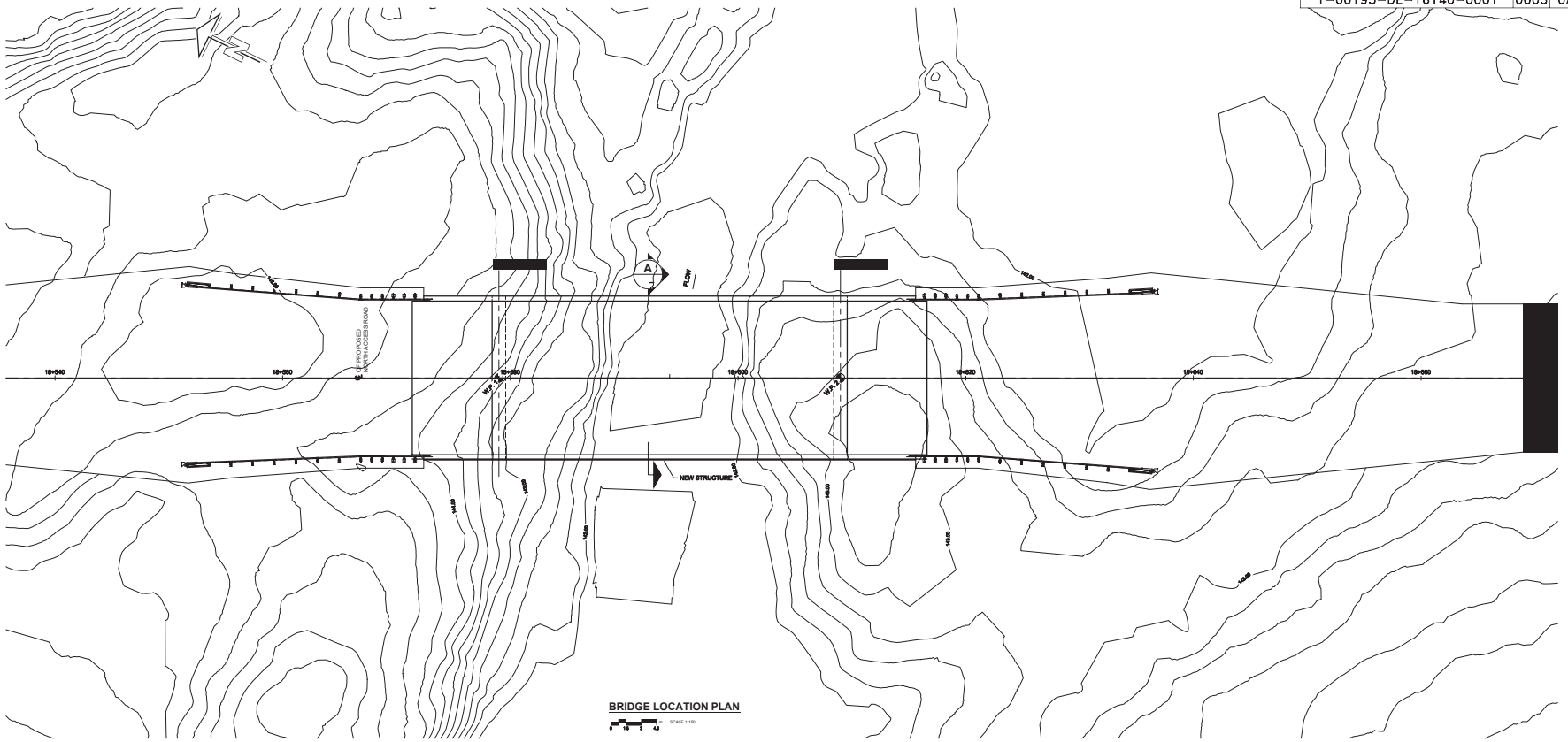
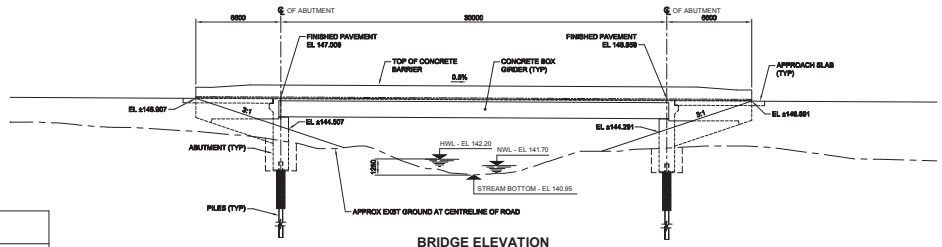
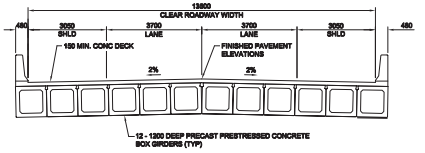






LOOKING BACK CREEK
WATER LEVELS AND DISCHARGES 2007-2008

DATE (Y.M.D)	TIME (CST)	WATER SURFACE ELEVATION (m)	DISCHARGE (CMS)	HIGH WATER MARK
2007 06 23	11:55	141.73	2.82	
2007 06 28	9:44	141.67	N/A	
2007 06 10	12:24	141.49	0.82	
2007 07 09	16:15	141.66	1.44	
2007 07 30	13:47	141.58	0.22	
2007 09 03	13:55	142.06	3.69	
2007 10 09	14:15	141.90	N/A	
2008 06 25	14:24	142.13	N/A	
2008 06 08	10:40	141.49	1.84	142.30
2008 07 07	18:28	141.51	1.17	
2008 08 10	19:26	141.83	0.13	

WORKING POINT COORDINATES

	LOCAL COORDINATE SYSTEM (GROUND DISTANCES)		C.S.R.S. (NAD 83) U.T.M. GRID	
WORKING POINTS	NORTHING	EASTING	NORTHING	EASTING
WP 1			6280070.086	360691.795
WP 2			6280043.279	360815.305

CONSULTANT PROJECT NUMBER: 0217-200-06

AECOM

DELCAN CORPORATION

SNC-LAVALIN

NO.	DATE	REVISIONS	BY	CKD.	APP.
A	--	--	--	--	--

NOTED

MANITOBA HYDRO

Keeyask Infrastructure Project

LOOKING BACK CREEK BRIDGE

GENERAL ARRANGEMENT

DRAWN

CHECK

SCALE AS NOTED

DATE

1-00195-DE-16140-0001 | SHT. 0003 | REV. 0A

Plot Time 6/24/2009 8:59 AM

Drawing File: 0217-200-06_01-S-0103_RX.DWG

AUTOCAD ORIGINAL

FOR WORKPLAN USE ONLY

1-00195-DE-16140-0001 | SHT. 0003 | REV. 0A

1-00195-DE-16140-0001 | SHT. 0003 | REV. 0A

Figure 2.3-2

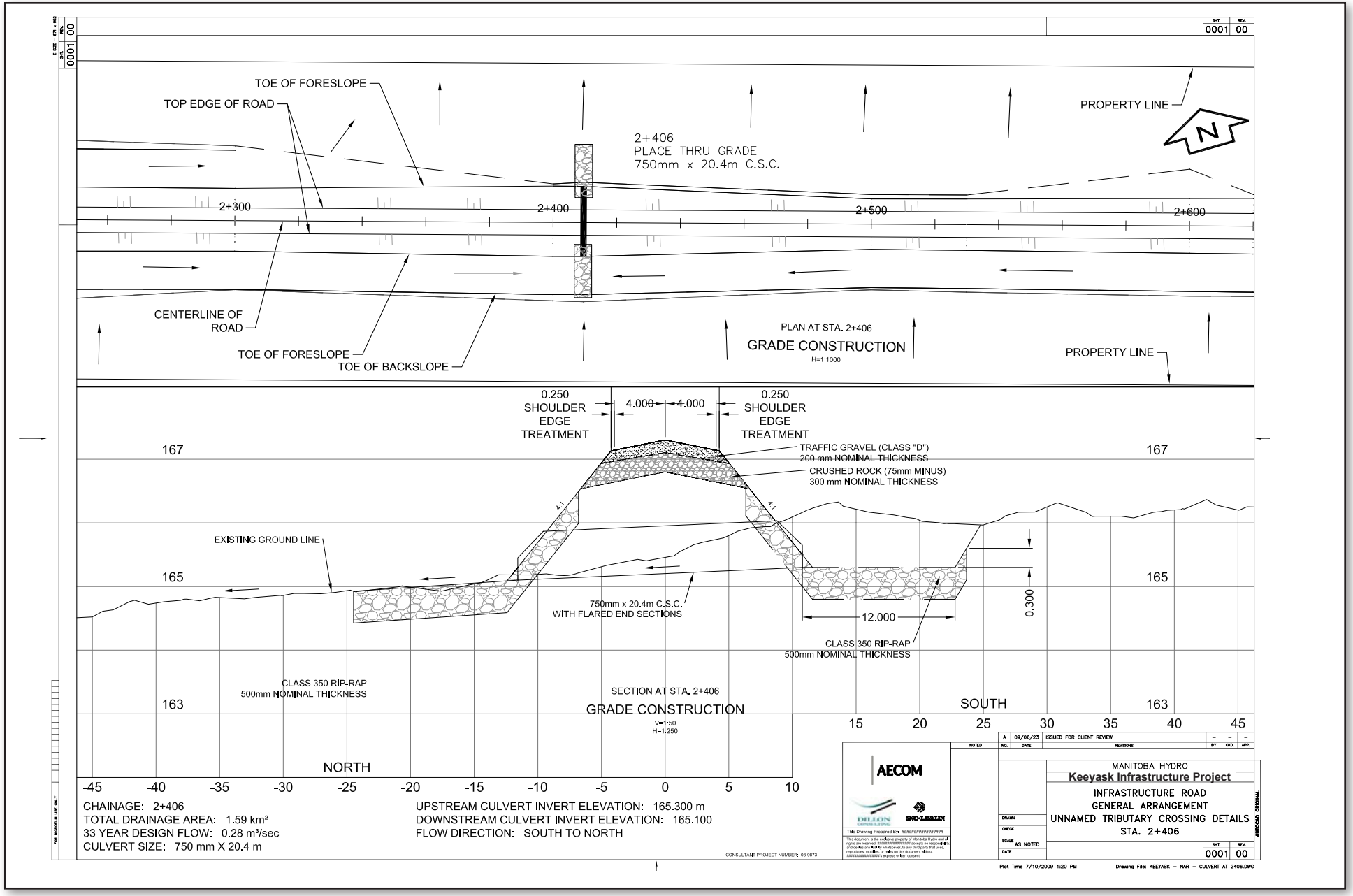

TOE OF FORESLOPE
TOP EDGE OF ROAD
PROPERTY LINE
2+406
PLACE THRU GRADE
750mm x 20.4m C.S.C.
2+300
2+400
2+500
2+600
CENTERLINE OF ROAD
TOE OF FORESLOPE
TOE OF BACKSLOPE
PLAN AT STA. 2+406
GRADE CONSTRUCTION
H=1:1000
PROPERTY LINE
0.250 SHOULDER EDGE TREATMENT
4.000
4.000
0.250 SHOULDER EDGE TREATMENT
TRAFFIC GRAVEL (CLASS "D")
200 mm NOMINAL THICKNESS
CRUSHED ROCK (75mm MINUS)
300 mm NOMINAL THICKNESS
4:1
4:1
EXISTING GROUND LINE
750mm x 20.4m C.S.C.
WITH FLARED END SECTIONS
12.000
0.300
CLASS 350 RIP-RAP
500mm NOMINAL THICKNESS
CLASS 350 RIP-RAP
500mm NOMINAL THICKNESS
167
165
163
NORTH
SOUTH
SECTION AT STA. 2+406
GRADE CONSTRUCTION
V=1:50
H=1:250
-45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10
15 20 25 30 35 40 45
CHAINAGE: 2+406
TOTAL DRAINAGE AREA: 1.59 km²
33 YEAR DESIGN FLOW: 0.28 m³/sec
CULVERT SIZE: 750 mm X 20.4 m
UPSTREAM CULVERT INVERT ELEVATION: 165.300 m
DOWNSTREAM CULVERT INVERT ELEVATION: 165.100
FLOW DIRECTION: SOUTH TO NORTH
AECOM
DILLON CONSULTING
SNC-LAVALIN
MANITOBA HYDRO
Keeyask Infrastructure Project
INFRASTRUCTURE ROAD
GENERAL ARRANGEMENT
UNNAMED TRIBUTARY CROSSING DETAILS
STA. 2+406
SHT. 0001 REV. 00
A 09/06/23 ISSUED FOR CLIENT REVIEW
SCALE AS NOTED
Plot Time 7/10/2009 1:20 PM
Drawing File: KEEYASK – NAR – CULVERT AT 2406.DWG

Figure 2.3-3

3.0 ENVIRONMENTAL SETTING

3.1 OVERVIEW

The proposed Project is located to the north and east of Lake Winnipeg (Figure 1.1-1) in the Knee Lake **Ecodistrict**, the Boreal Shield **Ecozone**, and the Hayes River Upland **Ecoregion** in northern Manitoba (Figure 3.1-1). Since the Project is located in the northern part of the Knee Lake Ecodistrict, characteristics of the study region are likely to be intermediate between the Knee Lake values and those listed for the Embleton Lake Ecodistrict located just north of the Project location. Where available, information for sites closer to the Project (e.g., climate information reported for Gillam) is used as being representative of that area.

The following sections provide information on the main components of the environmental setting:

- Physical environment:
  - Climate (temperature, precipitation, wind);
  - Physiography (topography, geology, soils, permafrost);
  - Surface water (hydrology, quality);
  - Groundwater (hydrogeology, quality).
- Aquatic habitat and biota.
- Terrestrial environment:
  - Vegetation (terrestrial ecosystems and habitat, plants);
  - Wildlife (invertebrates, amphibians, reptiles, birds, mammals).
- Socioeconomic environment:
  - Population and demographics;
  - Land and resource use;
  - Infrastructure and services;
  - Labour Force and Employment; and
  - Community and family life.
- Heritage resources.

3.2 PHYSICAL ENVIRONMENT

Physical environment includes climate, noise, air quality, physiography (topography, geology, soils and permafrost), surface water (hydrology, surface water quality) and groundwater (hydrogeology, groundwater quality).

3.2.1 Climate, Noise and Air Quality

The proposed Project is located within the sub-Arctic climate zone that is characterized by long, usually very cold winters, and short, cool to mild summers. Based on measurements at Gillam Airport, the mean annual temperature is -4.2°C, with a range of monthly average temperatures from -25.8°C in January to +15.3°C in July (Environment Canada 2009).

The mean annual precipitation is 499.4 mm, of which approximately 63% is rain, with the highest values occurring in July (81.8 mm) and August (77.2 mm). October through April tend to receive the most amount of precipitation in the form of snow, typically in the range of 23.4 to 43.9 cm per month. September and May can be considered transitional months, when both rainfall and snowfall can occur.

The predominant wind direction is northeast from March to July, northwest from August to November, and westerly from December to February. Monthly normal wind speeds range from 14.0 km/h in February, March and December to 17.8 km/h in October. A maximum gust speed of 107 km/h was recorded in July of 1991.

No data is available for ambient noise levels and no data was obtained for air quality; however, existing noise and air quality levels are expected to be low and typical of relatively undisturbed areas.

3.2.2 Physiography

3.2.2.1 Topography

The topography of the Knee Lake **Ecodistrict** is generally flat with undulating loamy moraines that erode into drumlin crests and ridges. Elevations range from 150 to 213 m above sea level (masl) in the lowlands near Stephens Lake. Eskers provide local relief to heights of 20 to 30 m (Smith *et al.* 1998).

The proposed road ROW is located along and adjacent to an **esker** (Gull Esker), which extends southeast from PR 280 to Stephens Lake, just north of Gull Rapids (Figure 3.2-1). Studies undertaken in support of this EA report indicate that the **topography** adjacent to the proposed road includes gently-sloping terrain, with peat of varying thickness overlying fine-grained glaciolacustrine clay and silt. Steeper slopes are found on the flanks of elongated **drumlins** that formed in an approximate east-west direction resulting from glaciers.

3.2.2.2 Geology

The region lies within the **Canadian Shield** near the boundary between the Churchill and Superior provinces in which its **geological overburden** thickness is estimated to be up to 30 m over the **Precambrian bedrock** (Betcher *et al.* 1995). This bedrock generally consists of **greywacke gneisses**, **granite gneisses** and **granites**. The overburden **stratigraphy** is a reflection of the last glacier retreat eastward and the resulting inundation of much of Manitoba by glacial Lake Agassiz. Some preglacial and silty sands are found immediately above the **bedrock** formation, but generally the overburden consists of a thick layer of deposited glacial material (**till**) overlain by postglacial deposits in the form of **alluvium** (cobbles and boulders overlying sands and gravels) and Lake Agassiz silts and clays. Studies undertaken as part of this EA report indicate that the latter are commonly **varved** and relatively thin in nature (except in topographic lows) or absent (e.g., on nearby ridges and knolls).

Within the Gull Rapids area, the bedrock basement is generally **metamorphic** and **cataclastic** in texture. Further downstream, **metasedimentary** rocks and **igneous intrusive** rocks are also found (Manitoba Hydro 1993a, 1993b). Studies undertaken in support of this EA report indicate that along the Stephens Lake shore zone, a **boulder lag** is present in places between the bedrock and the overlying glacial drift and some or all of the overburden units are reported to be locally absent.

3.2.2.3 Soils and Permafrost

Soils from the **Brunisolic**, **Cryosolic**, **Gleysolic**, **Luvisolic**, **Organic** and **Regosolic** soil orders were represented in field studies undertaken in support of this EA report for the Regional Study Area. Organic soils were the most common, followed by Cryosols (Appendix B2, Table B2-2-1). **Fibrisols** and **Mesisols** are the dominant Organic soil; Organic Cryosols are the dominant Cryosol. ineral soils, which cover approximately 10% of Regional Study Area, are concentrated on elevated areas which primarily occur along the Nelson River and the upper portions of the eskers and moraines. Mineral soils tend to be well-drained due to their locations.

As described in Section 3.2.2.1, the proposed road ROW extends along and adjacent to the Gull Esker in the vicinity of Gull Lake (Figure 1.3-1). Post-glacial peat and clay in this area has an average thickness ranging between 0.6 and 1.3 m (Manitoba Hydro 1993a, 1993b). Studies undertaken in support of this EA report indicate that median peatland depths in the region (i.e., combined thickness of peat, water and ice core) range from 0.5 to 3.2 m depending on peatland type. Three separate till-**intertill horizons**, which range in thickness between 2 and 10 m (Manitoba Hydro 1993a, 1993b), comprise the underlying deposited glacial material.

Peatlands are the dominant wetland type in the region (Appendix B2, Table B2.2-2). Measured peat thicknesses range from 20 cm to over 5 m. **Veneer bog**s and blanket peatlands are the most common peatland types, covering approximately 65% of the region. Veneer bogs primarily occur on upper and mid-slope positions. Blanket peatlands primarily occur on lower slopes, valleys and level areas. Blanket peatlands are thicker than veneer bogs and often contain scattered patches of ground ice. Peat plateau bogs and their transitional stages cover approximately 16% of regional land area. The remaining peatland types are **horizontal peatland**s, **aquatic peatland**s, thin wet peat and deep wet peat. These peatlands, which are generally found in depressional locations, cover approximately 9% of Regional Study Area.

Soil type and permafrost activity throughout soil horizons contributes to surface topography (Smith *et al.* 1998). Uneven soil horizon development in sediments with high clay content is evidence of permafrost effects on deeper soil layers. Permafrost activity is illustrated in surface layers by the presence of low earth hummocks (Smith *et al.* 1998). Mineral and organic soils present at regional and local scales frequently include bodies of **permafrost**. The permafrost table and bottom depths vary, depending on the depths of organic and mineral layers. While permafrost is widely distributed throughout the region, studies undertaken in support of this EA report indicate that the sandy, gravely soils of the esker have been found to be generally free of permafrost and that permafrost is expected to be absent in ridges composed of granular soils.

Surface permafrost is widespread in the area and generally occurs in all peatland types except for horizontal and aquatic peatlands. The types of permafrost range from cold soil temperatures only to

ice crystals, ice lenses and ground ice. Ground ice in peat plateau bogs can be several metres thick. Although permafrost may exist in the esker soils, it is unlikely that these frozen sandy/gravely soils will include large masses of frozen water (ice).

3.2.3 Surface Water

3.2.3.1 Hydrology

Overview

The Project is contained within the Nelson River Drainage Basin (Figure 3.2-2). The southern terminus of the proposed road is near Gull Rapids on the Nelson River (Figure 1.3-1). Lakes of various sizes are densely scattered across the landscape. Many of the lakes have shorelines composed of **unconsolidated** materials and often lie between drumlin ridges. The majority of the area is drained by Looking Back Creek westward into Stephens Lake. Drainage in the immediate area of the proposed road flows off the north side of the esker to the northeast and off the south side of the esker to the southeast.

The proposed road crosses Looking Back Creek and an unnamed tributary (Figure 2.1-1). Since no flow records have been previously collected on these streams a regional hydrology study was conducted for these local tributaries in support of this EA Report (Section 2.2.2.1). The study was necessary to determine the hydrological parameters for the analysis of the two crossings. It included using updated hydrometric information representing the region.

The hydrologic analysis involved using the regional flood analysis for estimating average flood peaks based on eleven hydrometric gauges of similar basins in the region. A relationship was determined between the average flood data and the corresponding drainage area. Design inflow hydrographs were computed using this information for the two stream crossings.

The proposed road will also require approximately 12 additional through-grade drains to allow passage of local overland runoff. These culverts do not constitute stream crossings and no hydrology studies were conducted for these locations.

Looking Back Creek

The proposed road crosses Looking Back Creek approximately 4 km upstream from the Nelson River. Approximately 95% of the 126- km^2 drainage area is upstream of the crossing site (Appendix B1-2). Looking Back Creek is a classified as a **third-order stream** at the crossing location.

Looking Back Creek is a medium-sized seasonal to perennial stream with a well-defined meandering channel lying within a narrow well-drained floodplain. The hydrologic assessment of Looking Back Creek undertaken in support of this EA report indicates that on average this creek will maintain low flows through the winter, with occasional (approximately 30% of the time) backwater flooding resulting from ice damming on the Nelson River. The mean monthly hydrograph indicates that flows rise quickly during the spring freshet, reach a peak of approximately 3.0 m^3/s in May, and then

decrease and stabilize at about 1.5 m^3/s throughout summer. Flows during the fall gradually decrease, reaching about 1.2 m^3/s by October. Flows continue dropping throughout the winter months, reaching the lowest flow values of approximately 0.15 m^3/s by the end of March. During fall 2004, channel width and maximum depth at the crossing were 7.4 and 0.8 m, respectively. During spring 2005, mean water velocity and discharge were 0.32 m/s and 2.37 m^3/s, respectively.

Unnamed Tributary

Although the unnamed tributary is a small **second-order stream**, the road crossing is in the headwaters, where the tributary is a **first-order stream**. Approximately 4-km^2 (11%) of the 36-km^2 watershed is upstream of the crossing location. The crossing site is approximately 1 km downstream of a small headwater pond, 11 km upstream of its confluence with the South Moswakot River and 30 km upstream of the North Arm of Stephens Lake (Appendix B1).

The tributary is a small intermittent stream with morphology and habitat ranging from boreal wetland with a braided channel and beaver dams to a well-defined narrow channel in upland forest. Studies undertaken in support of this EA report included an estimate of flow patterns for the unnamed tributary creek. The mean monthly hydrograph indicates that flows rise quickly during the spring freshet, reaching a peak of about 0.09 m^3/s in May, then decreasing and stabilizing at about 0.04 m^3/s throughout summer. Flows during the fall gradually decrease, reaching about 0.01 m^3/s by October. Flows continue dropping throughout the winter months and by March the flow is essentially zero at which time the creek is frozen to the bottom. This is the typical winter process, since this crossing location is well above ice staging effects on the Nelson River.

During a March 2005 field visit, the tributary was not accessible at the crossing location, but sampling was conducted approximately 1 km further upstream at the outlet of a small pond. Anoxic conditions were measured in the only site that water was found at that location. In February 2009, the crossing location was accessed and the tributary was found to be frozen to the bottom. During the fall of 2004, channel width and maximum depth of the main channel at the crossing location were 2.5 and 0.6 m, respectively. Discharge was 0.02 and 0.07 m^3/s during the fall 2004 and spring 2005 surveys, respectively.

3.2.3.2 Surface Water Quality

Surface water quality was examined at or near the proposed stream crossings four times in the open-water seasons of 2003 and 2004, once in the spring of 2005 and once in the winter of 2005 (Appendix B1). Sampling in 2003 and 2004 was conducted near but not at the crossing location of the unnamed tributary. Due to the relative proximity of the sampling site, conditions are considered to be adequate to characterize this stream-crossing location.

In situ conditions measured during the open-water season at the two stream crossings indicate a wide fluctuation in dissolved oxygen (DO) conditions. At both sites, DO ranged from 3.6 mg/L, which is below the instantaneous minimum for the protection of early life stages of cool-water species (5.0 mg/L), to near saturation. The pH remained near neutral to slightly alkaline at all times and was consistently within the water-quality guideline range for the protection of aquatic life (CCME 1999; updated to 2009). Water-quality data from the stream-crossing sites are presented in Appendix B1.

Turbidity and total suspended solids (TSS) varied across sampling times and were generally higher in Looking Back Creek than in the unnamed tributary. Total phosphorus (TP) also ranged relatively widely across sampling periods at both crossings and was consistently higher at the Looking Back Creek crossing than the unnamed tributary site, possibly reflecting the higher TSS at this site. With one exception (sample collected at Looking Back Creek in July 2004) all concentrations of TP were below the Manitoba narrative guideline for streams (0.050 mg/L; Williamson 2002). Ammonia and nitrate concentrations were generally quite low and were within the Manitoba water-quality objectives (Williamson 2002) and the CCME (1999; updated to 2009) guidelines for the protection of aquatic life, respectively.

Stream primary productivity, as estimated from chlorophyll *a* concentrations, varied notably between years at both crossing locations but peaked at both sites in August 2003. Chlorophyll *a* was consistently detected in the open-water season of 2003 but remaining generally low in 2004.

Looking Back Creek was frozen to the bottom at the crossing location when visited in March 2005. In February 2009, the Creek channel was approximately 6.5 m wide at the crossing location, with an average of 0.9 m of water under an ice cover of about 1.1 m. A DO reading could not be obtained but no stagnant odour was apparent. In March 2005, the tributary was sampled approximately 1 km upstream of the crossing location at the outlet of a small headwater pond due to poor access at the crossing location. Several holes were drilled at the outlet of the pond and all but one contained a mixture of mud and stagnant water. One location yielded approximately 0.2 m of water with a low DO concentration (1.72 mg/L and stagnant odour). The results suggest that DO conditions are not suitable to support aquatic life in winter. The tributary was investigated in February 2009 and was found to be frozen to the bottom at the crossing location.

3.2.4 Groundwater

Results from recent studies carried out on the **aquifers** in the region in support of this EA report indicated that groundwater levels generally drain towards Looking Back Creek and then to Stephens Lake. Groundwater levels have been noted to change in response to fluctuations in surface-water levels as a shared response to precipitation events.

3.2.4.1 Hydrogeology

The existing groundwater regime consists of unconfined surficial and semi-confined overburden aquifers (Betcher *et al.* 1995). The groundwater table below the esker is generally from 5 to more than 7.5 m below grade. The connection between the aquifers is not entirely understood but is expected to be present based on the local stratigraphy (specifically the lack of a continuous confining layer). Groundwater elevations and flow appear to correspond directly with surface topography. More specifically, groundwater elevations are highest in the highland areas and groundwater flows from topographic highs to topographic lows. Overall, groundwater is shallow (0 to 1.5 m below the ground surface). However, there are scattered locations on topographic highs where the depth-to-groundwater is more than 7.5 m.

Precambrian igneous and metamorphic rocks form the bedrock basement of the region (Section 3.2.2.2). This basal **hydrostratigraphic** unit is generally **impermeable** to groundwater

except where the bedrock has been fractured by **tectonic** movement (Betcher *et al.* 1995). The **permeability** of the bedrock units within the region is reported to be varied, based on the location of local bedrock positions.

3.2.4.2 Groundwater Quality

Carbonate-rich glacial till and bedrock units contribute to groundwater quality in the northern reaches of the Nelson River **watershed**. Betcher *et al.* (1995) describes groundwater in the area as "slightly alkaline," typified by calcium, magnesium and bicarbonate components, with total dissolved solid concentrations from 400 to 450 mg/L. According to Betcher *et al.* (1995), in some locations, groundwater samples show high levels (1,300 mg/L) of sodium and chloride, which is thought to represent residues of marine waters from the Tyrell Sea, which formed approximately 8,000 years ago and extended an estimated 250 km inland from the present day shore of the Hudson Bay.

In the study area, recent (2008) groundwater analyses and monitoring-well water sampling undertaken in support of this EA report confirm the previous findings of Betcher *et al.* (1995). Two water types can be distinguished based on general groundwater chemistry as follows:

- Calcium-magnesium-bicarbonate waters with pH between 6.5 and 7.5, and TDS concentrations between 470 and 550 mg/L. This type of water was collected on the north side of the Nelson River at four locations and three locations on the south side; and
- Residual marine-water pockets of sodium-chloride composition with a pH of 6.5, and TDS concentrations around 11,700 mg/L. This type of water was collected on the south side of the Nelson River at one location.

A separate camp well investigation has confirmed the potability of the groundwater to be used for the start up camp and main camp. Figure 2.2-1 shows the well locations.

3.3 AQUATIC HABITAT AND BIOTA

Aquatic habitat and biota consist of the aquatic, semi-aquatic and riparian environments in which aquatic plants and animals interact. Habitat requirements particular to a species can change at each stage of its life-cycle. For example, the habitat requirements for fish spawning will often be substantially different than those required for feeding. A species of fish may require a wide variety of habitats to successfully complete its life-cycle.

3.3.1 Aquatic Habitat

Aquatic habitat was assessed at the two crossing locations during the fall of 2004. A replicate of some of the physical measurements was obtained in spring of 2005. Winter conditions were assessed at or near both sites in March 2005 and February 2009. Detailed aquatic habitat assessments are provided in Appendix B1.

3.3.1.1 Looking Back Creek

Fish habitat at the Looking Back Creek crossing site consisted entirely of run/glide habitat (flat, laminar flow) with a small amount but high diversity of cover, including over-stream vegetation, woody debris, cut bank, in-stream vegetation, and boulder. In-stream vegetation accounted for approximately 40% of the cover within the reach. Emergent vegetation (e.g., sedges) and rooted aquatic macrophytes occurred in approximately equal abundance along the shorelines (Appendix B1). Stream substrate was moderately compacted fine sediments with sporadically occurring boulders.

3.3.1.2 Unnamed Tributary

The tributary at the proposed crossing site lies within a saturated floodplain with dense willow growth. Immediately upstream of the crossing site, the tributary channel is braided with numerous side channels and off-current pool areas. In contrast, downstream the channel is well-defined within a well-drained forested area. The crossing site consisted entirely of pool habitat with a moderate level of cover composed primarily of over stream vegetation and woody debris. In-stream vegetation (including rooted aquatic macrophytes) accounted for approximately 10% of the cover. Stream substrate was poorly compacted fine silts and organic matter.

3.3.2 Aquatic Biota

Aquatic invertebrate diversity was assessed in the streams potentially crossed by the proposed road during the fall of 2004 using D-ring kick netting. The scientific and common names for species identified are listed in Appendix B1. Fish use was assessed during the fall of 2004 and again in the spring of 2005 using a variety of equipment including electro-fishing, gill netting, seine, hoop netting and D-ring kick netting.

3.3.2.1 Invertebrates

During fall 2004, aquatic invertebrate sampling was conducted at Looking Back Creek and at the unnamed tributary. Aquatic invertebrates from 33 taxa were identified in kick net samples from Looking Back Creek, which supported a considerably more diverse aquatic invertebrate community than the 17 taxa identified from the unnamed tributary (Appendix B1).

3.3.2.2 Fish

Looking Back Creek

No fish were captured in Looking Back Creek during the fall 2004 study. The spring 2005 catch was limited to walleye and northern pike. A total of seven walleye and 54 northern pike were captured in a hoop net set at the crossing site, oriented to capture fish moving upstream in May 2005. The majority of northern pike females were ready to spawn and none were in post-spawning condition. In contrast, both ready-to-spawn and post-spawn northern pike males were captured. All of the walleye males were ready to spawn, as was the one female walleye for which maturity could be

determined. The capture of northern pike and walleye in pre-spawn condition suggests that these fish were moving to spawning habitat further upstream in Looking Back Creek, while the presence of some northern pike in post-spawn condition suggests that spawning may also take place further downstream.

The crossing location is in close proximity to Stephens Lake, with no barriers to fish passage downstream. At the time of the survey, the nearest upstream barrier to fish passage was a beaver dam located approximately 2 km upstream, from which point beaver dams were present into the headwaters of the creek. The diversity of habitat and size of the stream likely means that it provides spawning, foraging and rearing habitat for a number of both small- and large-bodied spring and summer spawning species. However, this Creek maintains little to no flow in the winter and therefore is not suitable for fall spawning species such as lake whitefish. It would appear that the crossing location may provide overwintering habitat for small- and large-bodied fish species in some years but not in others.

While the only species captured at this site were northern pike and walleye, it is expected that cyprinids and suckers may also use this site. These species would be considered as moderately resilient to change and perturbation. It is expected that the habitat at this site would be used for feeding and rearing. The site is not expected to supporting spawning habitat for walleye or suckers, although northern pike may spawn along the margins of the channel. The habitat and species present at this site is classified as prevalent because nothing about the habitat at the site appears rare. Looking Back Creek would be classified as a cool-water stream having moderate resiliency. Based on the Practitioners Guide to the Risk Management Framework for DFO Habitat Management Staff Version 1 (Fisheries and Oceans Canada 2007a), the site would be ranked as moderate sensitivity. This ranking is due to the presence of species such as northern pike and walleye that are moderately resilient to perturbation, use of habitat to fulfill a variety of life history functions (but no critical habitat), prevalence of habitat and species found within the stream, and flow for much of the year.

Unnamed Tributary

No fish were captured in the tributary either during the fall 2004 or spring 2005 sampling periods. The presence of numerous beaver dams along the tributary likely inhibits fish passage to the road location from the pond upstream of the crossing and from areas downstream. At the proposed road location, the tributary may provide some habitat for small-bodied species such as brook stickleback and fathead minnow during the open-water season, although access to the site likely is difficult. The pond located approximately 1 km upstream of the road location was found to contain some water with little oxygen. The dissolved oxygen concentration of 1.7 mg/L was well below Manitoba's Water Quality Standards, Objectives and Guidelines instantaneous minimum objective of 3 mg/L for the protection of mature life stages of cool-water aquatic life in winter (Williamson 2002). When the crossing site was accessed in February 2009, the unnamed tributary was frozen to the bottom. Large-bodied species such as northern pike are not expected to make use of the unnamed tributary at the road due to numerous beaver dams impeding passage and the distance from potential overwintering sites. If small-bodied fish are present in the area (e.g., brook stickleback and fathead minnow), it is likely that the habitat at the site could be used only for feeding and rearing, with deeper pools outside of the ROW being used as overwintering habitat.

The tributary at the stream crossing does not appear to support any potential spawning or overwintering fish habitat. It is classified as a cool-water stream with moderate resiliency. Based on the Practitioners Guide to the Risk Management Framework for DFO Habitat Management Staff, Version 1 (Fisheries and Oceans Canada 2007a) the site would be ranked as low sensitivity, given the potential presence of only resilient species (e.g., brook stickleback, fathead minnow), limited habitat use, prevalence of habitats and species found within the stream, and little or no flow for much of the year**.**

3.3.2.3 Aquatic Species at Risk

No aquatic species considered at risk by Manitoba's *The Endangered Species Act* (MESA) (2007), the *Species at Risk Act* (SARA) (Schedule 1) (2008) or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (2007) are known, or expected, to make use of the two streams crossed by the proposed road.

3.4 TERRESTRIAL ENVIRONMENT

The terrestrial environment includes terrestrial plants, animals and other terrestrial organisms and the habitats on which they rely. Terrestrial habitat includes uplands and wetlands. Some terrestrial animal species also use aquatic habitat.

3.4.1 Terrestrial Ecosystems and Habitat

3.4.1.1 General

Key topic areas for the description of terrestrial ecosystems and habitats are **ecosystem diversity, priority habitat types, plant species, wetland** function and **fragmentation**. These topic areas provide information on ecosystem health. The methods used to describe terrestrial ecosystems, and the key topic areas are described in Appendix B2-1.

3.4.1.2 Regional Overview

Numerous lakes and waterways are scattered throughout the Regional Study Area, accounting for approximately 28% of its area. Human features, not including cut lines, account for less than 1% of the current land area (Figure 3.4-1). Most of the region is covered by a mixture of forest, woodland, sparsely treed and low vegetation types. Tall shrub vegetation covers less than 2% of the land area. About two-thirds of the forest is concentrated along the Nelson River and the elevated portions of the esker and moraines. The remaining forest is scattered throughout the region. Woodlands occur as large patches throughout the region except in the large recent burns. Sparsely treed vegetation and mixtures of sparsely treed and woodland vegetation are throughout the region.

Needle leaf tree communities on peatlands cover two-thirds of regional land area. Most of the remaining area is covered by needle leaf tree communities on mineral soils and young regenerating burns on peatlands.

Black spruce[2] is the most widespread and abundant overstorey tree species. Jack pine is generally found on coarser textured or other very well-drained mineral soils where it can be the dominant species. Tamarack tends to occur on peatlands, occasionally as the dominant species or occasionally in pure stands. White spruce was found along the Nelson River and a few other locations but nowhere with enough canopy cover to appear in the habitat mapping.

Broadleaf tree communities account for less than 1% of land area and occur almost exclusively on mineral soils. Trembling aspen is the most common broadleaf tree species and primarily occurs in mixed woods with needle leaf species (black spruce and/or jack pine), or as mixtures with white birch and/or balsam poplar. Balsam poplar and white birch stands are uncommon. Balsam poplar is more frequent on wetter soils. White birch is most abundant on mineral soils but is also scattered on veneer and peat plateau bogs.

In combination, tall shrub and low vegetation on peatlands account for the second highest percentage of land cover (approximately 16%). Most tall shrub vegetation occurs along streams, rivers, lakes, or small channels on slopes or in other wet areas. Willow is the most common tall shrub species. Swamp birch and speckled alder also occur on the wetter peatlands. Green alder is common on uplands. Low vegetation consists of various mixtures of low shrubs, herbs, sedges, grasses, mosses and lichens, with sedges and/or Sphagnum mosses the most abundant species. Low vegetation is generally found where the water table is close to the surface. The main exception is the few large 19 or 24 year old burns in the north and southwest portions of the mapping area (Figure 3.4-2) where the vegetation is regenerating slowly. The low vegetation in these burns consists primarily of low shrubs with scattered tall shrubs and short black spruce.

More than 20% of the in the region land area burned at least once between 1976 and 2003. Fires in 1999 and 2001 burned half of the Local Study Area (Figure 3.4-2). The average age of the vegetation mosaic is relatively young due to the prevalence of disturbance by large fires. Plant communities in young regenerating burns, which primarily occur on peatland ecosites, cover approximately 8% of Regional Study Area (Appendix B2).

3.4.1.3 Ecosystem Diversity

Habitat composition is illustrated in Figure 3.4-3. In this report, ecosystem diversity refers to the number of habitat types and distribution of area amongst them. The region includes 55 terrestrial habitat types, not including the marsh and shallow water wetland types, and permanent human features. The distribution of area between these habitat types is highly uneven. Pure black spruce on peatlands covers approximately 64% of the regional land area while the 50 least abundant habitat types only cover approximately 7% of the Regional Study Area (Appendix B2).

The Local Study Area and Project Footprint contain 32 and 28 of the habitat types, respectively. The distribution of area among the habitat types is considerably more even in the Local Study Area than in the surrounding region. Pure black spruce on peatland only covers 33 and 25% of the Local Study Area and Project Footprint, respectively. The eastern half of the Local Study Area has much lower

[2] See Appendix B2-4 for full scientific names and Manitoba Conservation Data Centre conservation concern rankings.

ecosystem diversity than the western half because it is within the 1999 and 2001 burns. This will gradually change as these areas regenerate.

Two factors contribute to some substantial differences in Local Study Area and Regional Study Area habitat composition. First, the Project Footprint and Local Study Area have a higher percentage of mineral soils and shallow organic soils because they occur along an esker. Second, fires in 1999 and 2001 burned much of the eastern half of the Local Study Area (Figure 3.4-3). Consequently, compared with the surrounding region, the Local Study Area has:

- Substantially lower percentages of surface soil permafrost, needle leaf treed peatland and pure black spruce on peatland;
- Substantially higher percentages of young regenerating habitat types; and
- Somewhat higher percentages of jack pine mixture, trembling aspen mixtures and trembling aspen mixedwood communities on mineral soils.

Since the Project Footprint is smaller and more confined to the esker area than the Local Study Area, it has lower percentages of blanket peatland and horizontal terrain and a higher percentage of ridge terrain.

3.4.1.4 Habitat Types

The most common habitat types in the Regional Study Area are pure black spruce communities on peatlands, pure black spruce communities on mineral soils, pure jack pine communities on mineral soils, trembling aspen with scattered spruce communities on mineral soils, and tall shrub communities growing on peatlands.

Pure black spruce communities on peatlands are characterized by a black spruce overstorey, a low shrub understorey of common Labrador tea, bog cranberry, small bog cranberry and a herb layer composed mainly of cloudberry. Northern bog laurel and northern bog bilberry are often found in the understorey. The ground is covered by feathermosses, Sphagnum mosses, other mosses, reindeer lichens and club lichens.

Pure black spruce communities on mineral soils are characterized by a black spruce overstorey, a green alder tall shrub layer and a low shrub layer of common Labrador tea, bog cranberry and prickly rose. Feathermosses and other mosses excluding Sphagnum mosses, reindeer lichens and club lichens cover the ground.

Pure jack pine communities on mineral soils generally have green alder in the tall shrub layer, prickly rose and bog cranberry in the low shrub layer and common Labrador tea, bunchberry and twinflower in the herb layer. Feathermosses and mosses other than Sphagnum dominate ground cover and reindeer lichens are frequent.

Trembling aspen communities on mineral soils generally have black spruce in the understorey, green alder in the tall shrub layer and a low shrub layer with common Labrador tea, prickly rose and bog cranberry. The herb layer generally contains bunchberry, twinflower and fireweed; one-sided

wintergreen is also frequent. Ground cover is dominated by feathermosses and mosses other than Sphagnum.

Tall shrub communities growing on peatlands have a tall shrub canopy that generally contains various mixtures of speckled alder, swamp birch and flat-leaved willow. There is generally a low shrub layer with leatherleaf and a sparse herb layer. Sphagnum mosses and other mosses dominate ground cover. The composition of low vegetation communities varies considerably depending on the associated ecosite and topographic types.

A key topic for this assessment is priority habitat types. Thirty habitat types are very uncommon (i.e., cover 1% or less of the land area) and 5 types are uncommon (i.e., cover between 1.1%.1 and 10% of land area; Appendix B2). All of the uncommon types, as well as 21 of the very uncommon types occur in the Local Study Area. The very uncommon habitat types occur less frequently in the eastern half of the Local Study Area due to the large recent burn in this area. Figure 3.4-4 shows the distribution of priority habitat types in the Local Study Area and surrounding area.

Some habitats are not common because they are associated with site conditions that are uncommon. This is generally the case for the mineral soil habitat types. It is especially true for jack pine on mineral soils which primarily occurs on the well-drained mineral soils found on the esker. This esker is one of the few that are found in the region.

Uncommon peatland habitat types are typically associated with specific topographic and hydrological conditions. Most of the uncommon and very uncommon peatland habitats in the Local Study Area are found along streams, creeks and lakes. Fens in depressions with flowing water are more likely to support a higher number of plant species.

Diverse habitat types in the region are, in descending order of species richness, trembling aspen mixture tree communities on mineral soil, black spruce pure tree communities on mineral soil, jack pine pure tree communities on mineral soil, black spruce pure tree communities on peatland and trembling aspen pure tree communities on mineral soil.

3.4.1.5 Wetland Function

Relative to many other habitat types, wetlands make disproportionately high contributions to ecosystem functions such as cleaning water, storing water and storing carbon. The importance of wetlands is recognized by federal policy and guidance for the maintenance of wetland function (Government of Canada 1991; Milko 1998). **High quality wetlands** refer to wetlands that usually have high primary productivity, high species richness, are critical habitat for rare species, and/or are high quality habitat for mammals or birds.

Approximately 5,000 ha of high quality wetlands occur in the Habitat Mapping Area (Appendix B2). High-quality wetlands cover approximately 85 ha of the Project Footprint with the majority of this area in borrow area zone G-1 (Figure 3.4-4 and Figure 3.4-5). Low vegetation on peatlands accounts for nearly three-quarters of this area followed by tall shrub peatlands. Most high-quality wetlands are concentrated along waterways and lakes.

3.4.1.6 Plants

Ninety plant species were found within the Local Study Area during field studies (Appendix B2 for the species list and scientific names). Black spruce, common Labrador tea, bog cranberry, club lichens, green reindeer lichen, stair-step moss, Sphagnum mosses and red-stemmed feathermoss were found in at least 50% of sample locations in the region. Of these species, stair-step moss is much more common on mineral soils while Sphagnum mosses are largely confined to peatlands. The remaining species are frequent on all soil types.

Invasive and/or non-native plants are of concern since they can crowd out other plant species and, in extreme cases, change vegetation composition. Invasive and/or non-native plant species encountered during field studies include ox-eye daisy, narrow-leaved hawks-beard, wild barley, reed canary grass, common plantain and common dandelion. All six species were found in cleared areas near Gull Rapids. Reed canary grass was the only invasive species found in the Local Study Area. Some additional invasive and non-native plants may be present but undetected within the Local Study Area. White sweet clover was found in ditches and borrow pits along PR 280 (Figure 3.4-6).

Plant Species at Risk

None of the plant species found in the Local Study Area are listed as being at risk by MESA, SARA (Schedule 1) or COSEWIC (Appendix B2). As well, none are provincially very rare to uncommon based on Manitoba Conservation Data Centre (CDC) (2007) rankings[3].

Some species of conservation concern may be present but undetected in the Local Study Area. Plant species found elsewhere in the region during field studies included oblong-leaved sundew, shrubby willow and rock willow (Appendix B2). Oblong-leaved sundew was restricted to three patterned fens. Shrubby willow was found at 12 locations, primarily on veneer bog in pure black spruce forest and woodlands. Rock willow was found at four locations on rocky substrate. Data collected for other studies suggests that rock willow is more common in this region than indicated by its CDC ranking.

Species found in the Local Study Area that may be near a range limit include twining honeysuckle, ground-pine, hairy goldenrod and tufted bulrush. Twining honeysuckle and ground pine were each found at one location on mineral soils in a jack pine mixture community and a white birch mixedwood community, respectively. Hairy goldenrod was found at several locations in aspen or jack pine mixtures and mixedwoods, primarily on deep mineral soil, but also on a thin mineral and outcrop site. Tufted bulrush was found in low vegetation on a transitional peat plateau bog.

3.4.1.7 Fragmentation

Fragmentation essentially refers to the extent to which an area is broken up into smaller areas by human features and how easy is it for animals, plant propagules and other ecological flows such as

[3] The Manitoba Conservation Data Centre (CDC) assigns conservation status ranks to species as an indication of their rarity and degree of provincial conservation concern. Of these plant species, the ones of highest concern are those that are listed by MESA, SARA (Schedule 1) or COSEWIC.

surface water to move from one area to another area. Road density (length of roads in the region expressed as km/km^2) can be a good synthetic indicator of the extent of fragmentation effects on plant and animal populations (Forman 1995). There are 29.3 km, or 0.03 km/km^2, of all weather roads in the Habitat Mapping Area (Figure 3.4-7).

3.4.2 Wildlife

3.4.2.1 Invertebrates

Overview

Arthropoda is the largest phylum in the animal kingdom, comprising 84% of the known species of animals. The most commonly recognized members of this group include spiders, centipedes, millipedes, isopods (pill bugs) and insects (Table B3-1 in Appendix B3).

The diversity of plant communities present in Manitoba's Boreal Forest (Section 3.4.1) gives rise to equally diverse terrestrial invertebrate communities. Such invertebrate communities include species living in the soil (e.g., nematodes, earthworms), on the ground (e.g., beetles, spiders), in the air (e.g., butterflies, moths, flies) and within the vegetation canopy (e.g., spiders, aphids, beetles).

Invertebrate Species at Risk

None of the invertebrate species listed under MESA, SARA (Schedule 1) or COSEWIC are recognized as having the potential to occur in northern Manitoba.

3.4.2.2 Amphibians

Overview of Amphibian Community

Most amphibian species in Manitoba are generally restricted to more southerly regions of the province. The ranges of three species of amphibians extend into the Regional Study Area include the boreal chorus frog, wood frog and northern leopard frog (Preston 1982). These three species are the most abundant and widespread of the 15 amphibian species known to be native to Manitoba (Koonz 1992). While boreal chorus frogs and wood frogs were found to be common in the region during field studies, they are present in low densities compared to those in southern Manitoba (Cash *pers. comm.* 2006). Frog observations during the course of field studies undertaken in support of this EA report tended to consist of small groups of several frogs. Northern leopard frogs were not encountered during field investigations in the region.

Field studies undertaken in support of this EA report have indicated that the mating periods for boreal chorus frogs and wood frogs overlap during May and June and that they use similar types of breeding ponds during the spring. Frog species disperse into terrestrial habitats after the breeding season, overwinter in leaf litter and return to waterbodies that do not contain fish populations to breed the following spring.

The proposed road is primarily routed along the lower slopes of an esker. There are occasional low-lying wet areas along the slopes of the esker where willow and alder grow in standing water. While these densely vegetated wet areas support populations of boreal chorus frogs and wood frogs, frogs are less common in the boggy lowlands at the base of the esker. Some high-quality wetlands near the proposed route (Section 3.4.1.5; Figure 3.4-4) may support higher amphibian populations.

Amphibian Species at Risk

The only amphibian species at risk that may occur within the Regional Study Area is the northern leopard frog, a species of **special concern** by COSEWIC and SARA (Schedule 1). The northern leopard frog's northern range limit in Manitoba falls within the Regional Study Area (Preston 1982), however large population declines for this species during the mid-1970s occurred throughout Manitoba and other parts of Canada, causing this species to disappear from parts of its historical range (Seburn and Seburn 1998). Due to the lack of population monitoring following this decline, the recovery of this species is not well known (Seburn and Seburn 1998). It is therefore uncertain whether or not the northern leopard frog has recolonized its former range within the Regional Study Area. Studies in support of this EA Report did not reveal the presence of any breeding populations of northern leopard frog within the Regional Study Area. Anecdotal evidence has however, placed northern leopard frogs near Limestone Generating Station in 2004. If in fact the northern leopard frog has recolonized parts of its northern historical range, including the Regional Study Area, populations would be small and isolated (Seburn and Seburn 1998). Although this species has re-populated southern parts of its range, leopard frog populations are still considered low compared to pre-1970 populations (Preston 1982; Seburn and Seburn 1998).

The northern leopard frog typically breeds between April and early June in small, warm and shallow (less than 2 m deep) breeding ponds (Preston 1982). It forages in grassy meadows, often spending time in damp patches of soil. In forest habitat they are inconspicuous, hiding in dark crevices found along the forest floor. In August, adults return to lakes, deep ponds, rivers and creeks to over-winter in submerged sediments (Preston 1982; BC Government 2002).

3.4.2.3 Reptiles

The known range of reptile species in Manitoba is well south of the proposed Project location. Common garter snakes, snapping turtles, and western painted turtles all have the potential to occur in low numbers in the Regional Study Area (CARCNET 2009). There is an anecdotal record of one sighting of a snapping turtle along the Nelson River near Gillam (Preston 1982). None of the species with any potential to occur in the Regional Study Area are listed by the MESA, SARA (Schedule 1) or COSEWIC as being of conservation concern.

3.4.2.4 Birds

Overview of Bird Community

The terrestrial and aquatic environments in the Regional Study Area provide breeding, staging (during migration), foraging and over-wintering habitat for a potential total of 177 species of birds (Appendix B3, Table B3-1). Of these species, 27 are considered resident birds that may breed and

over-winter in the Local Study Area (Figure 3.4-1). No nationally, regionally or locally important migratory bird habitat occurs within the Regional Study Area as indicated by the Canadian Wildlife Service (Poston *et al.* 1990).

Bird studies conducted in 2004 and 2005 as part of this EA report (see Appendix B3) identified 113 different species of bird using the Regional Study Area. These species include forest-dwelling birds (e.g., songbirds, woodpeckers, upland game birds, raptors and nighthawks), waterbirds (e.g., ducks, geese, cranes, herons, rails, gulls and terns), shorebirds (e.g., sandpipers, yellowlegs), raptors (owls, hawks and eagles) and other birds (e.g., woodpeckers and kingfishers). The most common birds observed within the various plant communities surveyed in the Local Study Area were songbird species such as ruby-crowned kinglet, yellow-rumped warbler and northern waterthrush.

Waterbirds

There are a number of small inland lakes, creeks and wetlands in the vicinity of the proposed Project that are utilized by waterbirds (e.g., ducks and loons) and shorebirds (e.g., snipes, yellowlegs and sandpipers). They provide breeding and staging habitat for migrant ducks (e.g., ring-necked ducks, scaup and common goldeneye) and other waterbirds (e.g., common loon).

Bog and fen wetland habitat located within the region support sandhill crane and Wilson's snipe. These areas also have the potential to support small breeding populations of rails, bitterns and herons.

Gull Rapids, located at the south end of the proposed road, is an area of fast flowing, turbulent water that supports a number of vegetated islands and rocky reefs. During the breeding season, reefs located near the south shore of the Nelson River (at Gull Rapids) support breeding colonies of ring-billed and herring gulls (up to 2,000 gulls), as well as common terns (up to 200 terns).

Shorebirds

Wetland habitat located within the Region Study Area supports Wilson's snipe. Creeks (such as Looking Back Creek) and the inland lakes may support small, localized populations of shorebirds (e.g., spotted sandpiper, solitary sandpiper and yellowlegs).

Raptors

A total of 13 raptor species have been identified in the Regional Study Area, with a further five species expected to breed within or migrate through the area. Most raptors observed in the region were bald eagles, although red-tailed hawks and northern harriers were also common. Most of the bald eagle sightings were along the Nelson River, which is considered a regionally important area for breeding and migrating eagles due to its ample breeding and forage opportunities (Koonz 1988).

Five owl species have been observed in the Regional Study Area: long-eared owl, short-eared owl, great horned owl, northern hawk owl and great grey owl. Owls that were observed nesting and roosting in the Local Study Area were observed in upland forested transects both along and adjacent to the proposed road.

Upland Game Birds

Forests, open fens and willow-covered cut lines within and adjacent to the Regional Study Area provide ideal habitat for a variety of upland game bird species (e.g., grouse and ptarmigan). Ruffed grouse are common in the alder-dominated understory of jack pine and mixed-wood forests located along the road route. Spruce grouse are common along the black spruce-dominated forest and sparsely treed wetland areas (lower-lying areas). Sharp-tailed grouse are also a year-round resident in the Regional Study Area, but are less common. Willow ptarmigan occur only as a winter resident, utilizing areas that support willows (e.g., in and along forest openings, edges of wetlands, riparian areas and cut lines; Storch 2000).

Songbirds (Passerines)

Studies undertaken in support of this EA report indicate that overall bird densities along the road route ranged from 3.3 to 5.3 birds/ha, with the five most common species being ruby-crowned kinglet, yellow-rumped warbler, hermit thrush, blue-headed vireo and white-throated sparrow. With the exception of the white-throated sparrow, which is a short-distance migrant and blue-headed vireo, all abovementioned species are **neotropical migrant** songbirds. The most common passerine species recorded in forest communities within the Local Study Area are also very common throughout boreal forest habitat of Manitoba (Erskine 1977, Bezener and DeSmet 2000).

Other types of bird groups observed in the Local Study Area included woodpeckers, kingfishers and nighthawks. Four of the six possible woodpecker species were observed in the Local Study Area (hairy woodpecker, three-toed woodpecker, black and northern flicker). Common nighthawks were also observed using open areas found within the region.

Species at Risk

Several bird species that utilize the Regional Study Area are currently experiencing population declines in all or parts of their range and are considered to be species at risk (COSEWIC 2008, CWS 2005, Manitoba Conservation 2008). Six bird species potentially occurring within the area have been listed as species at risk by MESA, SARA (Schedule 1) or COSEWIC: olive-sided flycatcher (**threatened**, COSEWIC), common nighthawk (threatened), short-eared owl (special concern, COSEWIC), rusty blackbird (special concern, SARA Schedule 1), peregrine falcon (threatened, MESA and Schedule 1 of SARA) and yellow rail (special concern, SARA Schedule 1).

Yellow rails breed in sedge or grass-dominated fen habitat containing shallow water (0-20 cm) or damp ground (Goldade *et al.* 2002). This species is not expected to breed within the Local Study Area as fen habitat is uncommon (Figure 3.4-3; Bookhout 2009).

The peregrine falcon may occur as a transient migrant within the Regional Study Area, but not as a breeder, as optimal nesting habitat for this species does not occur in the area. Peregrine falcons nest in the Arctic, on steep cliffs located where seabirds are abundant (Manitoba Naturalists Society 2003).

The common nighthawk is listed as threatened and is known to occur, and likely nests, in the Local Study Area, based on studies undertaken in support of this EA report. This species nests on bare rock or gravel, and forages along rock outcroppings, recent burns and other forest clearings (Poulin *et al.* 2009). Recently burned habitat is common throughout the eastern portion of the Local Study Area (Figure 3.4-3).

The short-eared owl has been observed using riparian areas, including creeks, marshes and fens throughout the Regional Study Area. This species prefers to hunt and nest in open fen habitats that are uncommon within the Local Study Area (Figures 3.4-3 and 3.4-5).

The olive-sided flycatcher is considered to be an uncommon breeder in the boreal forest (Manitoba Naturalists Society 2003). This species uses recent burns, clearings and forest edges and nests in conifers (Manitoba Naturalists Society 2003). Olive-sided flycatchers likely nest within the Local Study Area and throughout the Regional, as their preferred habitat (recent burns and edge habitat) is common in the eastern half of the Local Study Area (Figure 3.4-3).

The Rusty blackbird was not observed within the Local Study Area during environmental studies. This species has, however, been observed using creeks and lakes within the Regional Study Area. The rusty blackbird nests near water, in low willows or conifers, along edge habitat and along dense coniferous forests (Manitoba Naturalists Society 2003).

3.4.2.5 Mammals

Overview of Mammal Community

Scientific studies in the Regional Study Area undertaken in support of this EA report identified 32 mammal species. While data were collected on all mammal species, studies focused on priority mammals such as caribou, moose and beaver. This is because these species are an important resource to the local communities and/or have sport, commercial or scientific value. Detailed approach, methods, tables and figures from the field studies are reported in (Appendix B4).

The majority of mammal species found in the Local Study Area and surrounding Regional Study Area are common to Manitoba's boreal forest. Regionally common mammal species may include moose, black bear, red fox, snowshoe hare, red squirrel and Gapper's red-backed vole. Uncommon mammals may include caribou, wolverine, raccoon and porcupine.

Common habitats types for mammals in the Local Study Area include pure black spruce on peatland, low vegetation on peatland, young regeneration on recent burn and pure black spruce on mineral soil. These habitats cover approximately 93% of the land area (Section 3.4.1.2.1; Appendix B2). Most other broad habitats are uncommon. Based on habitat composition (Figure 3.4-3), terrestrial mammals that prefer coniferous dominated habitats are likely more numerous in the Local Study Area compared to mammals that inhabit broadleaf or broadleaf-dominated mixedwoods. Aquatic mammals are more likely to be widely distributed and common in the surrounding Regional Study Area compared to the Local Study Area, which has limited riparian habitat.

The balance of this section discusses ungulates (caribou and moose), furbearers (aquatic mammals, carnivores, etc.) and potential species at risk.

Ungulates

The key ungulate species considered in this assessment are caribou (coastal, barren-ground and summer resident caribou) and moose.

Caribou

Caribou ecotypes present in the Regional Study Area include barren-ground caribou (Qamanirjuaq), two subpopulations of coastal caribou (Pen Islands and Cape Churchill), and a group of forest-dwelling summer resident caribou.

Historically, Qamanirjuaq barren-ground caribou that originated from Nunavut used to migrate as far south as Split Lake or further and as far east as the Hudson Bay. Local resource users reported steadily decreasing numbers of barren-ground caribou around the 1950s. Based on studies undertaken in support of this EA report it appears that barren ground caribou only recently returned to the study region in the winter of 2004-05.

Currently, the majority of caribou observed in the region resemble a woodland caribou type in that they are darker in colour and appear to be larger in size than barren-ground caribou. Studies done in support of this EA report indicate that these animals are most likely coastal (Pen Islands) caribou. Larger numbers of Pen Islands caribou are found here in winter as compared to summer. Winter movements of Pen Islands animals were first reported in the 1990s near the study areas (Thompson and Abraham 1994, Abraham and Thompson 1998). Although there are indications that some Pen Islands caribou may spend the summer period in the study area and that these animals may account for some or all of the summer-residents, the majority of these animals characteristically move back towards the Hudson Bay coast during this period.

There is a group of caribou that appear to reside in the region for the summer period and do not move back towards the coast with the other Pen Islands caribou. These animals have been observed to calve in isolation or make use of island habitat, as is characteristic of boreal woodland caribou (Rettie and Messier 2000). While coastal and boreal woodland caribou are indistinguishable in appearance, and at this time, may be genetically indistinguishable (based on studies done in support of the EA report), coastal caribou can be differentiated by their calving behaviour. They reported to calve en-mass in more open areas, as is characteristic of barren-ground caribou (Kelsall 1968), and form nursery groups. This en-mass calving behaviour has not been demonstrated by the summer resident caribou present in the region during the summer and fall months.

Other caribou types that may periodically occur in the surrounding region include coastal caribou such as Cape Churchill animals, which originate from the Wapusk National Park and Cape Churchill Wildlife Management Area. Although there is some level of uncertainty, few of these caribou range into the Local Study Area and surrounding region during winter. The majority of these animals are expected to stop their southward migration by an area north and east of the Limestone Lakes.

Studies undertaken in the Regional Study Area in support of this EA report indicate that abundances of caribou can range from uncommon to very abundant, depending on year and location. During the summer months, caribou are uncommon in the Regional Study Area and densities are low. With the possible exception of a few Pen Islands animals, most of these caribou are forest-dwelling summer residents. It is highly unlikely for Qamanirjuaq and Cape Churchill animals to be present in the Regional Study Area in summer or fall. During winter, caribou tend to be more common in the region in early and mid-winter, becoming less common during late winter. The large majority of these animals are Pen Islands caribou. Occasionally, Qamanirjuaq caribou may comprise the majority of animals in the region.

Studies undertaken in support of this EA report indicate that a total of 541 caribou were observed in the Regional Study Area during winter aerial surveys. Tracks, beds and craters were also recorded. The caribou density averaged 0.23 caribou/km^2 (min=0, max=2.24). Although high variations were apparent among habitats, seasons and years surveyed, most caribou were generally observed south and east of Ilford. Density variations were expected seasonally, as several caribou populations migrate through the region. The timing of movements and the habitats used may be different among caribou types[4] from year to year. Variations in caribou densities are explained further by habitat quality, habitat availability, and the spatial distribution of habitats in the study areas (Thompson and Abraham 1994, Abraham and Thompson 1998). Caribou density estimates are not available from provincial records for comparison.

Studies undertaken in support of this EA report indicate that the regional subpopulation of summer resident caribou is estimated conservatively to number from 20 to 50 individuals. The total is based on the approximate use of islands for calving in the area, as well as signs identified during the summer surveys. The summer resident caribou are uncommon within the Local Study Area, as caribou numbers appear to be low to moderate in summer. Summer resident caribou do not appear to use the Local Study Area in winter when caribou numbers vary from very low to none. There is uncertainty as to how far and where these caribou migrate. After the Pen Islands caribou migrated from the Regional Study Area in April 2009, potential late winter range was identified for approximately 12 caribou. This range was located from 30 to 60 km south of the Nelson River in the Regional Study Area

Particularly important habitat for the summer resident caribou includes calving and rearing habitats. These animals calve in isolation or make use of island habitat, as is characteristic of woodland caribou in Manitoba and elsewhere (Shoesmith and Storey 1977, Hirai 1998, Rettie and Messier 2000). Potential calving habitat identified (Figure 3.4-7) includes islands in lakes and habitat complexes (i.e., raised conifer-dominated treed islands surrounded by peat bog or fen habitat). One unverified moderate quality calving habitat complex and four unverified low quality calving habitat complexes are present in the Local Study Area. Potential calving habitat is relatively abundant for the summer resident caribou. The **Habitat Mapping Area** contains at least 69 potential calving complexes and at least 33 additional verified calving islands in lakes with a minimum of 400 calving islands. Many more caribou calving complexes and islands in lakes extend outside the area displayed in (Figure 3.4-7) into the Regional Study Area.

[4] Potentially including summer resident, Pen Islands, Cape Churchill and Qamanirjuaq caribou.

Studies undertaken in support of this EA report indicate that winter and summer food, cover and migration habitats are common and extensive in the Local Study Area and in the surrounding region. These habitats are not mapped for this assessment because these habitats are not uncommon and are unlikely to limit this population.

The coastal and barren-ground caribou that are found in **Game Hunting Area** (**GHA**) 1, 2, and 3 (Appendix B4) are legally hunted by resident hunters. All other caribou in Manitoba are known as boreal woodland caribou. Boreal woodland caribou are listed as Threatened by MESA and cannot be legally harvested (Hedman, *pers. comm.* 2008). The majority of the study region is located in GHA 9, which is outside the licensed caribou hunting area.

The Pen Islands caribou herd tends to migrate into the Bird and Gillam areas in early to mid-November. Presently, there are 75 licenses in GHA 3 that are sold to hunt this herd; almost all of the licenses are sold to residents of Gillam. The Cape Churchill herd is located to the north of Bird. An average of 20 resident licenses are sold for this area. The combined resident harvest of the two herds has historically been an average of 40 caribou for the Pen Islands herd and 5 to 10 animals for the Cape Churchill herd (Hedman, *pers. comm.* 2008). Although it is unclear as to how many animals are harvested annually by local First Nations, caribou from these herds are harvested most often in winter. Pen Islands caribou are highly likely the type of animal to be harvested most frequently. Although Qamanirjuaq caribou are harvested much less frequently, this population appears to sustain a high level of harvest should they be present in the Regional Study Area. The harvest of Cape Churchill caribou is currently unknown, although it is unlikely that many of these animals are harvested in the Local Study Area given their expected distribution.

Moose

Aerial surveys for moose (and caribou) were conducted during winter on nine occasions between 2002-03 and 2006-07 in support of this EA report. A total of 212 moose were observed in a 2,338-km^2 regional survey area during the survey periods. Tracks and beds were also recorded. The moose density averaged 0.09 moose/km^2 (min=0; max=0.77) over the study periods. Moderate to high variations in moose density were apparent among habitats, seasons and years surveyed.

Moose densities in the Regional Study Area are similar to previous Provincial aerial surveys (1999-2000). In GHA 3[5], densities ranged from 0 moose per km^2 in low strata[6] to 0.317 moose per km^2 in super high strata. In medium strata, moose densities are 0.165 moose per km^2 (Manitoba Conservation, unpubl. data). On average, 2002-2007 moose densities in the Regional Study Area were low to medium compared to the full range of moose strata in GHA 3. A few local areas in the region may support higher moose densities than are found in super high moose strata in GHA 3. In the Split Lake RMA, the moose population was estimated at 1,639 animals. In a much larger survey area (GHA 9[7]), the 2001-02 provincial estimate of this population was 6,822 moose (95% Confidence Interval = 3,406 to 10,238).

[5] I.e., a region that overlaps with a portion of the Keeyask Study Areas.
[6] Low strata are considered as sample unit areas with low quality habitat for moose. Strata sampled may range from extra low to super high.
[7] GHA 9 extends from about Keeyask to the Manitoba-Saskatchewan border.

Moose generally show a preference for lowland and upland mature tree stands, shrubs, riparian and wetland areas. Burns provide important habitat (Split Lake Cree and Manitoba Conservation 1994); however, deciduous burns are preferred over coniferous burns. Edge habitats that may be composed of coniferous tree stands with adjacent shrub habitat are often preferred by moose in winter. Field study results indicated that as new growth becomes available during the summer, moose ranges tend to increase in response to premium growth (Franzmann and Schwartz 2007). Studies undertaken in support of this EA report indicate that at the local level, moose track densities averaged 0.13 signs/100 m^2 in the Local Study Area during the winter while summer track densities averaged 1.71 signs/100 m^2. At the regional level, moose track densities averaged 0.33 and 0.07 signs/100 m^2 in the summer and winter, respectively.

Approximately 750 moose (range: 661 to 812) are harvested per year by licensed hunters in GHA 9 and/or in parts of GHAs 1, 2, 3, and 3A (Manitoba Conservation 1993-2007; unpubl. data). This harvest level is less than the proportional harvest of most other southern GHAs in Manitoba (Rebizant, *pers comm.* 2008). Although it is unclear as to how many moose are harvested annually by First Nations in the Regional Study Area, moose are a preferred source of **country food** (Section 3.5.3-1).

Furbearers

A total of 18 furbearing species were identified from all of the surveys conducted in the region. These include aquatic furbearers (beaver, muskrat, etc.), terrestrial furbearers (red fox, red squirrel, ermine, and racoon) and small mammals (voles, shrews, etc.).

Muskrat and beaver are common semi-aquatic furbearers and aerial surveys for aquatic mammals were conducted as part of this EA report indicate that in the spring and fall of 2001 and 2003 using low-altitude helicopter flights to cover about 6,100 km of riparian habitat in the surrounding region. Marsh, shallow water and high quality wetlands are uncommon in the Local Study Area, but tend to be more common in the surrounding region (Section 3.4.1.2 and Section 3.4.1.5). The average density of beaver sign was 0.10 beaver lodges/km of water. Ponds, creeks and streams generally supported the highest densities of beaver, while rivers and large lakes supported the lowest densities of beaver lodges in the region. Density variations were observed between habitats, seasons and by year surveyed, and were attributed to habitat availability and quality (Novak *et al* 1999).

Studies undertaken in support of this EA report indicate that the most common terrestrial furbearers include red fox, red squirrel and ermine. Red squirrel was the most abundant species (0.79 sign/100 m^2), while lynx, muskrat, raccoon and weasel were least abundant in common habitat types. Uncommon habitat types had more mammal sign than the common habitat types. Nine species were identified in **uncommon** habitat transects, with red squirrel being the most abundant furbearer (0.33 sign/100 m^2). Gray wolf and red fox were the least abundant. Overall frequency of mammal sign in uncommon habitat transects was 1.24 sign/100 m^2, compared to 0.15 sign/100 m^2 for common habitats.

A total of 14 species were detected from tracking studies in the Local Study Area that contains the proposed road. Red squirrel and snowshoe hare were the most abundant species (0.92 and 0.78

sign/100 m^2, respectively), while coyote, fisher, mink and wolverine were least abundant with only one sign being recorded for each.

Raccoons are uncommon in the Local Study Area and surrounding region. This species is considered uncommon because the proposed Project is at the northern fringe of its range. Studies undertaken in support of this EA report found only a single raccoon sign on a habitat-based transect near water in four years of mammal studies. Only three raccoons were trapped in the Split Lake RMA between 1961 and 1984 (Manitoba Conservation trapping records). Manitoba Conservation reports that the range for racoons is extending beyond The Pas toward Thompson and this species is considered common throughout the southern half of Manitoba. Racoons are not listed by MESA or SARA (Schedule 1).

Although porcupine range is widespread in Manitoba (Chapman and Feldhamer 1982), this species is very uncommon in the Regional Study Area. Porcupines were not found in the Local Study Area, and only one porcupine has been reported east of Gillam near the community of Bird. It is unclear why porcupines are uncommon in the Local Study Area and surrounding region. Porcupine densities are often lower in areas where fishers are present, but relatively little is known about the existence of porcupine in the boreal forest (Chapman and Feldhamer 1982). Porcupines are not listed by SARA (Schedule 1).

Studies undertaken in support of this EA report resulted in a total of 12 small mammal species being captured in the Local Study Area at a mean frequency from all species of 1.43 individuals/100 Trap Night. The average capture frequency for small mammals was greater in riparian habitats compared to terrestrial habitats. Red-backed vole was the most abundant and wide-spread species. Water shrew was the least abundant species, with only one animal trapped. Large variations of small mammals were observed between habitats, seasons and by year surveyed. These variations were likely due to natural population cycles of small mammals, habitat availability and habitat quality (Chapman and Feldhamer 1982).

Species at Risk

Mammal species considered in this assessment include species that are listed by MESA or SARA (Schedule 1), species that are rare, dependent on uncommon or rare habitats near a range limit or those which are highly sensitive to disturbance, and/or may be considered invasive. Protected and mammal species in the Local Study Area and surrounding region include potential woodland caribou and wolverine.

In Manitoba, there are an estimated 1,800 to 3,150 boreal woodland caribou, which are listed as threatened under SARA (Schedule 1) (Thomas and Gray 2002). The Manitoba woodland caribou population is also listed as threatened in the MESA as of June 2006 (MESA 2007). Historically, woodland caribou range was mapped near Keeyask in the Nelson-Hayes area. Currently, Manitoba Conservation and Environment Canada do not consider Schedule 1-listed woodland caribou range to occur in the Regional Study Area (MESA 2007, Environment Canada 2008a).

Although there is some uncertainty as to whether or not the MESA or SARA-listed boreal woodland caribou ecotype is present in the Regional Study Area, calving behaviour[8], general morphology and possibly genetic evidence suggests that the small subgroup of summer resident caribou found in the Local Study Area and surrounding region are more similar to woodland caribou than to any other ecotype found in the region. For the purposes of this environmental assessment, the seasonal occurrences of this subgroup of animals and their respective habitats were treated as a boreal woodland caribou ecotype.

Wolverines are rare in the Local Study Area and surrounding region. Studies undertaken in support of this EA report resulted in only 20 wolverine sign being found in the Regional Study Area from 2001 to 2004. Important wolverine habitats such as den sites have not been identified in the Local Study Area or surrounding region. The western population of wolverine is not listed under SARA (Schedule 1); however, COSEWIC designated this species as special concern, the status of which was last revised in 2003 (COSEWIC 2003, Environment Canada 2008b). Manitoba animals are still being harvested for fur. About two wolverines are trapped annually in the Split Lake RMA (Manitoba Conservation trapping records 1961-1984). The Manitoba wolverine population has been estimated to be between 1,200 and 1,600 animals (COSEWIC 2003).

3.5 SOCIO-ECONOMIC ENVIRONMENT

3.5.1 Overview

The socio-economic environment for the environmental assessment of the proposed Project includes the following:

- Population and demographics;
- Land and resource use;
- Infrastructure and services;
- Labour force and employment; and
- Community and family life.

3.5.2 Population and Demographics

According to Statistics Canada, the population of Thompson was 13,256 people in 2001 (Statistics Canada 2002), and increased to 13,446 people in 2006 (Statistics Canada 2007) (Appendix B5. In 2006, 4,910 people in Thompson reported Aboriginal identity (37% of the total population), including 1,505 Métis.

According to Statistics Canada, the population of Gillam was 1,178 people in 2001 (2001 Census of Canada), and increased to 1,209 people in 2006 (Statistics Canada 2007) (Appendix B5). In 2006, 580 people in Gillam reported Aboriginal identity (48% of total population), including 125 Métis.

[8] As found in the Keeyask area, solitary calving behaviour is an important part of the definition of woodland caribou

It is noted that Statistics Canada uses its own series of definitions to name places or communities, especially for First Nation communities. Thus, Statistics Canada refers to the Indian Reserves of Tataskweyak, York Factory, War Lake, and Fox Lake First Nations respectively as Split Lake, York Landing, Ilford, and Fox Lake 2 (Bird) (Appendix B5). Census of Canada information provided in this EA report describes conditions within the geographical boundary of each community specified. These First Nations have off-reserve members who reside outside of the KCN Community Study Area, including many in Thompson, Gillam and beyond.

According to the 2006 Census of Canada, the combined on reserve population of the four communities included in the KCN Community Study Area was 2,455 people, predominantly Aboriginal (Appendix B5). These data indicate that, consistent with northern Manitoba in general, these four communities had relatively young populations. On average, almost one-third (32%) of the population was below the age of 15, and less than 6% of the population was over the age of 60. By comparison, approximately 20% of the total population of Manitoba was below 15 years of age and almost 19% was over the age of 60 (Statistics Canada 2007). Individual community population is described below:

- Of the four communities noted, Split Lake's on reserve population makes up the majority of the population of the KCN communities. In 2006, the total population of Split Lake was 1,819, consisting mainly of Aboriginal people. Approximately 37% of the population (684 people) are under the age of 15 and less than 6% (105 people) are over 60 years of age (Appendix B5).
- York Landing's on reserve total population in 2006 was 416 (Appendix B5). In 2006, approximately 36% of this community's population was under the age of 15 and approximately 2% are over 60 years of age.
- The on reserve population of Ilford in 2006 was 116 (Appendix B5). In 2006, the population under the age of 15 was approximately 30% of the total, and 4% were over the age of 60 years.
- Fox Lake's on reserve population, at Bird, was 105 (Appendix B5). In 2006, approximately 25 % of Bird's population was under the age of 15 and 10% over the age of 60 years. The Fox Lake population in Gillam has not been included as FLCN members comprise part of the Statistics Canada population for Gillam.

The above Statistics Canada population data should also be considered within the context of overall First Nation total population. Table 3.5-1 below provides the June 2009 Registered On and Off Reserve Population as available on the Indian and Northern Affairs website: http://pse5-esd5.ainc-inac.gc.ca/fnp/Main/Search/SearchFN.aspx?lang=eng.

Table 3.5-1: Registered On and Off Reserve Population as of June 2006.				
Residency	**Tataskweyak Cree Nation**	**War Lake First Nation**	**York Factory First Nation**	**Fox Lake Cree Nation**
Registered Males On Own Reserve	1,065	37	208	64
Registered Females On Own Reserve	1,057	31	184	69
Registered Males Off Reserve	505	67	320	362*
Registered Females Off Reserve	534	79	354	462*
Total Registered Population	3,240	256	1,110	1,066

Source: Indian and Northern Affairs Canada Website 2009

Notes:

- Population counts only include registered Indians under the Indian Act of Canada. Therefore, they contain no information on any Non-Registered individuals who may be living on reserve or Crown lands, and similarly, they contain no information on any members registered to other bands who may be living on reserve or Crown lands.
- An individual's information on INAC's Indian Registry System is usually updated on the reporting of a life event to the First Nation's Indian Registry Administrator (IRA), although some bands may update the system more frequently. Thus, a significant limitation on Indian Register data involves the late reporting of these life events.

*It should be noted that FLCN members comprise part of the Statistics Canada population for Gillam, therefore the above table does not accurately represent the total population of FLCN.

There are no known existing or permanent residences in the Project Footprint. However, there are traditional-use areas, such as campsites, which are used by people living in the surrounding communities.

3.5.3 Land and Resource Use

3.5.3.1 Community and Domestic Resource Use

Moose, caribou, and other **country foods** (e.g., fish, ducks, geese, grouse, rabbit, beaver and muskrat) constitute a large part of the diet for many people in northern Manitoba. Traditional gathering and harvesting activities constitute important additions to earned income and help to offset the high cost of living. Furthermore, these resources have cultural and spiritual importance including their contribution to maintaining Aboriginal Traditional Knowledge (ATK). Typically, seasonal harvesting activities include moose hunting in the fall, spring and fall harvesting of waterfowl, berry and plant gathering from the spring through to fall, and trapping during the winter.

Tataskweyak Cree Nation and War Lake First Nation carry out extensive land and resource use activities throughout the Split Lake Resource Management Area (RMA), a part of which is in the

KCN Community Study Area. Tataskweyak Cree Nation and War Lake First Nation consider land and resource use as being at the core of their cultural identity.

Fox Lake Cree Nation and York Factory First Nation both have resource management areas within the Northern Manitoba Study Area. Fox Lake Cree Nation members hunt for moose and caribou in the areas around Stephens Lake. Fox Lake Cree Nation has also identified the South Moswakot River as an important area for fishing and hunting near the Project Footprint. York Factory First Nation has noted that the Project Footprint is not a main resource use area for their community. However, the Project Footprint is near York Factory First Nation's traditional territory and members do travel through the area and may harvest resources from time to time.

The Registered Trapline System is a provincial commercial furbearer harvest management system whereby a person is granted the exclusive opportunity to commercially harvest furbearing animals in a particular area. One trapline (Trapline 15) exists within the Project Footprint. Although there is currently no registered holder, it is understood that Trapline 15 is currently used by a number of families who are members of Tataskweyak Cree Nation. Typically, about a dozen furbearer species have been trapped in this trapline area. Beaver and muskrat comprise the main species that have been trapped in the past, and pine marten has become a more frequent species for trapping in recent times. A trapline (Trapline 9) currently registered to a Fox Lake Cree Nation member, is also located just outside the Project Footprint on the south side of Stephens Lake within the KCN Community Study Area.

Domestic fishing in local tributaries may occur within the Project Footprint; however, the Project site has not been identified as having major fishing activity.

3.5.3.2 Other Resource Use Activities

Northern Manitoba, including the KCN Community Study Area and the Project Footprint is located within the Manitoba Conservation, Forestry Branch designated "Non-commercial Forest Zone" due to its limited timber production potential (due to climatic conditions), distance to mills and markets, and lack of infrastructure (i.e., roads and railroads).

At present, there is no commercial scale demand and therefore no commercial harvest of timber within, or in close proximity to, the KCN Community Study Area (Holmes *pers. comm.* 2008). In part, this condition is created by a supply of wood fibre that exceeds the demand in closer proximity to mills and markets. Small-scale timber harvest for personal use, primarily firewood, does exist within the Study Area, most notably in the vicinity of the Tataskweyak Cree Nation community on the north shore of Split Lake.

A review of Manitoba Science, Technology, Energy and Mines (MSTEM) Geographic Information System maps (2009) indicates no active mineral dispositions within the Project Footprint (i.e., no mining claims, mineral leases, mineral exploration licenses, exploration projects, or operating mines). There are currently three mineral exploration licenses within the KCN Community Study Area that are located in the northeast section of Stephens Lake and in areas east of Gillam and west of Split Lake.

According to MSTEM (2009), the above information has been compiled solely from sources in the public domain, such as company news releases, mineral tenure information and geological base-maps. Only projects that are "active" (i.e., currently being worked) are included.

Four outfitting companies have been identified that operate in the Split Lake RMA. Dunlops Lodge is at the mouth of the Little Churchill River on Lake Waskaiowaka, approximately 50 km northwest of the proposed Project location. Recluse Lake Lodge and Outfitters operates at Recluse Lake which is about 70 km north of the Project location on the Little Churchill River. Spence's Outfitting Service operates out of Split Lake, and Fox River Outfitters, located in Gillam, makes use of the area around Stephens Lake.

3.5.4 Infrastructure and Services

3.5.4.1 Roads and Trails

PR 280 is a gravel public highway that runs from the intersection with PR 391 immediately north of Thompson to Gillam, a distance of approximately 290 km (Figure 1.4-1). The distance from the PR 391 intersection to the proposed road is approximately 174 km. The current role and function of PR 391 and PR 280 are to serve commercial goods movement and passenger mobility between the communities along its route. PR 280 is a provincial road classified by Manitoba Infrastructure and Transportation as an A1 Highway[9]. It is the main road directly connecting the communities of Gillam and Bird, and indirectly Split Lake and York Landing (via ferry in summer or winter road in winter). It is therefore important to KCN community members. In 2007, the average annual daily traffic (**AADT**) on PR 280 was between 60 and 310 vehicles (MIT 2007). Residents in the area have noted concerns with respect to the poor condition of PR 280 in many sections including damage to vehicles as a result of the poor road conditions.

In 2002, the Government of Manitoba allocated funding for improvements to PR 280, including gravel stabilization on 261 km of PR 280 from PR 391 to Gillam under the Community Main Access Gravel Road Stabilization Program, additional gravel on various locations of PR 280 between PR 391 and PR 290 (the road north from Gillam to Bird); and road improvements on PR 280 at Troy Lake, 52 km north of PR 391 (Government of Manitoba 2002). Planning is under way to undertake further site grade improvements including curve shaving and road widening in 2011.

There are a few trails that cross the Project Footprint that are used for snowmobile access and resource harvesting activities.

3.5.4.2 Public Services

As the main service centre in northern Manitoba, Thompson (in the Northern Manitoba Study Area) offers many services such as restaurants, shopping, the regional airport, entertainment, health and social services, post secondary education services and recreation facilities. The Hudson Bay Railway, owned by OmniTrax, provides supplies by rail from The Pas to Thompson and Gillam up to three times a week. Thompson's health and social services includes the Thompson General

[9] As defined in the Vehicle Weights and Dimensions on Classes of Highways Regulation under the *Highway Traffic Act*.

Hospital, which currently operates 30 in-patient beds for general medicine, surgery and paediatrics, 16 for obstetrics, 10 for psychiatry and three for the special care unit. The hospital is rated for 74 beds and provides both primary and secondary inpatient care. The Thompson General Hospital is within 200 km of the proposed Project site.

Thompson supports several local firms capable of providing goods and services related to construction activities of the proposed Project. These include sale and repair of heavy equipment, hydraulic repair, sale of large tires and retreads, safety and industrial outfitting and fabrication.

The Town of Gillam (in the Northern Manitoba Study Area) has become Manitoba Hydro's key operations and service centre in northern Manitoba. Services and facilities include the Gillam School (K-12), a recreation centre (including skating and curling rinks, gymnasium and library), an aquatic centre, a child-care centre, a hotel, Co-op store and True Value store, the Gillam Hospital, RCMP station and several other businesses. Nearby at Stephens Lake, there is a marina for boating and a campground to park a camper with sites that have picnic tables and fire pits. The Gillam Hospital is a 10-bed facility, with three beds allocated to long-term care, five for medical and surgical patients, and the remaining two for paediatric care. A constant challenge for the Gillam and Thompson hospitals is maintaining consistent staffing levels of professional caregivers. Child and family services for northern Aboriginal people are available through the Awasis Agency of Northern Manitoba.

The four KCN communities face challenging living conditions. Cost of living in the communities is high due to long travel distances to Winnipeg, where most of their goods and supplies originate, and to Thompson, the closest regional centre. Retail, commercial and health services are limited in each community. Housing shortages, crowding and a lower standard of living are common.

The community of Split Lake (in the KCN Community Study Area) is located approximately 6 km from PR 280 on the shores of Split Lake. A range of facilities and services are available in Split Lake including a nursing station (under the First Nations and Inuit Health Branch, Health Canada), an office of the Awasis Agency, fire department and police station, water treatment facility (upgraded service in 2002), landfill, telephone, electricity, a radio station, the elderly persons home and the TMC Arena. The community also houses the Tataskweyak band office, the Chief Sam Cooke Mahmuwee Education Centre (K-12 school), the Tataskweyak/University College of the North Regional Centre and the St. John the Baptist Anglican Church. Businesses include Jo-anne's Convenience Store, the Northern Store, Morris Chicken, a gas bar, the 14-unit Kistepinanik Hotel and the Tataskweyak Construction LP. Scheduled bus service is also available.

A range of services and facilities are located in Bird (Fox Lake Cree Nation's reserve community in the KCN Community Study Area, Figure 1.4-2) which is accessible by road approximately 55 km northeast of Gillam. The Band administrative offices include a nursing station, housing services, public works services and educational services (including those related to adult education). The community also has a K-8 school, public works garage and facilities, and a recreation centre. The community has a convenience store located in the recreation centre. These programs and services can be accessed by Fox Lake Cree Nation members living in Gillam. A scheduled transportation service is available Monday to Saturday between Bird and Gillam. Fox Lake Cree Nation members also live, work and depend on programs and services provided in the Town of Gillam.

The community of Ilford (in the KCN Community Study Area, Figure 1.4-2) is located on the rail line approximately 65 km south of Gillam and is the home of War Lake First Nation. Services in Ilford include a new health centre (opened in November 2007), airport and rail, a K-8 school, a daycare centre, post office, sewage treatment plant and landfill, and an adult training facility. Hudson Bay Railway train service provides supplies from The Pas up to three times a week and there is winter road access to York Landing. Fire fighting capability is based on a well-equipped pumper truck from the community fire hall. RCMP response is from the Gillam detachment. The community's lack of year-round road access results in isolation that poses barriers for effective and affordable access to opportunities and services such as higher education, job sites, health and social services, as well as adding to the cost of living.

The community of York Landing (in the KCN Community Study Area, Figure 1.4-2) is located at the mouth of the Aiken River and Split Lake. York Landing is accessible by air, daily summer ferry operations on Split Lake and winter road access in the winter. Community services include a modern school for Kindergarten to Grade 9, an indoor hockey rink, a learning institute, a child-care centre, a nursing station, a motel/bunkhouse, a water treatment facility and piped domestic water supply, sewage lagoon and collection system, and a sanitary landfill. There is also a fuelling station, the Ripple River Store and an Anglican Church. The community's lack of year-round road access results in isolation that poses barriers for effective and affordable access to opportunities and services such as higher education, job sites, health and social services, as well as adding to the cost of living.

3.5.5 Labour Force and Employment

This section provides an overview of the economies for the four KCN communities. The discussion relies, in part, on Statistics Canada Census of Canada information. Caution should be used when interpreting these data as the communities are small and the data are subject to random rounding procedures to preserve confidentiality. It should also be noted that data for some communities were suppressed for the 2006 Census of Canada due to concerns about data quality and low response rates. As a result, this section relies primarily on 2001 Census of Canada data. Finally, it should be noted that quantitative statistical information does not adequately describe the economies in the KCN communities. The section below on barriers to employment provides some additional perspectives on employment.

3.5.5.1 Labour Force

The labour force is defined as the number of people in the potential labour force (i.e., persons 15 years and older excluding institutional residents) who were either employed, or unemployed and looking for work, in the week prior to the Census day (Statistics Canada 2001). Typically, individuals not considered to be part of the active labour force include full-time students, homemakers, retired workers, seasonal workers in an "off-season" who are not looking for work and individuals with disabilities or illnesses that preclude them from being able to work.

Statistics Canada provides labour force characteristics for the four in-vicinity communities and the Northern Manitoba Study Area (Census divisions 22 and 23, Figure 1.4-1). Census data for Split Lake from 2001 reported the largest potential and active labour force, followed by York Landing,

War Lake and Fox Lake. In 2001, the participation rate[10] for the KCN communities ranged between 50.0% and 73.7%. A weighted KCN average for the four communities was 58.8 %. By contrast, the weighted average participation rate reported for the Northern Manitoba Study Area was 60% in 2001.

3.5.5.2 Employment Levels

Statistics Canada defines employment rate as the number of persons employed in the week prior to Census Day, expressed as a percentage of the total population 15 years of age and over (Statistics Canada 2001). Information from Statistics Canada Census 2001 indicates the employment rates for the KCN communities ranged between 29.3% and 63.2% with a weighted average employment rate of 35.6%. By comparison, the total employment rate for northern Manitoba in 2001 was 48.4%. The total employment rate during this period for the province and Canada was 63.3 and 61.5%, respectively.

Employment rates calculated by Statistics Canada Census 2001 demonstrate that, on a weighted average basis, employment rates for the KCN communities are below the provincial and national averages. Lower employment in these communities, as with many other northern Manitoba communities, is in part due to the lack of opportunities available. Consistently, among the top three types of employment available for all of these communities are: occupations in social science, education, government service and religion; trades, transport and equipment operators; and sales and service. The range of employment rates between the KCN communities suggests that this variable may be influenced by the size of the population relative to the amount of jobs available in these types of employment (i.e., there are more jobs available per capita in band administration or government services for a smaller community).

3.5.5.3 Unemployment Levels

Unemployment rate refers to the unemployed expressed as a percentage of the labour force in the week prior to Census Day (Statistics Canada 2001). Information from Statistics Canada (2002) indicates unemployment rates for the KCN communities ranged between 14.3% to 50.4%. A weighted average unemployment rate for the KCN communities was 40.0%. The total unemployment rate for northern Manitoba in 2001 was 18.3%. The total unemployment rate during this period for Manitoba and Canada was 6.1 and 7.4% respectively, which is considerably lower than that for all four communities and the average for northern Manitoba.

3.5.5.4 Barriers to Employment

The Northern Economic Development Commission Benchmark Report (1992) noted that, in addition to a lack of employment opportunities, Northern Manitoba First Nations and Northern Affairs communities face certain barriers to labour force participation. Such barriers can include lack of opportunities, lack of training and work experience, perceptions and attitudes of potential employers, language barriers, and cultural differences. In addition, many employment and education

[10] Participation rate is defined by Statistics Canada as the labour force in the week prior to Census Day, expressed as a percentage of the population 15 years of age and over.

opportunities require individuals or family members to leave home communities. This can lead to stress and anxiety for those who leave and can diminish social networks and resources for families and the home community. As a result, the existence of training and job opportunities alone does not necessarily ensure uptake of those opportunities.

Members of the KCN communities have indicated that many of these same conditions exist and are relevant today. In addition, York Factory and War Lake members face logistical challenges in traveling to employment opportunities outside their community as neither community has year round access.

3.5.5.5 Skills Available in the Communities

The Hydro Northern Training and Employment Initiative (HNTEI) has been providing pre-project training and employment support to prepare northern Aboriginal residents for skilled labour positions since 2001. A focus has been employment opportunities generated by construction of the Wuskwatim project and the Keeyask project. This $60.3 million initiative is funded by Manitoba Hydro, the Province of Manitoba, Human Resources and Skills Development Canada, Indian and Northern Affairs Canada and Western Economic Diversification, and extends until March 31, 2010. Partners and key participants in the Initiative are the four Cree Nations located in the vicinity of the Keeyask Infrastructure Project, namely, Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation and York Factory First Nation, along with Nisichawayasihk Cree Nation, Manitoba Keewatinook Ininew Okimowin, the Manitoba Métis Federation, Manitoba Hydro, the Province of Manitoba, and Human Resources and Skills Development Canada (HRSDC). Each of the seven Aboriginal partners plans, manages and delivers its own training programs using a five-phased approach consisting of the following:

- Assessment;
- Academic preparation;
- Academic and technical instruction;
- On-the-job training; and
- Employment.

The group develops multi-year and annual training plans to deal with all aspects of career planning, training and support for individuals. The partners have implemented a wide variety of training using this community-based training and employment approach. The Wuskwatim and Keeyask Training Consortium (WKTC) (2008) is a non-profit corporation with legal responsibility for the governance and administration of the Initiative.

According to the Hydro Northern Training and Employment Initiative 2008-09 3rd Quarter Statistical Analysis Report as of December, 31 2008 a total of 2,086 individuals had participated in training activities over the previous four years, as follows:

- 375 trainees had completed training in non-designated trades such as labourers, heavy equipment operators, and truck drivers;

- 43 trainees had completed training in business and management for management of labour force programming at the community level, and management and accounting in existing businesses as well as potential new entrepreneurial Aboriginal ventures in response to new economic activity generated by hydroelectric construction activity;
- 64 trainees had completed training in technical/professional areas including surveyors, civil engineering technologists, environmental monitors, and health/safety and emergency response personnel;
- 66 trainees had completed training in construction project supports such as catering staff, administrative and clerical workers, and security personnel; and
- 414 individuals had completed training in designated trades areas such as plumbing or carpentry, with 20 trainees becoming certified journeypersons.

3.5.5.6 Education Levels

In 2001, 59% of the population over the age of 25 in the KCN Community Study Area did not have a high school graduation certificate (compared to 23% provincially and 29% for the Northern Manitoba Study Area for the same time period) (Statistics Canada 2002). On average 23% of the four communities over the age of 25 had a trades, college, or university certificate or diploma (below a bachelor's degree). Less than 1% had a university degree. The factors affecting participation in post-secondary education such as background characteristics (age, gender, place of residence, Aboriginal status) and intervening factors (academic performance, work/employment, family responsibility, personal barriers) have been extensively researched by government agencies, education authorities, funding agencies, and academics across Canada and worldwide. The links among better education, better jobs, and better income are well documented and there is "ample evidence that education attainment leads to greater opportunities in the areas of employment and income" (Hull 2005).

Manitoba Hydro recognizes that northern Aboriginal communities often face barriers in attaining the necessary education and training to access the employment opportunities it provides in northern Manitoba. As such, in addition to participating in the Hydro Northern Training and Employment Initiative, Manitoba Hydro offers a variety of programs to northern Manitobans and First Nation peoples including bursaries, scholarships, internships, pre-placement programs, career development programs, and trades training programs.

3.5.6 Community and Family Life

First Nation communities are often structured around social networks, kinship relationships and functional roles within a community. These roles and relationships are not limited to families and child rearing but are community wide and intertwined into all aspects of daily life, including sharing of resources and providing services. The Royal Commission Report on Aboriginal Peoples (INAC 1996-Volume 3, Chapter 2, Section 1.2) describes these diverse and interconnected relationships as follows:

> *"As is the case in contemporary society in Canada, among Aboriginal peoples traditionally it has been the responsibility of the family to nurture children and introduce them to their*

responsibilities as members of society. However, the extended family continued to play a significant role throughout the lives of its members. When a young man went out on the hill to seek a vision of who he was to be and what gifts were uniquely his, it was not because he was preparing to go out into the world and seek his fortune. Rather, he would come back to the camp or the village to obtain advice from his uncles or his grandfather on the meaning of his experience, and his 'medicine', or personal power, was to be exercised in the service of family and community.

To Aboriginal people, family signifies the biological unit of parents and children living together in a household. But it also has a much broader meaning. Family also encompasses an extended network of grandparents, aunts, uncles and cousins. In many First Nations communities, members of the same clan are considered family, linked through kinship ties that may not be clearly traceable, but stretch back to a common ancestor in mythical time.

The effect of these diverse, overlapping bonds was to create a dense network of relationships within which sharing and obligations of mutual aid ensured that an effective safety net was in place."

These networks are fundamental to life in the KCN communities. They help to increase social-capital, personal and community well being and resilience.

3.5.6.1 Workplace Public Health and Safety

Workplace safety and health for Manitoba Hydro and contractors is a top priority at all times during a project. Hazards in the workplace are caused by the use of materials, tools, machinery and chemicals, and can be exacerbated by literacy or language barriers (Workers Compensation Board of Manitoba 2008). Manitoba Hydro's safety systems and services provide prevention through minimizing risks to people, property, and the environment. The policies and programs in place to support employee safety and health include the following:

- Safety, Health, and Workplace Policies and Programs;
- Technical expertise and assistance to support employee activities in safety and health;
- Discrimination and Harassment Free Workplace Policies;
- Health Education Programs;
- Personal and Confidential Health Counselling;
- Employee Assistance Program; and
- Construction camp policies and rules.

All Manitoba Hydro employees and contractors are required to follow *The Workplace Safety and Health Act* and associated regulations dealing with the health and safety of workers, protection of the public from unsafe mechanical and electrical equipment and fuel-burning appliances in buildings, and the licensing of tradespersons in the province. The Manitoba Workplace Health and Safety Division emphasizes a preventive focus to eliminate workplace and public hazards through education, training, working with employers and employees, and inspections and incident assessments.

3.6 HERITAGE RESOURCES

3.6.1 Overview

Heritage resources are defined in *The Manitoba Heritage Resources Act* to include: "a heritage site; a heritage object, and any work or assembly of works of nature or of human endeavour that is of value for its archaeological, palaeontological, pre-historic, historic, cultural, natural, scientific or aesthetic features, and may be in the form of sites or objects or a combination thereof". 'Heritage sites' refers to designated sites that are considered to be of Provincial significance. Heritage resource sites refer to all sites, both undesignated and designated. Heritage objects include archaeological (product of human endeavour), palaeontological (fossilized animal remains), natural heritage (geological features that may or may not contain floral or faunal evidence), and human remains that are discovered outside a recognized cemetery. Found human remains during fieldwork or Project activities are subject to *The Manitoba Heritage Resources Act* (1986) and Manitoba's *Policy Respecting the Reporting, Exhumation and Reburial of Found Human Remains* (1987).

3.6.2 Regional Context

The tangible cultural heritage (artifacts) of northern Manitoba coincides with post-glacial conditions that paved the way for successive migrations of wildlife (plants and animals) into previously inaccessible lands.

Evidence of human occupation indicates that as recent as 6,500 years ago the Nelson River system, as a well-established travel route, supported small bands of seasonally subsistent people. The skeletal remains of a variety of wildlife show that early human populations relied on a range of large and small mammals, birds and fish for their nutritive requirements. As well, the size and shape of the tool assemblage indicates specialized tools for different uses and occasions.

New ideas and technologies quickly spread through the network of intricate waterways where they were modified and improved upon according to need. For example, the ceramic tradition considered to have been introduced into the area approximately 2,000 years ago, quickly spread throughout the boreal forest from the southeast. Attribute analysis and C14 dating illustrate the changing ceramic technology in both form and function. The same applies to the vast range of tools and weapons that are recovered from archaeological sites. From the producers of changing traditions emerged the predecessors of today's Cree Nation inhabitants. Appendix B6 (Table B6-2) provides a brief overview of the cultural chronology related to technological advancement.

In addition to the Pre-European contact component, there are historical Cree and European fur trade sites along with more recent resource use sites found in the vicinity of the proposed road. These sites illustrate a longstanding use of the surrounding area. Experience in other areas of the province demonstrates that eskers and beach ridge formations in particular have been used as travel routes for humans as well as animals.

3.6.3 Project Area

The investigation of the proposed road, adjacent borrows locations and portions of the Project Footprint consisted of aerial and pedestrian surveys conducted between 2002 and 2005. A total of 66 shovel tests were carried out (Appendix B6, Table B6-2); of these 5 were positive for artifacts. These positive tests were located on the north bank of the Nelson River at Keeyask Rapids.

Aerial and pedestrian surveys will be conducted in late July 2009 for the start-up and main camp (phase one) areas. This component was not included in the original field surveys as the exact locations of the start-up and main camps were not known at that time. The specific locations for both the start-up and the main camp have now been established. The archaeological field investigations will include aerial (helicopter) and pedestrian survey with shovel testing along random transect routes within the coordinates for both the start-up and main camps. The results and analysis of the investigation will be submitted as a supplementary filing on completion of the assessment.

While no heritage resources sites have been found along the esker ridge or proposed road and borrow areas, eskers are known to have been used extensively as travel routes for humans as well as animals. Therefore, there is potential for pre- and post-European contact sites (including camp and kill sites) and burials to be present beneath the overburden.

N

Moswakot River

280

PROPOSED LOCATION OF START-UP CAMP

Unnamed Tributary Stream Crossing

Proposed Road

EXISTING WINTER TRAIL

Looking Back Creek

100m ROW

Looking Back Creek Stream Crossing

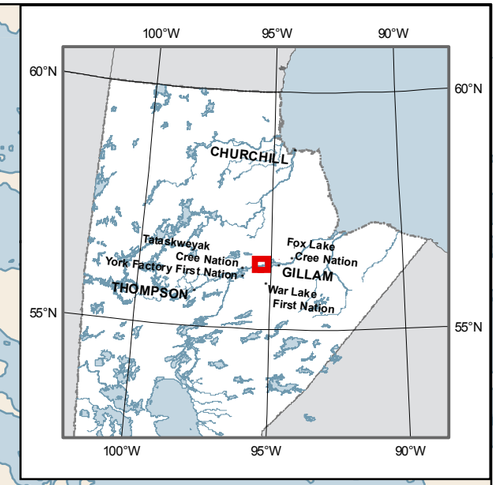
MAIN CAMP (PHASE ONE)

PROPOSED KEEYASK GS

GULL LAKE

Gull Rapids

Gillrat Lake



KEEYASK

Scale

0 1.25 2.5 5 km

0 1.25 2.5 5 mi

Projection: UTM NAD83, Zone 15N
Data Source: Manitoba Hydro and Government of Canada
Created By: TetrES Consultants INC.
Date Created: July 24, 2009

LEGEND

Elevation (meters)
High : 202
Low : 117

Main Camp (Phase One)
Start-Up Camp
100m ROW
Winter Trail

Keeyask Infrastructure Project
Digital Elevation Model

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Figure 3.2-1

Nunavut

N

THLEWIAZA RIVER BASIN

SEAL RIVER BASIN

Churchill

Hudson Bay

Churchill River

HUDSON BAY BASIN

Southern Indian Lake

Keeyask Infrastructure Project

Nelson River

HUDSON BAY BASIN

CHURCHILL RIVER BASIN

Fox Lake

Split Lake

Bird

Gillam

Ilford

York Landing

Shamattawa

Rat River

Burntwood River

Churchill River

Thompson

Wuskwatim Lake

Nelson River

NELSON RIVER BASIN

HAYES RIVER BASIN

Saskatchewan River

SASKATCHEWAN RIVER BASIN

SEVERN RIVER

Lake Winnipeg

LAKE WINNIPEG BASIN

Saskatchewan

Ontario

ASSINIBOINE RIVER BASIN

Winnipeg

WPG. RIVER BASIN

RED RIVER BASIN

North Dakota

Minnesota

LEGEND

- Nelson River Drainage Basin
- Other Drainage Basins
- Keeyask Proposed GS
- Community

KEEYASK

0 50 100 200 km
0 30 60 120 mi

Projection: NAD83, UTM Zn 15N
Data Source: Province of Manitoba, Government of Canada, Manitoba Hydro
Created by: TetrES Consultants Inc.
Date Created: July 22, 2009

Nelson River Drainage Basin

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Figure 3.2-2

Nunavut

N

THLEWIAZA RIVER BASIN

SEAL RIVER BASIN

Churchill

Hudson Bay

Churchill River

HUDSON BAY BASIN

Southern Indian Lake

Keeyask Infrastructure Project

Nelson River

HUDSON BAY BASIN

CHURCHILL RIVER BASIN

Fox Lake

Split Lake

Bird

Gillam

Ilford

York Landing

Shamattawa

Rat River

Burntwood River

Churchill River

Thompson

Wuskwatim Lake

Nelson River

NELSON RIVER BASIN

HAYES RIVER BASIN

Saskatchewan River

SASKATCHEWAN RIVER BASIN

SEVERN RIVER

Lake Winnipeg

LAKE WINNIPEG BASIN

Saskatchewan

Ontario

ASSINIBOINE RIVER BASIN

Winnipeg

WPG. RIVER BASIN

RED RIVER BASIN

North Dakota

Minnesota

LEGEND

- Nelson River Drainage Basin
- Other Drainage Basins
- Keeyask Proposed GS
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KEEYASK

0 50 100 200 km
0 30 60 120 mi

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Nelson River Drainage Basin

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Figure 3.2-2