eco-tourism activities occur in the Project Study Area, including: bird and wildlife viewing; hiking and nature interpretation; canoeing/kayaking; mountain biking and adventure racing/orienteering; equestrian; snowshoeing, dog sledding and cross-country skiing; Aboriginal traditional experience; and local festivals. Adventure travel and eco-tourism is often explored through self-directed activity, however many organizations which provide a guided experience operate in the Project Study Area.

Riding Mountain/Churchill Nature Tours is a wildlife viewing company that offer tours in southern and northern Manitoba, which include locations such as Delta Marsh, Shilo Plains, Douglas Marsh, and Riding Mountain National Park. Tours are facilitated by experienced naturalists and are tailored to provide customers with an overview of the natural and human history of the region visited.

Rivers Run Wild Tours offer canoe trips throughout a number of northern rivers including the Limestone, Hayes, and Churchill Rivers. Frontiers North Adventures offers "The Black and White Bear Adventure" allowing customers to experience a multi-day and multi-regional look at Manitoba's bear populations in Riding Mountain National Park and Churchill, the latter which is outside the Project Study Area.

Grass River Provincial Park has three main campgrounds; Gyles Lake, Iskwasum Lake, and Reed Lake Campgrounds. Users can hike, paddle and portage throughout the extensive network of river systems and discover designated satellite campground locations. Opaspuia Tours is located in The Pas and offers nature and heritage tours which specialize in bringing the fur trade to life, and is guided by a certified heritage interpreter.

The Kamsack Ski Club out of Swan River is the regional cross-country ski organization that maintains trails and organizes ski events in the Duck Mountain Provincial Forest. The Rivendell Cross-Country Ski organization maintains and grooms track ski runs in the Assiniboine Valley near Russell and Roblin.

The Parkland Ranch, located in Inglis, offers accommodations, and is a professional horse training ranch that provides customers with an equestrian experience which includes horse training and care, trail rides, riding excursions, cattle drives, fishing and canoeing.

Based out of Dauphin, White Pelican Kayak Tours offers multi-day adventure guiding which incorporates hiking, portaging, mountain biking and paddling. Tour locations available include Clear Lake, Lake Winnipegosis, and Riding Mountain National Park.

Riding Mountain National Park (RMNP)offers many natural attractions to users including camping, hiking, cycling, snowshoeing, cross-country skiing, interpretive tours, self-guided trails, and wildlife viewing, and equestrian. Old Surrey Station and Clear Lake Bike Rentals provide customers with access to a variety of bicycle types for the enjoyment of RMNP's extensive network of bicycle trails. Elkhorn Resort is located in the vicinity of RMNP and facilitates a variety of adventure, travel and econ-tourism activities. The rental shop has snowshoes, skates, cross-country skis, mountain bikes, and toboggans, and horseback riding is also available in the area. The Great Canadian Travel Company provides black bear viewing in RMNP.

The Manitoba Orienteering Association is the governing body in Manitoba who promotes the sport of orienteering, which involves technical and physical navigation throughout a carefully mapped course. Participants use a compass and generalized topographic map to determine locations of a number of checkpoints. The association promotes and plans out events throughout the Province.

Swamp Donkey Adventure Racing is Manitoba's premier adventure racing organization. Adventure racing is a dynamic sport which involves a variety of physical challenges that may include orienteering, running, hiking, paddling, cycling, portage, climbing and repelling over an extended period of time and geography. Adventure racing can include multi-hour or multi-day races. Swamp Donkey organizes various events throughout southern Manitoba.

Many local festivals that celebrate natural and human history occur throughout the Project Study Area including: Festival du Voyageur – occurs every February in Winnipeg at Fort Gibraltar and celebrates Canada's fur trade era; Northern Manitoba Trapper's Festival – takes place in The Pas every February and celebrates the cultural heritage of the northern pioneers; Dauphin Countryfest – celebrates country music with top artists from around the world every July; World Lily Festival – celebrates lillies and takes place annually in Neepawa every July; Folklorama – occurs annually in Winnipeg every July and August and showcases a variety of cultures that have made Canada their home; and Manito Ahbee – celebrates Aboriginal culture and occurs in Winnipeg every November (the Tourism Company, 2002).

Recreational Resources

Recreational Trails

The majority of the designated recreational trails outside of established parks within the Project Study Area are located in the parkland and south-central areas of Manitoba. The southern recreational trails are located in the vicinity of the Town of Carman, along the Seine River in Winnipeg and other locations (e.g., Transcona trails, Fort Whyte Alive), in the Town of Treherne and the Boyne River Valley, the Vermillion River Trail in Dauphin, and the Assessippi ski area in the Assiniboine Valley. Northern recreation trails

include a trail in The Pas/RM of Kelsey, The Kwasitchewan Falls Trail along the Grass River, and the Thompson Trail around the City of Thompson (Manitoba Recreational Trails Association, 2010).

Of the known recreational trails, the TransCanada Trail (TCT) is the most extensive through the Project Study Area (Map 6-35). The TCT crosses southern Manitoba meandering through four natural regions including: Tall Grass Prairie, Assiniboine Delta, Mixed-grass Prairie and Western Uplands. Trail length through these natural regions is approximately 984 km stretching along a route south of the City of Winnipeg to Duck Mountain Provincial Forest at the Manitoba/Saskatchewan border.

Cross Country Trails and Downhill Skiing Areas

Downhill skiing areas and cross country skiing trails are maintained in a number of locations within the Project Study Area, particularly within the parks. Walking trails are groomed after snow fall and converted for the winter season. Several prominent locations within the Project Study Area include:

- Ski Valley Minnedosa located north of the Town of Minndosa;
- Asessippi Ski Area; located in the Asessippi Provincial Park;
- Mystery Mountain located 20 km north of Thompson;
- Beaudry Provincial Park (16 km of groomed trails) west of the City of Winnipeg;
- Spruce Woods Provincial Park (60 km of groomed trails) east of the City of Brandon;
- Riding Mountain National Park (260 km of groomed trails) south of the City of Dauphin;
- Bittersweet Cross Country Ski Trails; west of the junction of PR 242 and Assiniboine Hills Trail, north of the Assiniboine River in the RM of South Norfolk;
- Langford Winter Park seven km east of Neepawa on the south side of PTH 16;
- Rivendell Cross Country Ski Area; located one km west of PTH 83, 23 km south of Roblin (25 km of groomed trails for cross country and uphill skiing);
- One facility located to the south of the City of Flin Flon; and
- Snowmobiling.

There are numerous snowmobile trails within the Project Study Area. Trails have been developed in Provincial Parks and by local snowmobile clubs which maintain trails for their particular communities. With the exception of the Snow Lake, Thompson, and Paint Lake Provincial Park areas, the majority of established snowmobile trails are south of Snow Lake. For the year 2010, there were 20 snowmobile clubs operating trails within

the Project Study Area (Map 6-35). In addition to the club snowmobile trails, Porcupine Provincial Forest, Paint Lake, Grass River, Clearwater Lake, Spruce Woods, and Duck Mountain Provincial Parks contain numerous snowmobile trails and warming shelters.

Municipal Recreational Facilities

Municipal recreational facilities exist throughout the Project Study Area. These include municipal parks, community centers, golf courses, and other recreational sports fields. Most of these facilities are located in the vicinity of communities throughout the Project Study Area. To the extent that some are located in rural or non-urban areas, these are identified and their coordinates listed in Appendix 6B Table 6B-9.

Attractions, Museums, Historical Landmarks and Travel Routes

Tourism attractions, museums and historical landmarks are found in a variety of locations across the Project Study Area. Travel Manitoba has identified primary tourist attractions in different areas of the province. RMNP and Manitoba's Museum of Agriculture, which is located in Austin, are two located in the Project Study Area. Other attractions are educational such as the Interpretive Centre in Ste. Agathe and forestry tours of Tolko Industries in The Pas.

Historic landmarks are found across the Project Study Area. These include original homesteads, schools which are no longer used, etc. There are eight main historic travel routes in the Project Study Area. These include: the Northern Woods and Water Route (PTH 6 and 68) from Winnipeg to The Pas; Yellowhead Route (PTH 16) from Winnipeg to Russell and Saskatchewan; Red Coat Trail (PTH 2) from Winnipeg to Souris; Lord Selkirk Highway (PTH 75) from Winnipeg to Emerson; Assiniboine Trail (PTH 26) from Winnipeg to Portage la Prairie; Dawson Trail (PR 207) from Winnipeg to Richer; Park's Route (PTH 5) from the Canada-US border through McCreary; and MOMs Way (PTH 12) from the Canada-US border to Ste. Anne.

Designated Canoe Routes

An extensive network of lakes, rivers and streams dominate the landscapes within the Project Study Area, much of which is navigable. Designated canoe routes involving major lakes and rivers have also been established to help promote outdoor recreation. There are nine designated canoe routes in the Project Study Area (Map 6-35). These are as follows: Grass River, Land of Little Sticks, The Middle Track and Hayes River, Chain Lakes, Blue Lake, Beaver Lake, The Waterhen Country, Assiniboine River, and Riviére Aux Rats canoe routes.

6.3.2.9 Domestic Resource Use

An Aboriginal Traditional Knowledge (ATK) process was created for the Project. The process involved community participation in ATK workshops or community-led studies (Chapter 5, and *Bipole III Aboriginal Traditional Knowledge Technical Report*). Information obtained through the ATK process assisted in providing information on domestic resource use in the Project Study Area.

Domestic resource use includes hunting, fishing, trapping and gathering. The last type of resource use can include the collection of berries, medicinal plants, tree products (culturally modified trees) such as birch bark stripping for baskets, art, diamond willow carving and other cultural products, fire wood gathering, and harvesting of herbs for smudging, blessing and other ceremonial purposes. Communities in the Project Study Area use a wide array of plants and animals for traditional purposes. Resources are harvested throughout the year for specific seasonal resources. For example, waterfowl hunting typically occurs more frequently in the spring and fall, while small furbearers are typically harvested through the winter and fishing occurs throughout the year. Often more than one domestic resource activity takes place at the same time; for example, fishing often supplements hunting and is sometimes considered a survival food.

Resource Gathering

Plants important to Aboriginal people for medicine, food, cultural and other purposes were identified through the ATK process and included, but was not limited to, areas within wetlands, uplands and in areas of sandy soils. More than 80 plant species of traditional value were noted as being used through the ATK process (Appendix 6B Table 6B-10).

Plants are used to treat a range of ailments such as headaches, colds, upset stomachs, toothaches, sinus congestion, sunburn, diaper rash and other aches and pains, while more serious illnesses such as heart problems, arthritis, migraines, sore throats, infections, toothaches, burns are handled by combinations of measured plant product usually administered by a medicine man or woman who is recognized by the community as an expert in their field. These pharmaceutical plants are used carefully to contribute to the general well being of those persons who ask for help.

Plant and berry harvesting typically occurs close to a community although people will travel longer distances to harvest specific plants. Berries and other edible plants are generally harvested during late summer through to fall freeze-up, while medicines are harvested throughout the year. The same plant may actually be harvested at different times of the year for specific parts; for example, strawberry flowers, berries and roots serve different medicinal purposes and are picked in spring, summer and fall.

A number of communities in the Project Study Area harvest trees for a variety of purposes including firewood, birch and maple trees for sap, rind and roots, diamond

willow for carving, walking sticks and ornaments, and cedar for medicine, as well as collecting driftwood for crafts such as baskets.

Herbs and plants such as mint, tamarack, sweet grass, Labrador tea, sage, Seneca root, pitcher plant, and ginger root were noted throughout the Project Study Area for their medicinal qualities. Some were used together for more complex concoctions and infusions. Some plants were noted as being used historically and are no longer found or are found in limited supply (Daniels et al. 2011). Berries harvested include blueberries, strawberries, saskatoons, raspberries, cloud berries, and cranberries.

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). Through the ATK process, the communities of Pikwitonei, Thicket Portage, Barrows, Duck Bay, Cormorant, Camperville, Pine Creek and Herb Lake Landing identified community plant harvesting for medicinal purposes and berry harvesting of strawberries, raspberries and saskatoons; and community firewood gathering. Community members of Dawson Bay participate in community and family plant harvesting (i.e., blueberries, strawberries, raspberries, cranberries, chokecherries, moss berries, sweet grass and maple tree sugar tapping) for subsistence, traditional medicines and economic gain, and firewood.

Chemawawin First Nation and the community of Easterville's traditional gathering activities include: berry harvesting (i.e., strawberries, raspberries, blueberries, chokecherries); harvesting of plants (i.e., Seneca root, ginger roods) and herbs for ceremonial or medicinal purposes, as well as for supplemental income; and tree harvesting for logs and other uses (i.e., cedar for medicine, firewood for heating homes, driftwood for crafts [birch baskets]). Wuskwi Sipihk First Nation indicated that members gather Seneca root, sweet grass, maple sap and eggs, along with berries and wild rice gathering and sowing.

Dakota Plains First Nation indicated members harvested plants and berries in the fall including cranberries, chokeberries, raspberries, plums, saskatoons, wild onions, wild turnips, wild garlic, cattails and sage, as well as other plants for medicinal use. Dakota Tipi First Nation members also harvest berries and plants. Long Plain First Nation indicated that members collect berries (raspberries, strawberries, grapes, plums, rhubarb, crap-apples, saskatoons, chokecherries, cranberries, pin cherries, gooseberries, nana berries, and sand cherries; red willow bark; medicinal herbs for smudging, blessing and purifying and other plants (seneca root, wee-kaa root, sweet clover, little red cherries, bark, skunk grease, and sage use for a variety of purposes.

Fox Lake Cree Nation and Tataskweyak Cree Nation identified general plant harvesting and gathering locations in the vicinity of the northern Project components.

Fishing

Domestic fishing occurs throughout the year in the Project Study Area. Major species targeted include lake whitefish, pickerel and pike. Lake sturgeon has also been harvested traditionally where they occur. In addition, trout have been identified as an important fish species in creeks in the Gillam area. Other species harvested include perch. Pikwitonei, Thicket Portage and Herb Lake Landing identified domestic and recreational fishing activities including catch and release of sturgeon due to declining populations. Other communities engaged in domestic fishing include Cormorant, Chemawawin First Nation, Easterville, Pelican Rapids, Camperville, Barrows, Wuskwi Sipihk First Nation, Dawson Bay, Dakota Plains First Nation, Dakota Tipi First Nation and Duck Bay.

Hunting and Trapping

Traditional hunting activities were identified across various regions of the Project Study Area. Large game, specifically moose, elk, white-tailed and mule deer, woodland caribou, barren-ground and coastal caribou, black bear, fox and wolf were identified as being included in traditional hunting within the project study area, with harvested species varying based on species availability in an area. Of the large game, moose have been traditionally hunted in the Gilliam, Thompson, Snow Lake, The Pas, Swan River areas and in the surrounding areas of Riding Mountain National Park. Deer have been traditionally hunted in the Swan River and The Pas and RMNP areas, while elk has been traditionally harvested in the areas surrounding RMNP.

Small animal harvesting in the Project Study Area was identified to include upland game birds (pheasant, ruff grouse, sharp tail, partridge, ptarmigan), ducks, geese and rabbits. These have traditionally been hunted in the Gilliam, Thompson, Snow Lake, The Pas, Swan River areas and in the surrounding areas of Riding Mountain National Park, and further south.

Aboriginal communities have reported mallard as part of their domestic harvest. Other waterfowl species reported included lesser scaup, redhead, and canvasback, for example. Traditional goose harvest continues to be important for northern communities. Half of the respondents in one interview reported harvesting ducks and one third reported harvesting geese. Outfitting was identified as an activity in or near the Project Study Area. Duck hunting with American tourists was specified by one community in the Lake Winnipegosis area (*Bipole III Resource Use Technical Report*). Migration routes for ducks and geese have been identified by several communities, and are an important component of local harvest strategies. Cranes were held traditionally in high esteem, and because this species was culturally important, they were not hunted. Colonial waterbird nesting sites have been identified in or near the southern portion of Project Study Area. At least one heron colony was specified. Owls, eagles, and osprey have been identified in or near the southern portion of the Project Study Area by Aboriginal communities. Some birds of

prey such as eagles have been identified as sacred, and were not hunted (*Bipole III Aboriginal Traditional Knowledge Technical Report*).

Upland game bird harvest has been identified as a past and present activity by Aboriginal communities in Manitoba, including pheasant, ruffed grouse, sharp-tailed grouse, partridge, chicken, and ptarmigan. Several sites for grouse and partridge hunting were specified.

The fall was identified as the most important season for large and small animal harvesting, followed by winter and then summer. The primary species hunted during these periods were moose, deer, upland birds and waterfowl.

First Nations people do not require a license to trap for domestic purposes and generally have the right of access to trap within: First Nation Reserve Lands, Wildlife Management Areas, Provincial Forests, areas of Provincial Parks where licensed trapping is permitted, unoccupied Crown lands, other Crown lands where licensed hunting or trapping is permitted, and private land with the permission of the landowner or occupant of Federal land. In terms of trapping, species trapped include: beaver, coyote, fisher, fox, marten, mink, muskrat, rabbit, weasel, and wolf. Although trapping occurs at various times of the year, it was noted trapping generally occurred along rivers, during the spring. Fur bearing animals were trapped for both meat and use of the hide; hide was stretched for sale and many people prepared meat for consumption.

Many of the communities that participated in the ATK process indicated that members trap. OCN indicated that the Elk trapping zone is designated as a youth line that serves as an outdoor classroom providing an opportunity for youth to practice ways of OCN people, learn about habitat and wildlife management practices, and wilderness safety.

Metis

The Manitoba Metis Federation (MMF) undertook a self-directed study to identify interests and concerns of its members with respect to the Project. To be a member of the MMF, an individual must self identify as Metis, show an ancestral connection to the historic Métis community and be accepted by the contemporary Metis community. The MMF has initiatives in place to advance the interests of its members with respect to harvesting and the MMF self-directed study concluded that MMF members engage in harvesting activities throughout the Project Study Area. As part of its Metis Harvesting Initiative, the MMF issues Metis Harvester Identification Cards which identify Metis harvesters of fish, geese, ducks, game birds, big game and other mammals, as well as wild rice and fire wood gathered for family-use. They are validated on a yearly basis.

The self-directed MMF study for the Project used a screening survey which was mailed to all individuals over 15 years of age holding a valid Metis Harvester Card (3,278 in total). As part of the survey, respondents were asked to draw on maps provided with the survey the areas where they regularly undertake traditional activities (hunting, fishing,

trapping and gathering). In addition, respondents were asked about participating in a more detailed interview. Three hundred and eighty two respondents were found through this process to engage in traditional use in the Project Study Area.

Through the detailed interviews, the Metis harvesters who were interviewed advised that they undertook food harvesting and trapping in the Project Study Area. A number of interviewees reported harvesting large animals and fishing. Many indicated they harvest small animals and less than half indicated that they engage in gathering activities. Based on the interviews, fall is the most important season for animal harvesting, followed by winter. Summer and, then winter, are the most important seasons for fishing. Berries and edible plants are mainly harvested from late summer to fall freeze up, while medicinal plants are harvesting throughout the year.

6.3.3 Economy

6.3.3.1 Overview

Manitoba's economy is highly diversified with a major presence in manufacturing, transportation, agriculture, hydro-electric development, minerals, forestry, finance and trade. The largest individual sector is manufacturing, followed by retail trade, agriculture and other primary industries. As a whole, manufacturing accounts for about 10% of Manitoba's Gross Domestic Product (GDP), and the Province's primary industries – mining, agriculture and forestry – together account for about 7% of GDP.

The following outlines labour force characteristics within the Project Study Area, including the size of the potential labour force, unemployment levels, participation rates, industry and occupations, education levels and income Appendix 6B Table 6B-11.

Based on the 2006 census data, the potential labour force (i.e., the population that are over 15 years of age which is considered working age) was 683,750 people in First Nations, NAC and incorporated communities, or approximately 75% of the Project Study Area (including the City of Winnipeg). The potential labour force in the City of Winnipeg was 514,780 (approximately 75% of the Project Study Area). Excluding the City of Winnipeg, the potential labour force in the Project Study Area was 168,970 (approximately 25%). As a Province, Manitoba's potential labour force was 908,450, or 79% of the total population which is slightly larger than the Project Study Area.

The size of the potential labour force in the First Nation and NAC communities within the Project Study Area was 13,405, or approximately 55% of the total population in these communites. The size of the potential labour force of cities, towns, villages, RMs and the LGD within the Project Study Area was 670,345, or approximately 80% of their combined populations. Although cities, towns, villages, RMs and the LGD currently have a proportionately larger labour force, the potential labour force in Aboriginal

communities is expected to increase more rapidly as the large numbers of young people (14 years and younger) move tinto the labour force.

The participation rate, which is the portion of the labour force that is active (employed or unemployed and looking for work) for the Project Study Area was approximately 59%. This compares to approximately 67% in the Province. The participation rate was highest in Project Study Area RMs at approximately 73% compared to 68% for Winnipeg. Other cities, towns and villages had a participation rate of approximately 59%. The data indicate that there was a substantial difference between the participation rate for workers in First Nation and NACs in the Project Study Area. In 2006, the participation rate in First Nation communities was estimated to be approximately 44 and approximately 51% in NACs.

In 2006, the unemployment rate (percentage of unemployed workers in the active labour force, the latter which consists of those who are working or looking for work) for the Project Study Area was approximately 14% which is higher than the Province at approximately 5.5%. The unemployment rate in cities, towns and villages, excluding the City of Winnipeg, was 6%, while Winnipeg was 5.2%. The unemployment rate in RMs was 3.5%. The unemployment rates in First Nation and NAC communities were substantially higher at approximately 24% and 30% respectively.

The most prevalent industries and occupations in which workers from incorporated communities and First Nation communities were employed in 2006, as compared to the overall Project Study Area and the Province is presented in Appendix 6B Table 6B-11. In terms of industries, the three most prevalent in the Province were health care and social assistance, retail trade and manufacturing. Within the Project Study Area and the City of Winnipeg, the three most prevalent were the same as for the Province as a whole. In Project Study Area RMs, health care and social assistance and manufacturing were also important, but agriculture, forestry, fishing and hunting were the most prevalent primarily because of agriculture and forestry. Agriculture, forestry, fishing and hunting were most prevalent in NAC communities, followed by public administration and educational services. In First Nation communities, the most three prevalent industries were public administration, health care and social assistance, and educational services.

In terms of occupations, the three most prevalent in the Province are sales and services, business, finance and administration, and trades, transport and equipment which is the same as Winnipeg. In terms of other cities, towns and villages in the Project Study Area, the three most prevalent are sales and services, trades, transport and equipment operators, and business, finance and administration. Trades, transport and equipment operators, and sales and services were the two most prevalent occupations in First Nation and NAC communities in the Project Study Area.

In terms of education levels, in general, individuals living in First Nation and NAC communities in the Project Study Area had lower levels of education in 2006 than those

in cities, towns, villages, RMs and the one LGD. For example, 69% of people aged 15 years or over in First Nations and approximately 62% of NACs had no diploma, degree or certification compared to approximately 35% in cities, towns, villages, RMs and LGD excluding Winnipeg. Winnipeg's percentage was approximately 23%, while the Province's was approximately 29%. Approximately 27% of the Province as a whole had completed high school as the highest level of schooling which ws similar to the Project Study Area. In terms of Winnipeg, approximately 28% of the population over 15 years of age had completed high school as the highest level of schooling — this compares to approximately 27% in RMs, 25% in other cities, towns and villages, and approximately 13% in First Nation and NAC communities in the Project Study Area.

In terms of income, the median income after taxes for persons 15 years and older in Manitoba was $21,805 in 2006 which compared to $17,494 for the Project Study Area. In terms of incorporated communities in the Project Study Area, Winnipeg had a median income after taxes of approximately $23,175. RMs and the LGD had a median income after taxes of approximately $19,279. Project Study Area First Nations had the lowest median income after taxes at approximately $9778 in 2006.

6.3.3.2 Mineral Economic Base

Mining is the second largest primary resource sector of the Manitoba economy. There are currently 16 active mining companies; 5 metallic mineral and 11 industrial mineral and 67 active exploration companies. There are 10 producing mines, 1 smelter and 2 refineries[5] presently operating in the province.

In 2009, the total value of mineral production for metals ($1.18 billion), industrial minerals ($144 million) and petroleum ($620 million) amounted to over $1.9 billion. Manitoba's top four metals include; nickel, copper, zinc and gold. As a result of recession, inventories of important base metals increased significantly in 2009, with the price falling more than 20% for nickel and copper in Canadian dollars and zinc prices fell 5.1% following a drastic decline in 2008. Production of these metals amounted to $1.425 billion in 2008, down 36% from the 2007 value of $2.229 billion. With declining demand, Manitoba nickel production fell by 8.3%, copper output was down 7.2% and zinc production decreased 6.9%. However, gold production volumes increased substantially in 2006, continued to rise in 2007 and 2008, with output posting a 2.3% increase over this period (Government of Manitoba 2010a). Over the last several years, exploration expenditures have increased significantly from $52.9 million in 2005 to an all-time high of $152.1 million in 2008, though the past 2 years have experienced a drop to $85.9 million in 2010.

[5] As of 2010, the operating refinery in Flin Flon by Hudson Bay Mining and Smelting closed down operations. Similarly, plans were announced by Vale-Inco to close down the operating refinery in Thompson beginning by 2012.

In 2009, the mineral industry accounted for approximately 4.7% of provincial Gross Domestic Product (GDP), down from 6% in 2008 and 7.8% of total exports, down from 10% in 2008. The Manitoba mining and exploration sector employed an average of 5,400 in 2009, a 3.8% increase from 2008. Capital investment has increased from $323.3 million to a high of $673.8 million in 2008. In 2010, capital investment totalled $478.6 million, up 4% from 2009 of $461.1 million.

6.3.3.3 Forestry Economic Base

With approximately 11.7 million hectares of certified forest area, forestry has an important role in the economy of Manitoba. The Manitoba forestry sector employed approximately 6,700 direct jobs in 2009, a decrease from 7,800 direct jobs in 2008. In 2008, the total wages and salaries from the forestry and logging industry ($13,002,000), pulp and paper product manufacturing industry ($79,338,000) and wood product manufacturing industry ($137,359,000) amounted to over $229 million (Natural Resources Canada 2010).

In 2008, the total revenue of goods manufactured from forestry and logging industry ($63,054,000), pulp and paper product manufacturing industry ($457,680,000) and wood product manufacturing industry ($585,523,000) amounted to over $1.1 billion. Manitoba forestry is dependent on exports. The largest market is the U.S., followed by the Middle East and South and Central America, with exports of over $328 million worth of forest products in 2009, down from a 2008 value of over $472 million and 2007 of over $531 million (Natural Resources Canada 2010).

Two key forestry companies have established operations within the Project Study Area, Tolko Industries Ltd. (Tolko) at The Pas and Louisiana Pacific (LP) Canada at Swan River. Tolko is the primary employer in The Pas. Its current operations include both a pulp and paper mill and a lumber mill. Currently, Tolko employs 750 people at the mill site with an additional 350 people in woodland contractor operations. The annual payroll in these operations instills more than $50 million into the regional economy. In 2010, the Government of Canada invested $2.2 million under the Pulp and Paper Green Transformation Program to improve the mill's energy efficiency and increase renewable energy production at the facility . Tolko Industries workforce in the saw-mill and Solid Wood Division operations have been affected by layoffs, which began in 2008 and continued through 2009, the result of a lack of demand for lumber, related to the slowdown in the U.S. housing market and high Canadian dollar. Approximately 110 workers have been laid off since 2008 with the mill shutdown. Remaining employees still working at the mill are mainly engaged in suppling wood chips to the Kraft Paper Division (Tolko Industries, 2010).

Louisana Pacific Canada's Minitonas Oriented Strand Board (OSB) plant has been in operation since 1996 and has provided approximately 175 jobs at the Minitonas OSB

Mill and forestry Resources Division in Swan River and has accounted for roughly $20 - $50 million annually in sales (Profile Canada, 2011). More than half of the employees are currently not working because of the current recession, and decrease in the production of OSB. The mill at Minitonas was also affected by the prolonged downturn in the U.S. housing market, the strong Canadian dollar and escalating fuel prices. In addition to these larger mills, there are numerous other wood processing facilities located within the Project Study Area, including softwood and hardwood sawmills (e.g. Waugh's Woods, Spruce Products Ltd.), post and pole plant, and pressure treating facilities (Prairie Forest Products Ltd., Roblin Forest Products Ltd.). The shut-down of the Tembec pulp and paper mill at Pine Falls has also affected the Swan River area as the company has rights to timber there.

6.3.3.4 Hydro Northern Training and Employment Initiative

An extensive training initiative, called the Hydro Northern Training and Employment Initiative (HNTEI), took place from 2002 through 2010. The purpose of the HNTEI was to provide an opportunity for northern Aboriginal people to enhance their skills and obtain training for jobs relevant to the construction of the Wuskwatim Project and the proposed Keeyask Project,. Although the HNTEI was not developed specifically for the Bipole III Project, the initiative has enhanced skills of many members of the northern Aboriginal labour force and it is expected that many will be employed in the construction phase of the Project.

The HNTEI provided academic upgrading and technical training (accompanied by life skills programming) in the following areas:

- Construction designated trades;
- Construction non-designated trades;
- Construction support jobs; and
- Technical and professional occupations.

Technical training courses for occupations were offered in the following areas: truck driving, heavy equipment operation, carpentry, cooking, catering, security, plumbing, crane operation, welding, ironworking, business support and computer systems maintenance.

The $60.3 million training initiative was funded by Manitoba Hydro, Canada and the Province of Manitoba. Commencing in 2005, Manitoba Hydro and the two levels of government provided their respective shares of the funding to a non-profit corporation, the Wuskwatim and Keeyask Training Consortium Inc. [WKTC Inc.] which, in turn, advanced funds each year to participating First Nations and the Manitoba Metis Federation [MMF] in accordance with work plans and budgets prepared by the First

Nations and the MMF. WKTC Inc. was governed by a Board consisting of nominees of each of the primary First Nations participating in the initiative, the MMF, Manitoba Hydro and the Province. The HNTEI was originally scheduled to end on March 31, 2009, but Manitoba Hydro and the Province agreed to extend it by one year to allow additional time for participants to utilize funding that had not, as of March 2009, been advanced.

The HNTEI provided training to more than 2,600 Aboriginal residents of communities throughout Northern Manitoba. The largest number of graduates undertook training in the non-designated trades, followed by designated trades. The majority of the graduates in the designated trades were at the apprentice level, although some trainees were accredited as journeymen as a result of the PPT program. A further group of graduates was trained in skills in the construction support category and an additional group was trained in skills related to business and management.

6.3.4 Services

6.3.4.1 Overview

Services are critical to meeting a wide range of human needs. Community services include provision of housing, public infrastructure (to provide potable water and waste handling, roads, electricity and other needs) and public facilities to provide health care, education and other government services. Services highlighted are those potentially affected as a result of Project-related sources of effects and include housing, temporary accommodations (hotels, etc.), water and sewer services, electricity, policing and emergency services, and travel and transportation.

Given the location of the proposed Keewatinoow Converter Station and associated facilities in northern Manitoba, addition detail is provided for the Town of Gillam. Although the FLCN community at Bird is the closest community to the proposed converter station site at an estimated distance of 35 km, there are a limited range of amenities in the community. There is a school in the community, but there are no hotels, restaurants, or publicly accessible recreation facilities/programs.

Gillam is approximately 90 km from the proposed converter station and associated facilities. Over 250 FLCN members reside in Gillam. The community offers publicly and privately provided services in the health, education, retail, hospitality, and administrative sectors. Gillam is the operations and maintenance center for Manitoba Hydro's Nelson River facilities, as well as numerous transmission lines in the region. The largest segment of the community's population consists of Manitoba Hydro operations and maintenance employees and their families. Being a larger community, Gillam has a number of

amenities including a lounge, liquor vendor, liquor sales store, two hotels, two restaurants, and one publically accessible multipurpose recreation centre.

6.3.4.2 Community Services

Housing

Appendix 6B Table 6B-11 outlines the total number of occupied private dwellings, dwellings requiring major repair, average number of rooms per dwelling, and average household size in the Project Study Area overall, and for First Nations, NACs and incorporated communities, as compared to the province based on 2006 Statistics Canada data.

There were a total of 341,989 occupied private dwellings in the ProjectStudy Area, of which 261,135 were in the City of Winnipeg. There were 5,068 occupied dwellings in First Nations communities and 926 occupied dwellings in NACs. Exlcuding Winnipeg, there were 74,860 occupied private dwellings in cities, towns, villages, RM and the LGD in the Project Study Area.

The 2006 Statistics Canada data shows that a greater proportion of housing in the Project Study Area First Nation and NAC communities required major repairs than in incorporated communities in the Project Study Area or the Province — approximately 487% of homes in Project Study Area First Nation communities and 28% in NACs required major repairs. The compared to approximately 12% in RMs in the Project Study Area, 9.5% in incorporated villages, cities and towns, other than Winnipeg and approximately 10% for the Province. Winnipeg's percentage was 8.5%.

The 2006 Statistics Canada data indicates that, in general, Project Study Area First Nation and NAC communities had higher levels of crowding when compared to other communities and the Province as a whole. The average household size in the Province is 2.5 persons compared to 2.8 for the Project Study Area. This compares to 2.6 for Project Study Area RMs, 2.4 for Winnipeg and 2.2 for other cities, towns and villages. Project Study Area First Nations and NACs averaged 3.6 and 3.0 persons per household according to the 2006 data.

Of the occupied private dwellings in Gillam, approximately 74% were rental units, the majority of which are owned by Manitoba Hydro. Manitoba Hydro homes accounted for approximately 322 units that ranged in size (i.e., 600 to 1,650 square feet) and type (e.g., apartment, trailer, townhouse, and single family dwellings). There is a shortage of housing in Gillam and there are currently 40 people on a waiting list for Manitoba Hydro housing. Housing units are being built to match the expanding needs in the region. Manitoba Hydro recently developed six to eight single-family lots (*Bipole III Socio-Economic Baseline Technical Report*, 2011) and a four-plex unit is under construction. There are plans to construct a minimum of 100 houses in Gillam over the next ten years.

The Town of Gillam is currently looking into developing three new housing subdivisions. These subdivisions would consist of approximately 400 lots (*Bipole III Socio-Economic Baseline Data Technical Report*, 2011). Most privately-owned housing is located in the Gillam Trailer Park. Home ownership in Gillam is restricted by the limited availability of serviced land and high development costs due to remoteness and soil conditions that require construction of costly foundations.

Temporary Accommodations

Temporary accommodations in the Project Study Area include hotels, motels, bed and breakfasts, and lodges and resorts. Within the Project Study Area, it is estimated that there are approximately 7,900 of these which can accommodate approximately 23,700 people (*Bipole III Socio-economic Baseline Data Technical Report*). Most of the temporary accommodations are located in or near communities. Resorts, lodges and cabins exist throughout the Project Study Area, some of which are located in remote areas only accessible by plane or by boat while others are accessible by road.

Temporary accommodations in Gillam can be found at the Aurora Gardens Motel (21 original rooms and 14 recently added rooms) and the Gillam Motor Inn (36 rooms). Throughout the year, both businesses often have no vacancies and the expectation is that this situation will continue into the foreseeable future.

Water and Sewer Services

Water and sewer services are available in most communities in the Project Study Area, but the type of service varies with the community and often depends on the location of homes. Among Project Study Area incorporated communities, most urban centres provide piped water and sewer to local residents. A few towns and villages use a combination of water treatment reservoirs and community wells for their water supply. Other RM and smaller communities obtain their water supply solely from community wells, some of which provide only non-treated water. Sewage services in the majority of communities variously involve sewage treatment plants, sewage lagoon systems and septic holding tanks with pump-out.

Water and sewer services in First Nation communities vary depending on the location of homes and businesses. Most of the First Nation communities have on-site services for water utility and sewage facilities. Services can vary from piped water and sewerage to cistern tanks and septic fields. Some First Nation communities have off-site services for water supply and sewage treatment.

Water and sewer services also vary between NACs. Piped water is supplemented by water delivery, reservoir/dugout, lake-source, individual wells with truck service or public wells, and public pick-up in some cases. The community of Herb Lake Landing obtains water from a lake source and from individual wells with truck service for

example. Communities either have piped sewage service or sewage is hauled to lagoons with pump-outs from holding tanks.

Electricity

Electrical service is available in all communities in the Project Study Area. Electricity is provided by Manitoba Hydro through land lines.

6.3.4.3 Emergency and Policing Services

Health Services

Health services in the Project Study Area by community are listed in Appendix A of the *Bipole III Socio-Economic Baseline Data Technical Report*. Hospitals are available in Ste. Anne, Thompson, Gillam, The Pas, Flin Flon, MacGregor, Portage la Prairie, Neepawa, Dauphin, Grandview, Ste. Rose, Winnipegosis, Swan River, as well as several in The City of Winnipeg. In addition, a number of the communities in the Project Study Area have health centres and clinics.

Gillam Hospital is a ten-bed facility of which five are designated for acute care. Currently, there are adequate resources in place to handle emergency medical needs. When critical care is required, patients are flown to either Thompson or Winnipeg. An ambulance and attending physician are available 24 hours per day for emergency purposes. The hospital is in the process of developing an emergency response plan in the case of a large-scale emergency (*Bipole III Socio-Economic Baseline Data Technical Report*). There are no plans for additions or upgrades to Gillam's hospital in the near future. If the growth of the community eventually warrants upgrading, Manitoba Health would ensure that the necessary construction occurs.

In terms of First Nation communities and NACs in the Project Study Area, there are two First Nation and Inuit Health Branches, as well as various health centres, health offices and nursing stations that offer additional care. The First Nation and Inuit Health Branches are located in Camperville and Wasagamach. Ebb & Flow First Nation, Keeseekoowenin Ojibway First Nation, OCN, Long Plains First Nation, Swan Lake First Nation, Tootinaowaziibeeng Treaty Reserve and Waywayseecappo First Nation have health centres. The communities of Birdtail Sioux First Nation, Gamblers First Nation and Rolling River First Nation have health offices. Health services offered vary but can include treatment and prevention programs in the areas of nutrition, dental, health education, and nursing and physician services.

Ambulance services are found throughout the Project Study Area and, in some instances, are servicing a larger area to accommodate those that do not have their own ambulance services. For example, because of their size, many of the NACs rely on ambulance services from communities in their vicinity. Gillam provides ambulance

services to the surrounding area including the community of Bird. In terms of larger communities in the Project Study Area, Winnipeg, Thompson, The Pas, Flin Flon, Portage la Prairie, Dauphin and Gillam have ambulance services. North of Dauphin, in addition to the communities listed above, Chemawawin, Cranberry Portage, Snow Lake, Swan Valley, NCN, Wabowden, and Mafeking have ambulance services. In addition, a few communities transport patients by air to other centres for medical treatment (e.g., Moose Lake).

Fire Halls and Departments

Fire halls and departments are found throughout the Project Study Area (*Bipole III Socio-economic Baseline Data Technical Report).* Most of the major Project Study Area communities have dedicated fire services including Winnipeg (30 fire halls), Portage la Prairie, Dauphin, Flin Flon, The Pas, Thompson and Gillam. Many of the smaller communities have volunteer fire services to respond in the event of an emergency.

Police Services

Apart from The City of Winnipeg, there are numerous Royal Canadian Mounted Police (RCMP) detachments located throughout the Project Study Area. These include Cranberry Portage, Dauphin, Flin Flon, Gillam, Minnedosa, Neepawa, Portage la Prairie, Roblin, Swan River, The Pas, Thompson, and many other detachments based in smaller communities. Community detachments are responsible for policing surrounding areas that do not have their own detachment. Two First Nations within the Project Study Area have their own police services. OCN has a police department and the Dakota Ojibway Police Service operates out of The City of Brandon. Some First Nations also have band constables that work with the RCMP detachments. In addition, the City of Winnipeg has its own police service.

The Gillam RCMP detachment is responsible for the Town of Gillam and the communities of Bird and Ilford. The detachment is adequately staffed to provide services to the existing population, but an increase in the permanent population may warrant an increase in officers (*Bipole III Socio-Economic Baseline Data Technical Report*). The Thompson RCMP detachment is responsible for the City of Thompson, Split Lake, York Landing, Tadoule Lake, Thicket Portage, Paint Lake, and Pikwitonei. Staff numbers are currently adequate to provide all necessary services. The detachment has established working relationships with band constables at York Landing, Split Lake and Tadoule Lake, community constables at Thicket Portage and Pikwitonei, and Natural Resource Officers at Paint Lake.

6.3.5 Travel and Transportation

6.3.5.1 Airports and Aerodromes

Airports and aerodromes in the Project Study Area are listed in Appendix 6B Table 6B-3. There are airports and aerodromes located throughout the Project Study Area. Winnipeg International Airport is the largest airport in the Province. The other major airports in the Project Study Area are located at the communities of Thompson, Flin Flon, The Pas and Gillam. The Pas and Flin Flon have regularly scheduled commercial flights from Winnipeg through Bearskin Airlines and Calm Air International. Calm Air also has commercial flights to Thompson and Gillam. Perimeter Aviation has commercial flights to Flin Flon and Thompson, and also offers scheduled flights to Dauphin and Swan River.

The majority of flights to and from the Gillam Airport are commercial with 12 airlines using the airport on a regular basis. Additionally, many airlines offer charter and cargo services to Thompson, Flin Flon, The Pas and Gillam, and other locations in northern Manitoba.

The Thompson Regional Airport is a northern regional hub for both passenger and cargo traffic. It provides weekday and weekend connections to destinations throughout northern Manitoba, and beyond, as well as frequent service to and from Winnipeg. Bases for Custom Helicopters, RCMP Air Division and Manitoba Government are also at the Thompson Airport. Thompson Airport has experienced increases in passenger traffic associated with the development of the Wuskwatim Projects and increases in cargo traffic with the closing of winter roads earlier in recent years. Activity at the airport is expected to increase as Thompson has become a distribution point for supplies to northern Manitoba. Other activity out of the airport includes medi-vac or air ambulance service flights transferring patients between Thompson and Winnipeg often daily, and justice flights with transfer of justice employees, RCMP members and offenders (C. Ross, Thompson Regional Airport Authority, pers. comm., January 12, 2011).

6.3.5.2 Existing Road Network and Traffic Volumes

Provincial Trunk Highways (PTHs) and Provincial Roads (PRs) likely required for the construction of the Project include PR 207, PTH 15, PTH 101, PTH 6, PR 391, PR 280, and PR 290. In addition to these primary roads, a number of other PRs will likely be utilized for the project (*Bipole III Transportation Technical Report*). The 2009 Annual Average Daily Traffic (AADT) volumes along the primary traffic routes between Winnipeg and the site of the proposed Keewatinoow Converter Station, as well as others likely to be affected by construction of the Riel Converter Station are summarized in Table 6.3-10.

Table 6.3-10: 2009 Average Annual Daily Traffic (AADT) Volumes Along Primary Traffic Routes

Provincial Road	Location of Count	2009 AADT Volumes
PR 207	Between PTH 15 and Trans Canada Highway 1	1,700
PTH 15	East of PR 207	8,150
	West of PR 207	9,810
PTH 101	South of PTH 15	8,190
	North of PTH 15	6,530
PTH 6	Northwest of PR 236 (near Winnipeg)	3,880
	South of PR 513	1,290
	South of PTH 39	380
	North of PTH 39	510
	South of Thompson	2,170
PR 391	South of Airport Access	3,180
	Between Airport Access and PR 280	1,230
PR 280	North of PR 391	190
	South of the TCN Reserve Access	160
	Northwest of PR 290, north of the Nelson River	70
	Southwest of PR 290, south of the Nelson River	170
	East of Radisson Converter Station	210
	East of Gillam	290
PR 290	East of PR 290	150
	PR 290 west of Sundance Creek	50

Source: Bipole III Transportation Technical Report

Traffic Volume

Historical volumes on these roads were evaluated using data obtained from Manitoba Infrastructure & Transportation (MIT) count stations to gain an understanding of the traffic fluctuations that have occurred on the roads. Selected count stations were considered to adequately represent the historical traffic variations on the relevant roads in northern Manitoba. Manitoba Hydro's large-scale projects have had a large impact on traffic volumes on the provincial road network, in particular PR 391, PR 280 and PR 290. Although some fluctuations have occurred on PTH 6, traffic growth has been relatively consistent over the past 20 years and it is considered less sensitive to increased traffic than PRs in northern Manitoba (*Bipole III Transportation Technical Report*).

Collisions

Collision data for PR 280 and PR 290 was considered relevant to this discussion given the potential impact of the Keewatinoow Converter Station construction camp on this indicator. Collision rate is measured as the number of collisions per million vehicle-

kilometres of travel (MVKT) on a section of road during a designated analysis period. Data indicate that for the period 1994 to 2006, there was an average of 2.5 collisions per year on the stretch of PR 280 from its junction with PR 290 to Gillam; this translates to a collision rate of 1.4 MVKT. For PR 290, this value was 0.9 collisions per year, which represents a collision rate of 0.6 MVKT. Road sections with collision rates exceeding 1.5 incidents per MVKT warrant further review and potential road improvements.

Roads from Long Spruce to Limestone and Long Spruce to Thompson are in poor condition and are very dangerous, particularly in the winter months. Widening and upgrading is planned for over 177 km of road over the next four years, commencing in the spring of 2011. The roads within the Town of Gillam are relatively good (Mayor J. Goymer, Town of Gillam, pers. comm., December 9, 2010). Roads within the LGD of Mystery Lake could be improved. A portion of PTH 6 between Thompson and Paint Lake was recently resurfaced in 2010 (C. Stewart, LGD of Mystery Lake, pers. comm., January 12, 2011).

Gillam Area Roads

Two provincial roads (PR) exist in the area immediately surrounding the construction site for the Keewatinoow Converter Station: PR 280 and PR 290. PR 280 extends northwest from its junction with PR 290 and turns west and then south before ending at PR 391; PR 280 also extends southwest of its junction with PR 290. PR 290 extends east from its junction with PR 280 and connects PR 280 to the access road. Fox Lake (Bird) is located off of PR 290 and is about a 30 minute drive (35 km) from the construction site. Gillam is located off of PR 280, southwest of its junction with PR 290.

Under normal driving conditions, the trip between Gillam and Fox Lake (Bird) is approximately 45 minutes. In abnormal driving conditions, however, especially in snowy conditions, the drive could take much longer. The state of the road (particularly PR 290) is quite poor under normal conditions and can be even worse during certain times of the year (i.e., spring thaw). The Conawapa access road is generally in good driving condition under normal weather conditions (*Bipole III Socio-Economic Baseline Data Technical Report*).

Design capacities are based on the Design Standards in the MIT supplement to the Transportation Association of Canada Design Guide. None of the provincial roads that are relevant to the Keewatinoow Converter Station and associated facilities (PR 290, PR 280, PR 391) are expected to exceed road capacity due to Manitoba Hydro-related travel.

Existing Rail Network and Volumes (Northern Manitoba)

The Hudson Bay Railway (HBR) owns and operates a rail network comprising of approximately 1,300 km of rail line in central and northern Manitoba. It is an important service for the movements of goods such as minerals, wood, wheat / grain, and petroleum products as well as providing passenger service between regional communities. HBR is wholly owned by railroad holding company OmniTRAX.

The main line spans between The Pas and Churchill via the communities of Wabowden, Thompson, Pikwitonei, Kelsey, Ilford and Gillam. A shorter line exists between The Pas and Flin Flon via the communities of Atik, Cranberry, Sherritt Junction, and Channing. Interchanges to other rail lines exist at The Pas, which connects to the Canadian National (CN) rail network, and Sherritt Junction, which connects to the Keewatin Railway Company (KWC) rail line.

The existing traffic volume on the rail network is in the order of 17,000 and 19,000 car loads / year. At present, in the order of 6,000 to 7,000 car loads / year are wheat / grain that are transported to the Port of Churchill. It is expected these shipments will increase to approximately 9,000 car loads / year in the short term. The busiest time of the year for rail traffic usually occurs between August and November when wheat / grain rail traffic is active.

6.3.6 Personal, Family and Community Life

6.3.6.1 Total Population

The Project Study Area covers approximately 102,435 km^2 (approximately 18.5%) of the Province (Map 6.1). There are three types of communities in the Project Study Area: First Nation communities, incorporated communities (cities, towns, villages, rural municipalities, local government districts), and Northern Affairs Communities (NACs). The largest portion of the population lives in the southern portion of the Project Study Area, primarily between the Swan River-Dauphin region and the City of Winnipeg.

Based on Statistics Canada census data, in 2006, the combined population of communities within the Project Study Area was approximately 858,934 (Appendix 6B Table 6B-11). The City of Winnipeg accounted for the majority of the population with a population of 633,451 (approximately 74%). Excluding the City of Winnipeg, the Project Study Area population was approximately 225,483. The total on-reserve population in 2006 for First Nation communities in the Project Study Area was approximately 21,203. In general, the population of NACs in the Project study Area was the smallest with a total population of approximately 3,056. Approximately 14% of the Project Study Area population resided in RMs, compared to approximately 9.7% in cities, towns and villages excluding Winnipeg. Approximately 73.7% resided in Winnipeg, 2.5% in First Nations, and approximately 0.4% in NACs.

According to 2006 Statistics Canada census data, on-reserve populations in First Nation communities within the Project StudyArea are in the range of approximately 100 to 2,500 people. NACs in the Project Study Area had populations of about 500 or less. Incorporated communities had populations ranging from approximately 300 to over 600,000, the latter because of the City of Winnipeg. In terms of other cities and towns in

the Project Study Area, Gillam had a population of 1,209, Thompson's population was 13,446, Flin Flon's was 5,594, while the population of The Pas was 5,589. Dauphin had a population of 7,906 and Portage la Prairie's population was 12,728 in 2006 (*Bipole III Socio-Economic Baseline Data Technical Report).*

Of the total Project Study Area population of 858,934 in 2006, 111,335 persons identified themselves as Aboriginal or approximately 13%. This compared to approximately 11% in incorporated communities, approximately 79% in NACs and approximately 86% in First Nation communities.

6.3.6.2 Population Growth and Structure

Between 2001 and 2006, the population in the Project Study Area decreased by 0.5% (Appendix 6B Table 6B-11. In comparison, the population of the entire Province of Manitoba increased by 2.6%. In the same timeframe, the on-reserve population of First Nation communities increased by 7.6%. Populations in RMs, cities, towns and villages (excluding Winnipeg), and NACs decreased (-2.7%, -2.6% and -7.1% respectively). Gillam's population increased by 2.6%, while Thompson's increased by 1.4% and Winnipeg's by 2.2%. Other incorporated cities and towns experienced population decreases — Flin Flon by 6.8%, The Pas by 3.6%, Dauphin by 2.2% and Portage la Prairie by 1.9%.

Table 6.3-11 illustrates age characteristics of community types in the Project Study Area in comparison to Manitoba in 2006. The breakdown of the population of the Project Study Area is similar to Manitoba in that the majority of the population is between the ages of 15 to 64, followed by 0 to 14 and then 65 years of age and over. Some notable difference in population structure between Manitoba and the Project Study Area is that the Province had a relatively larger youth population (32.7% between the ages of 0 and 14, as compared to 18.9% for the Project Study Area). Furthermore, the Project Study Area had a larger percentage of (approximately 12 per cent more) population in the age ranges of 15 to 64. Both the Project Study Area and the Province had similar age structure for the population 65 years and over with 14% and 11.8% respectively.

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Table 6.3-11: Age Characteristics of Communities in the Bipole III Project Study Area

Age Group	Manitoba (% of total population)	Project Study Area (% of total population)	Rural Municipalities/LGD in Study Area (% of total population)	Cities, Towns and Villages in Study Area (% of total population)	City of Winnipeg in Study Area (% of total population)	Northern Affairs Communities in Study Area (% of total population)	First Nation Communities in Study Area (% of total population)
0-14	32.7	18.9	3	1.9	13	0.1	0.8
15-64	55.5	67.1	9.1	5.9	50.6	0.2	1.3
65+	11.8	14	1.5	1.8	10.5	0	0.1

Source: Census of Canada 2006.

The following Figure 6.3-1 illustrates the age and gender distribution of First Nation communities in the Project Study Area in comparison to the total population of the Province based on Manitoba Health 2010 data. The First Nation communities in the Project Study Area are a relatively young population as approximately 55% of the total population less than 25 years of age. This is consistent with Aboriginal communities in the Province that are typically younger and growing at a faster rate than non-Aboriginal communities as is illustrated when compared to the Province as a whole.

The age and gender distribution for the Province represents an older and more stationary population pyramid (i.e., lower growth rate) displaying somewhat equal numbers/percentages for most age categories. For the Province as a whole, only 33% of the total population is less than 25 years of age, with slight increases in the 45 to 50 age range.

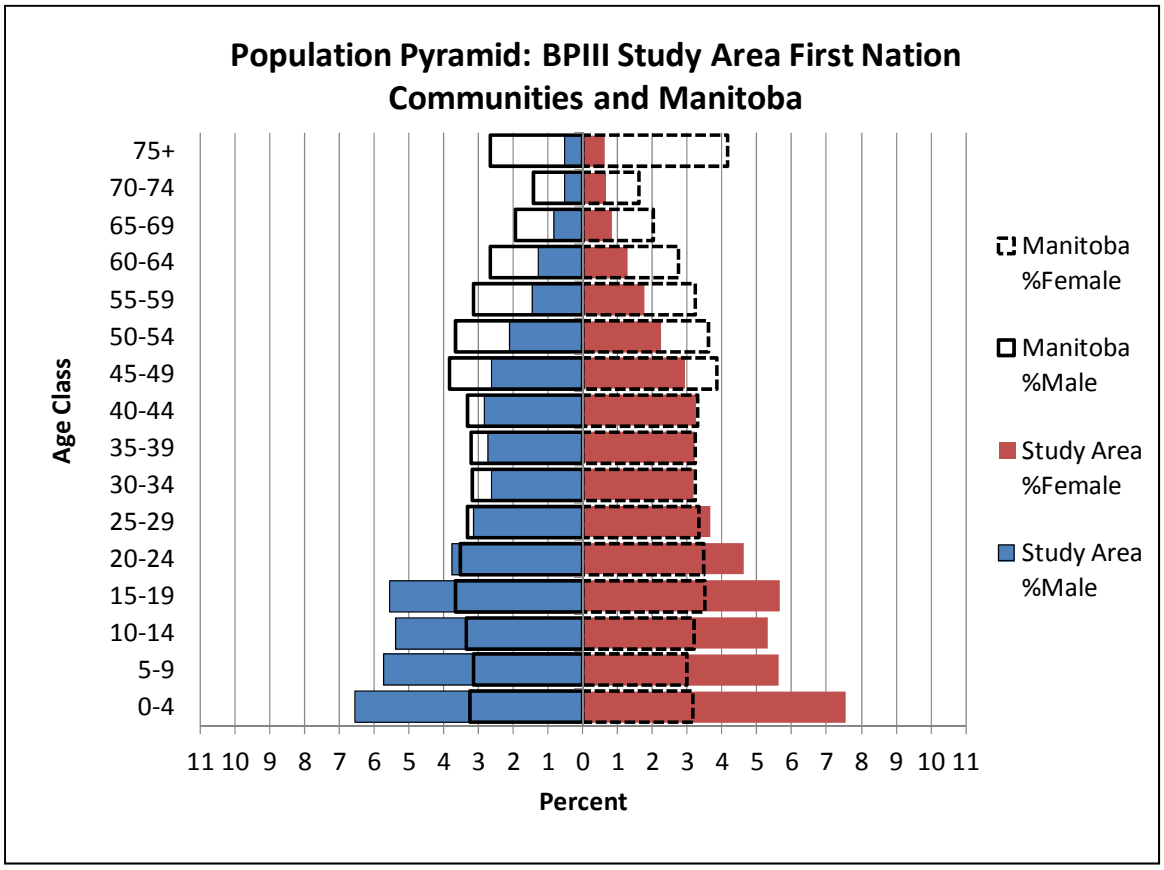

Figure 6.3-1: Population Pyramid for Bipole III Study Area First Nation Communities and the Province of Manitoba

Community Organization

Each community in the Project StudyArea — First Nation, NACs and incorporated municipalities — have a different type of community organization.

First Nation communities in the Project Study Area elect a Chief and Council who are responsible for formal community decision-making pertaining to a wide variety of matters. The terms served between elections vary according to each First Nation. First Nations who hold their elections under *The Indian Act* election system hold office for a two-year term, while other First Nations set their own electoral rules using community custom election processes. Those using custom election processes can set their own terms for Chief and Council to hold office. Many of the First Nations who have their own custom election processes have longer terms in office. For example, NCN elects its Chief and Council every four years.

NACs typically elect a Mayor and Council under the auspices of *The Northern Affairs Act*. However, some of the smaller NACs (for example, Herb Lake Landing) appoint a contact person that works with the provincial government to administer and manage the community.

Incorporated cities and towns elect Mayors and Councils which typically serve four-year terms in office. RMs elect Reeves and Councils which also serve four-year terms in office. The LGD of Mystery Lake is administered by an appointed Resident Administrator.

6.3.6.3 Health

Health services in Manitoba have been divided into regions through the establishment of Regional Health Authorities (RHAs). The primary responsibility for the RHAs is to ensure that all residents of a region have equitable access to health services. Communities in the Project Study Area are within the boundaries of nine separate RHAs as follows (Map 6-37):

- Assiniboine;
- Brandon;
- Burntwood;
- Central;
- Norman;
- North Eastman;
- Parkland;
- South Eastman; and
- Winnipeg.

Population total in each of the RHAs, along with the populations of incorporated communities and First Nations in each RHA in the Project Study Area for 2010 are provided in Appendix 6B Tables 6B-12 and 6B-13 respectively.

Assiniboine RHA

The Assiniboine RHA is located in southwestern Manitoba and covers an area of 34,839 km^2 – only part of the Project Study Area is within the Assiniboine RHA. The RHA had a total population of 68,505 in 2010 (Manitoba Health, 2010).

Brandon RHA

The Brandon RHA is includes the City of Brandon, which is outside of the Project Study Area, as well as some of the surrounding RMs. Only a small portion of the RHA is in the Project Study Area. The RHA had a total population of 52,550 in 2010 (Manitoba Health, 2010).

Burntwood RHA

The Burntwood RHA is located in northern Manitoba and has a total area of approximately 342,362 km^2. Only part of the Project Study Area is within the Burntwood RHA. The RHA had a total population of 48,080 in 2010 (Manitoba Health, 2010).

Central RHA

The Central RHA is located in south-central Manitoba and has a total area of 17,025 km^2. Only part of the Project Study Area is within the RHA. The RHA has a total population of 107,668 in 2010 (Manitoba Health, 2010).

Nor-Man RHA

The Norman RHA is located in northwestern Manitoba and has a total area of approximately 36,124 km^2. Most of the RHA is in the Project Study Area. The RHA has a total population of 24,570 in 2010 (Manitoba Health, 2010).

North Eastman RHA

The North Eastman RHA is located in eastern and northeastern Manitoba and has a total area of approximately 47,761 km^2. Only a small portion of the RHA, east of the City of Winnipeg, is in the Project Study Area. The RHA has a total population of 41,846 in 2010 (Manitoba Health, 2010).

Parkland RHA

The Parkland RHA is located in western Manitoba and has a total area of 28,259 km^2. Most of the RHA is in the Project Study Area. The RHA has a total population of 41,658 in 2010 (Manitoba Health, 2010).

South Eastman RHA

The South Eastman RHA is located in southeastern Manitoba and has a total area of 17,025 km^2. Only a small portion of the RHA, to the southeast of The City of Winnipeg, is in the Project Study Area. The RHA has a total population of 68,383 in 2010 (Manitoba Health, 2010).

Winnipeg RHA

The Winnipeg RHA includes the entire City of Winnipeg and is located entirely within the Project Study Area. The RHA has a total population of 697,274 in 2010 (Manitoba Health, 2010).

As an indicator of overall health in the project study area, an overview of RHA and provincial health data in terms of infant mortality and life expectancy is provided (Table 6.3-12). Infant mortality and life expectancy are widely used indicators to measure the well-being and health of the population respectively.

Table 6.3-12: Infant Mortality and Life Expectancy in RHAs in the Bipole III Project Study Area

Regional Health Authority (RHA)	Infant Mortality (per 1,000 live births of children under 1 year of age)	Life Expectancy at Birth (in years)	Life Expectancy at Age 65 (in years)
Assiniboine	7.7	79.2	19.6
Brandon	3.5	80.2	19.3
Burntwood/Churchill	10.3	71.3	14.3
Central	6.1	80.6	20.4
Nor-Man	8.4	75.7	16.9
North Eastman	4.7	78.2	19.6
South Eastman	5.3	80.8	19.3
Parkland	8.2	77.4	18.7
Winnipeg	6.5	79.9	19.6
Province of Manitoba	6.6	79.3	19.4

Source: Statistics Canada, Health Profiles, 2011.

In the Province of Manitoba, the infant mortality rate is 6.6 per 1,000 live births. In the RHAs in the Project Study Area, this rate varies from 3.5 in the Brandon RHA to 10.3 in the Burntwood/Churchill RHAs. Apart from the Burntwood/Churchill RHAs, the

Parkland and Nor-Man RHAs had higher rates than the provincial rate at 8.2 and 8.4 respectively. The remaining RHAs had rates lower than the provincial rate.

In the Province as a whole, life expectancy at birth is 79.3 years. The South Eastman, Brandon, Central and Winnipeg RHAs all had higher life expectancies at birth. In the remaining RHAs, life expectancy ranged from 71.3 years in the Burntwood/Churchill RHAs to 78.2 years in the North Eastman RHA. In terms of life expectancy at age 65 years, the provincial rate is 19.4 years. Only three RHAs had a greater life expectancy ranging from 20.4 years in the Central RHA to 19.6 years in the Winnipeg and North Eastman RHAs. The Burntwood/Churchill RHAs had the lowest life expectancy at 65 years with a rate of 14.3 years.

Premature mortality rates (PMR)[6] is another indicator of overall health and well-being. The average PMR for the RHAs in the project study area was compared to the Province of Manitoba based on data for two different five year periods (1996 to 2000 and 2001 to 2006). The Manitoba Centre for Health Policy provided PMRs for RHAs over a 10 year period (1996-2005). The Manitoba average for PMR was 3.4 per 1,000 people. Of the RHAs in the Project Study Area, six had PMRs lower than the provincial average with South Eastman having the lowest with 2.6.

The other RHAs with PMRs below the provincial average included Central, Assiniboine, Brandon, and Winnipeg. Two RHAs, North Eastman and Parkland, had rates that were similar to the provincial average. Both Nor-Man (4.6) and Burntwood (5.7) RHAs had rates that were higher than the provincial average (Manitoba Health, 2009; Winnipeg Regional Health Authority, 2004; Regional Health Authority of Central Manitoba, 2004; South Eastman Health, 2010; Brandon Regional Health Authority, 2009; Assiniboine Regional Health Authority, 2010; Parkland Regional Health Authority, 2004; NOR-MAN Regional Health Authority, 2004; North Eastman Health Association Inc, 2010).

In a recent Community Health Assessment conducted by the Province of Manitoba for the RHAs in Manitoba, the Burntwood RHA ranked highest (indicating the lowest overall health rating). The most prominent public health issues within the RHA include: addictions (alcohol, drugs, etc.); quality of housing; quality of water; and diseases, including diabetes. The RHA has access to the provincially provided Life Flights service, for those patients in critical condition, and other carriers providing medical flights (M. Ellis, P. Therrien and R. Beardy, Burntwood Regional Health Authority, pers. comm., January 12, 2011). Hospital utilization was higher in the Burntwood RHA (173.3 per 1,000 population) compared to the province as a whole (81.7 per 1,000 population).

6.5.5Aesthetics

[6] PMR is an indicator of the rate of early death (i.e., death before average life expectancy) in a population and is highly associated with morbidity and self-rated health, as well as with socio-economic risk factors for poor health. In Manitoba, premature mortality rates are calculated as the number of deaths that occur before age 75 per 1,000 residents.

The aesthetics of the Project Study Area vary with the topography and vegetation of the natural landscape, as well as the degree of human activity associated with settlement patterns and with consumptive and non-consumptive land/resource uses beyond communities. Manitoba's regions outside Winnipeg encompassed within the Project Study Area (either in whole or in part) include: North of 53, Parkland, Central Plains, Pembina Valley and Western Regions (Travel Manitoba, 2011). A description of the landscape within the regions is provided below.

North of the 53rd parallel, the Project Study Area is located in the North of 53 Region although the region extends further north and east of the Project Study Area. The region is sparsely populated and Thompson is the only city in the region. Thompson serves as the regional trade and service centre for northern Manitoba. It is located in the Boreal forest within the Canadian Shield, and has numerous lakes. Mining, hydro-electric development, forestry, commercial fishing, trapping, transportation and tourism are the region's major industries. Flin Flon is a mining community located to the northwest of Grass River Provincial Park towards the Manitoba/Saskatchewan border. The Pas serves as a major centre for forestry, transportation, tourism, and government and other services. Some agricultural activities do occur in the vicinity of The Pas. Snow Lake is a mining community situated midway between Flin Flon, The Pas and Thompson in north-central Manitoba, and is also known for its developing tourism industry.

Most of the Parkland region is located in the Project Study Area. Riding Mountain National Park and Duck Mountain Provincial Park area located in the region in the Project Study Area. Dauphin is the region's largest centre. Manitoba's highest point, Baldy Mountain, is located within Duck Mountain Provincial Park and is 831 m above sea level. The region's topography varies. The area has numerous lakes, rivers and streams, and offers all-season recreational opportunities. Much of the economy is agriculturally based.

The Western Region is includes forested hills and many small lakes. Brandon, although outside of the project study area, is the region's largest centre. The region includes Spruce Woods Provincial Park and the Carberry Desert, a large area of rolling sand dunes. The main industry throughout the region is mixed agriculture.

The Central Plains and Pembina Valley Regions are located in south-central Manitoba. Most of the Central Plains Region is in the Project Study Area, while only a small portion of the Pembina Valley Region is included in the Project Study Area. The Pembina Valley is most notable landform of the area, measuring over 2 km wide and 100 m deep, a leftover from the effects of glaciers, weather and time. Portage la Prairie is the largest community in the region. Agriculture is the major industry in the area. Farmers grow a wide range of crops and livestock production is also prominent.

6.3.7 Culture and Heritage Resources

6.3.7.1 Culture

Culture is a composition of values, beliefs, perceptions, principles, traditions and world views that are superimposed on one another and are perpetuated through the language and kinship system of a distinct group of people. Culture can be manifested in the way people do things (behavior) and the way they think (cognition). It can be misunderstood and often is confined to tangible expressions such as art, literature and other media. The intangible qualities of culture are more difficult to define and hence more difficult to access.

There are distinct Aboriginal groups in the Project Study Area — Cree, Ojibway, Dakota Sioux, and Métis. For the Project, an Aboriginal Traditional Knowledge (ATK) process and Key Person Interviews (KPIs) were conducted in the Project Study Area (*Bipole III Aborginal Traditional Knowledge Technical Report* and *Bipole III Socio-Economic Baseline Data Technical Report*). The ATK process and KPIs suggests that there are similarities and differences between Aboriginal and non-Aboriginal groups in the Project Study Area. In terms of similarities, inherent or universal values held by both is creating a strong sense of community. Those who regularly engage in traditional activities (see Domestic Resource Use) also have a great appreciation and love of the natural landscape. Where they differ is in the importance placed on their relationship with the land. Aboriginal culture, in general, is 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. Aboriginal people see the land on which they live as all encompassing, a way of life, where relationships with the land reinforce culture. To be denied the opportunity to maintain this relationship results in the loss of one's culture.

ATK plays an important role in Aboriginal culture. Though definitions vary, ATK is generally seen as the foundation of a way of understanding, based on observations, experiences and events over time. 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 incorporated municipalities in the project study area were developed, and have been sustained, primarily for resource use reasons (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 (Thompson, Dauphin, Swan River, Portage la Prairie, The Pas).

Both groups place importance on future generations which includes the need for economic stability in terms of employment and job opportunities. Many Aboriginal

residents are looking for ways to rekindle traditional practices and introduce younger generations to their cultural heritage. Efforts are made locally to encourage youth to engage in cultural activities. However, funding can be a major issue.

6.3.7.2 Heritage Resources

The Project Study Area is a complex patchwork of human adaptation that has, over the past 10,000 years, served as a record of cultural land use and occupancy by human populations.

Cultural Sequencing

The nature of deglaciation some 12,000 years ago (ya) and the subsequent development of glacial Lake Agassiz determined the physical boundaries of early human occupation in the Project Study Area. The location of tangible cultural heritage (artifacts and features) in Manitoba coincides with post-glacial conditions that allowed successive migrations of wildlife and plants into previously inaccessible lands. Once the physical condition of natural resources stabilized, human populations quickly took advantage of the new and emerging landscape. Subsequent fluctuations in climatic conditions also contributed to later movements of people throughout the Project Study Area.

Six major water ways transect the Project Study Area: Nelson, Burntwood, Grass, Saskatchewan, Assiniboine and Red rivers. Together these rivers drain a substantial portion of the interior, all of which empty into Hudson Bay via the Nelson River. In addition, a vascular network of numerous secondary rivers, streams and creeks connect these major water bodies. These interlacing river systems played a significant role in the movement of human populations. The archaeological record confirms this by the distribution of some tools, exotic tool-making stone, pottery designs, and cultural expression in the way of pictographs, petroforms and burial practices that are to be found within the Project Study Area. New ideas (e.g., the ceramic tradition) and technologies (e.g., invention of tool form and function) spread through the network of intricate waterways and ancient trails where they were modified and improved upon according to local needs.

Manitoba's heritage is loosely defined into two periods – Pre-European contact and Historic. These are described further below and in the *Bipole III Heritage Resources Technical Report*.

Pre-European Contact Period

The pre-European contact period represents the time before face-to-face encounters between indigenous people and Europeans. Generally, this period begins with evidence of the first people who explored the region during the post-glacial emergence of habitable lands. This occurred at different geographic and temporal locations. The pre-European period is divided into three categories which are based on association with hallmark technologies: the Palaeo/Plano Period (ca. 12,000 – 6,000 years ago); the Archaic (Western Diversification) Period (ca. 8,500 – 2,500 ya); and the Woodland Period (ca. 2,000 – 300 ya). The frequency of cultural sequencing within various ecosystems of the Project Study Area is noted in the table below. Maps 6-38 to 6-40 illustrate the distribution of the various cultural sites within the Project Study Area.

Table 6.3-13: Frequency of Cultural Sequencing within Bipole III Project Study Area Ecosystems

Pre-European Contact	Undetermined	Paleo	Archaic	Woodland	Taltheilei	Total
Borean Plains	538	89	196	275	0	1098
Boreal Shield	285	3	47	233	3	571
Hudson Bay Plains	27	0	0	0	0	27
Prairie	490	79	230	289	0	1088
Total	1340	171	473	797	3	2784

Source: *Bipole III Heritage Resources Technical Report.*

The Historic Period

The archaeological record for this period follows two somewhat parallel paths: European and Historic Aboriginal. The introduction of European trade goods such as copper pots, muskets, steel goods and trade beads caused significant changes to aspects of the subsistence economy.

Explorers and fur traders were the earliest Europeans to arrive in the Project Study Area, followed by a number of Hudson Bay Company (HBC) surveyors that explored areas along the Burntwood, the Saskatchewan and the Assiniboine Rivers. A number of fur trade posts were established through these early explorations. Soon after the formation of the HBC, the French entered Manitoba, interested in fur trade and imperialistic expansion.

In 1779, the newly formed North West Trading Company (NWCO) became a source of competition for the HBC and rival trade posts were created throughout western Manitoba particularly along major transportation routes. The progression of the fur trade led to the strengthening of the relationship between indigenous peoples and fur trade servants through the intermarriage of these two groups resulting in the emergence of a new culture (i.e., "country born" in the north and Métis). By 1811, amid competition between the NWCO and the HBC, plans for a settlement in the Red River Valley

emerged. By the following year, Scottish settlers had journeyed up the Hayes River to the Red River Valley to establish a settlement. Eventually a series of parish river lots were created along the Red and Assinboine rivers, leading to the establishment of the City of Winnipeg.

The Confederation of Canada in 1867 led to the founding of the Dominion Land Surveys of 1870 which incorporated the Province of Manitoba under a section, township, and range system of land classification. Numerous settlers arrived in the province, purchasing land through these government surveys and changed the cultural landscape of the Project Study Area. In 1880, the Canadian Pacific Railway (CNR) arrived in southwestern Manitoba and facilitated access to and from communities along the rail line and provided a new method of transporting agricultural goods to Winnipeg, eastern Canada and the U.S. With the development of the rail line, came the establishment of villages and towns, and the organization of municipal governments. Several buildings from this late Historic time period are now provincially or municipally designated sites.

Beginning in 1871, settlements of First Nations were under pressure to take Treaty with the Federal Government. Between 1871 and 1905 five treaties were signed in Manitoba and reserves were created shortly thereafter.

Distribution of Heritage Resources

The distribution of archaeological sites was examined by ecozone: Hudson Bay Lowland; Boreal Forest; Parkland and Prairie. The distribution of early Palaeo points was located above the Campbell Beach Ridge. Late Palaeo/early Plano sites were widely spread throughout the lower half of the overall study area (south of The Pas), while sites in northern half occur mainly on the western edge of the Project Study Area. Archaic period sites were distributed along major waterways and suggested an influx of both Shield and Plains Archaic. The vast distribution of Woodland archaeological sites throughout the Boreal and northern Parkland ecozones suggested rapid movement of ideas and/or people from the southeast. The southern Parkland and Prairie ecozones indicated movements of Plains people from the south and west. Site distribution was in keeping with earlier bison-hunting people and was considered to represent diffusion of changing technology rather than new people.

The presence of late Woodland period pottery, consistent with proto-Anishinaabe, at a site at Brandon, at a site at the Manitoba Narrows, and at Dauphin Lake illustrate a much broader range of Woodland-related people who accessed prairie resources such as bison on a seasonal basis. Bison are also known to have a much larger range than that of the historical period. Although outside of the Project Study Area, bison bone has been found at archaeological sites within the Interlake, and pictographs depicting bison have been found along the Bloodvein River at the Ontario/Manitoba border.

The Aboriginal content of the Historic Period has not been effectively identified and many sites that are noted as Historic (general) or fur trade may belong to the Historic Aboriginal category. The historic development of Manitoba is well represented within the Project Study Area (Map Series 6-4100). Further to the general archaeological inventory, federally, provincially or municipally designated sites, as provided by the Historic Resources Branch, indicates that the Historic Period is well represented (Map Series 6-4100). However, few designations have been made to Aboriginal sites.

Heritage and Cultural Resource Inventory Summary

According to the Historic Resources Branch inventory database, there are 4,912 heritage and cultural resource sites registered within the Project Study Area (Map Series 6-4100). Sites range in age from 10,000 ya to 100 ya, and include campsites, burials, animal kill sites, tool-making stations, lookouts, quarries, ceremonial features, homesteads, industrial locations, pictographs, fur trade posts, and palaeontological specimens such as plant and animal fossils. Of the total number of sites, 3,023 are archaeological sites (i.e., any site or object that shows evidence of human endeavour) of which 77 are registered burial sites.

Other heritage and cultural sites include Centennial Farms, cairns and plaques, and federal, provincial and municipally designated sites. Any active farm that is more than 100 years old and has been held by the same family is designated provincially as a Centennial Farm. Within the Project Study Area, there are 524 locations. Across the province, cairns or plaques mark events and occasions to commemorate a particular event. Within the Project Study Area there are 1,209 sites. Provincially and municipally designated heritage sites are considered to be of great value or of importance in that they reflect an event or happening that is important to the development of the province or are acknowledged for the contribution made at the municipal level. Within the Project Study Area, there are 57 and 99 recorded designated sites respectively.

In 2010, two new archaeological sites were discovered at the location of the proposed Keewatinoow Converter Station from field investigations as part of the Heritage Resource Impact Assessment (HRIA) process. The sites were situated on low rise gravel ridges that were likely beaches of the former Tyrrell Sea. Both sites contained elements of settlement, such as concentrated lithic scatters and stone features that represent human activity possibly at 3,500 years ago. HdKl-01 contained a number of stone features, three of which may represent former burial sites, in addition to numerous loci of lithic scatter. Further to these cultural features, a microblade tool was recovered during test excavation and may represent Palaeo-Inuit occupation. The second site contained stone features that may be tent rings; no diagnostic tools were found at this site during controlled surface collection.

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