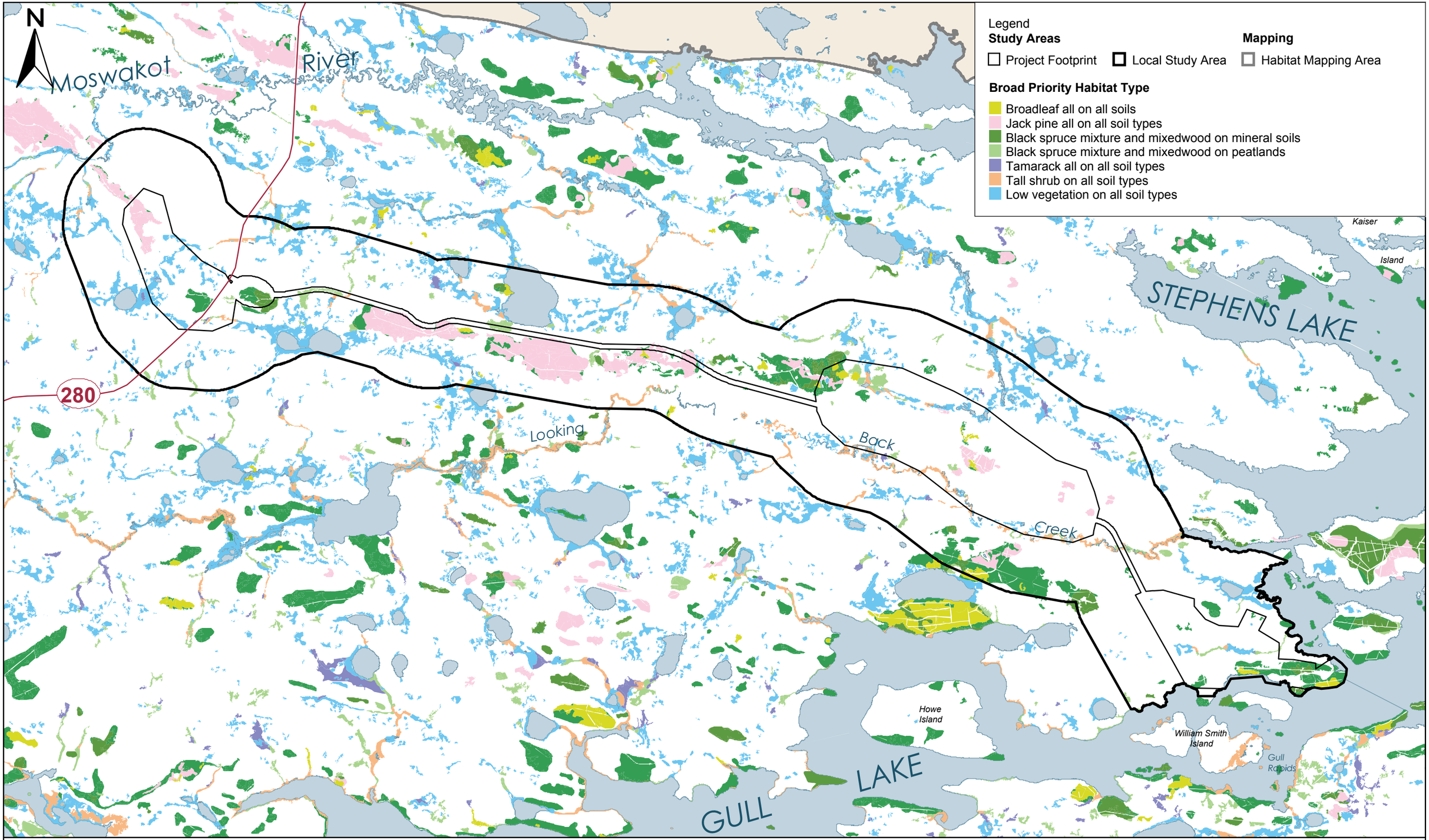

KEEYASK

0 1 2 4 Kilometres
0 0.5 1 2 Miles

Projection: UTM NAD 83, Zone 15
Data Sources: Habitat, Study Areas, Nelson River and Highway 280 - ECOSTEM Ltd.; Impact Areas- MB Hydro.
Created by: ECOSTEM Ltd.
Date Created: July 14, 2009

Priority Habitat* Distribution

* Habitat type is plant species rich and/or covers < 1.1% of region land area

Figure 3.4-4

Moswakot River

280

Looking Back Creek

STEPHENS LAKE

Kaiser Island

Howe Island

William Smith Island

Gull Rapids

GULL LAKE

N

Legend

Study Areas

- Project Footprint
- Local Study Area

Mapping

- Habitat Mapping Area

Wetlands

- High Quality

KEEYASK

0 1 2 4 Kilometres

0 0.5 1 2 Miles

Projection: UTM NAD 83, Zone 15
Data Sources: Wetlands, Study Areas, Nelson River and Highway 280 - ECOSTEM Ltd.; Impact Areas- MB Hydro.
Created by: ECOSTEM Ltd.
Date Created: July 14, 2009

High Quality Wetlands

Some high quality wetlands outside of the project footprint are not shown

Figure 3.4-5

Moswakot River

STEPHENS LAKE

Kaiser Island

280

Looking Back Creek

GULL LAKE

Howe Island

William Smith Island

Gull Rapids

N

Common dandelion
Reed canary grass
Narrow-leaved hawks-beard

Common plantain

Wild barley

Wild barley
Common dandelion

Ox-eye daisy
Common dandelion

Legend

Study Areas

- Project Footprint
- Local Study Area

Mapping

- Habitat Mapping Area

Observed Locations

- Non-Native & Invasive Species

Sample Locations

- Priority Plant Transect
- Invasive Plant Transect
- Habitat Characterization Plot

KEEYASK

0 1 2 4 Kilometres

0 0.5 1 2 Miles

Projection: UTM NAD 83, Zone 15
Data Sources: Samples, Study Areas, Nelson River, Species locations and Highway 280 - ECOSTEM Ltd.; Impact Areas- MB Hydro.
Created by: ECOSTEM Ltd.
Date Created: July 14, 2009

Invasive and Non-Native Species Locations In the Local Study Area

Figure 3.4-6

Legend

Summer Resident Caribou Calving Habitat

Verified Calving and Rearing Islands

- Caribou Present
- Caribou Absent

Potential Calving and Rearing Complexes

- Complex

Study Areas

- Project Footprint
- Local Study Area

Mapping

- Habitat Mapping Area

LAKE
Limestone River
North Ministik Lake
Crying Lake
Apetowachakamasik Lake
280
Astean River
Ferris Bay
STEPHENS
Wilson Channel
LAKE
Gull Rapids
GULL LAKE
NELSON RIVER
Birthday Rapids
Clark Lake
SPLIT LAKE
Lake
Carscadden Lake
Butnau Lake
Luke
Willbeach
N

KEEYASK

0 2.5 5 10 Kilometres
0 1.5 3 6 Miles

Projection: UTM NAD 83, Zone 15
Data Sources: Potential and known calving complexes and islands - WRCS Ltd.; Study areas, Nelson River and Highway 280 - ECOSTEM Ltd.
Created by: ECOSTEM Ltd.
Date Created: July 22, 2009

Summer Resident Caribou Calving Sites in the Habitat Mapping Area

Figure 3.4-7

4.0 PUBLIC INVOLVEMENT PROGRAM

4.1 PUBLIC INVOLVEMENT

4.1.1 Route Selection Process Summary

This section provides an overview of planning and public involvement activities that informed the route selection process for the road component of the Project. Planning activities related to the route selection process began in 2005 with the formation of the Keeyask North Access Road Technical Sub-Committee. Participants in the route planning process included representatives of First Nations in the vicinity of the proposed Project in their role as potential partners in the Project; Manitoba Hydro and its consultants; and Manitoba Transportation and Government Services (now Manitoba Infrastructure and Transportation). Related public involvement activities included community information and issues identification sessions in Ilford, Gillam and Bird in 2006 as part of the development of access route alternatives. Additional information about these meetings and participants is provided in Appendix D, and details on refinement of the route selection and outcomes from analysis of alternative routes are provided in Appendix A2 of this report.

The planning committee was tasked with meeting to gather relevant background information on alternative routes for a road between PR 280 and Gull Rapids. This included identifying potential physical and biophysical effects of route alternatives. The Committee combined engineering, environmental and local knowledge to evaluate issues affecting route selection. This included stream crossings, terrestrial habitat, sensitive areas, heritage resources and land use. The perspectives expressed an evaluation of alternatives centred around the effects on the road, communities and environment.

The Committee held the first of three meetings on July 7, 2005 (Meeting 1). The key action item arising from that meeting was to expand the Committee's membership to include two members from each of the KCN.

The second Committee meeting was held on July 22, 2005. The goal of this meeting was to develop a plan of action for arriving at a final routing that would be most sustainable. During this meeting, participants started to discuss potential biophysical effects of the route alternatives. At this meeting, it was agreed that a field trip to the proposed Project site would be required to help identify sensitive, heritage and traditional-use sites.

The third Committee meeting was held on August 22-23, 2005. Participants undertook a reconnaissance flight over the proposed route on the first day to identify sensitivities and suggest possible alternatives. A meeting was held on the second day to discuss the following matters:

- Observations from the site reconnaissance;
- Additional information available from mapping and other sources;
- Potential for alternative routes; and
- Other information needs.

Based on the discussions throughout the meeting and the observations during the helicopter reconnaissance, the Committee members concluded that the final route would be close to the original "preferred route" originally identified in route alternative maps. Further discussion produced refinements including a more northerly route option to make use of better terrain conditions.

Further analysis of the alternatives by Manitoba Hydro included three community issue-identification and information meetings (see Appendix D) on June 13, 2006 in Gillam and Ilford (War Lake First Nation) and June 14 in Bird (Fox Lake Cree Nation). Residents expressed concern about current conditions of the provincial roads.

4.1.2 2009 Public Involvement Summary

The Keeyask Hydropower Limited Partnership is currently engaged in a public involvement program for the proposed Project. The public involvement program is intended to provide communities and stakeholders with an interest in the project with the opportunity to identity concerns and offer suggestions. Key activities include:

- Leadership and community meetings in Split Lake, Ilford, York Landing and Bird. Meetings with FLCN members also occurred in Gillam Churchill, Thompson, and Winnipeg.
- Open houses in Thompson and Gillam.
- Individual meetings in Winnipeg with interested ENGOs.

The original intent was to have completed and documented this program for inclusion in this submission. However, due to a number of unforeseen factors, the most notable being concerns about and occurrence of the H1N1 in several of the KCN communities that delayed the holding of community meetings, it was not possible to complete this program as initially intended. The process is underway and will be largely completed by the time of submission, however several sessions will occur shortly afterwards. A report documenting the details of the program and its outcomes will be incorporated in a supplemental submission before the end of August.

5.0 POTENTIAL ENVIRONMENTAL EFFECTS AND MITIGATION

5.1 ASSESSMENT APPROACH

The approach for the EA has been structured to address the environmental effects that may occur during site preparation and construction of the proposed Project. This EA report focuses on assessing the environmental effects on the physical, aquatic, terrestrial, socio-economic and heritage resource components of the environment.

The assessment conclusions for the proposed Project were determined for residual environmental effects after the application of mitigation actions. The approach considered the nature and magnitude of the residual effect along with its temporal characteristics and spatial boundaries Table 5.1-1. The evaluation also included the likelihood of effects and any associated uncertainty.

Table 5.1-1: Factors Considered in Assessment of Environmental Effects

Factor	Explanation
Nature	
Positive	• Beneficial effect on the environment (e.g., job creation).
Neutral	• No change in the environment.
Adverse	• Negative effect on the environment (e.g., loss of habitat).
Magnitude	
Low	• Effects can be defined using standard practices but are anticipated to be within the range of natural variability. Effects may not be measurable.
Moderate	• Effects exceed natural variability and can be observed or measured with a well-designed monitoring program.
High	• Effects are large or widespread and can be easily described, observed and measured.
Frequency	
Once	• Effects occur once during the life of the Project. • Effects are unique and do not accumulate over the life of the Project.
Sporadic	• Effects occur occasionally but without any predictable pattern during the life of the Project (e.g., vehicle-wildlife collisions along the road). • Effects may accumulate over the life of the Project.
Continuous	• Effects are reoccurring continuously (e.g., vegetation clearing from construction to maintenance) or periodically in a predictable manner during the life of the Project (e.g., vehicle emissions). • Effects may accumulate over the life of the Project.
Duration	
Short term	• Effects occur for a small proportion of the life of the Project (e.g., effects associated with construction, maintenance and decommissioning activities).
Long term	• Effects occur beyond the life of the Project (e.g., borrow pits). • Effects persist beyond any reasonable reclamation effort after decommissioning.

Table 5.1-1: Factors Considered in Assessment of Environmental Effects	
Factor	**Explanation**
Reversibility	
Reversible	• Effects do not persist in the environment after the application of mitigation and rehabilitation.
Not Reversible[1]	• A long-term effect that persists in the environment beyond decommissioning of the Project (i.e., remains indefinitely as a residual effect).[11]
Spatial Boundary	
Project Footprint Study Area	• Area in the immediate vicinity of the physical works or activities (biophysical and socio-economic).
Local Study Area	• Zone of influence of the physical work or activities (biophysical).
Regional Study Area	• A 14,000-km^2 Regional Study Area was selected on the basis that this was the area required to capture natural spatial and temporal variability in habitat composition (biophysical).
KCN Community Study Area	• Area of the four First Nation communities in the vicinity of the proposed Project (socio-economic).
Northern Manitoba Study Area	• Area encompassed by Statistics Canada Census Divisions 22 and 23 (socio-economic).

5.2 ENVIRONMENTAL EFFECTS AND MITIGATION

The following section provides information on the anticipated environmental effects and proposed measures to address adverse effects on the following areas:

- Physical Environment:
  - Atmosphere, air quality and noise
  - Physiography
  - Soil and permafrost
  - Surface water
  - Groundwater
- Aquatic Habitat and Biota:
  - Aquatic habitat
  - Aquatic biota
- Terrestrial Environment:
  - Terrestrial ecosystems and habitat:
    - Ecosystem diversity and habitat types
    - Plant
    - Fragmentation
    - Wetland function
  - Wildlife:
    - Invertebrates

[11] An example of a non-reversible effect would be the removal of borrow materials from a borrow site. The types of materials that previously existed at borrow areas will not be replaced, therefore borrow areas will not be returned to the original condition (effect is not reversible).

    - Amphibians
    - Reptiles
    - Birds
    - Mammals
- Socio-economic Environment:
    - Direct employment and business opportunities
    - Regional supplies and services
    - Resource use
    - Individual and community health, safety and wellness
    - Traffic
    - Access
- Heritage resources

Dealing with effects from construction and maintenance activities will draw heavily from the Preliminary EnvPP. The Preliminary EnvPP is submitted concurrently with this EA report, under separate cover, and an overview of the program is provided in Appendix C. In to referencing the EnvPP guidance on avoiding or reducing adverse effects was gained from the Keeyask Cree Nations Principles Regarding Respect for the Land and measures that would comply with these principles (Appendix C).

5.3 ANALYSIS OF ALTERNATIVES

One of the best methods of managing adverse effects is through mitigation developed during the Project design phase. Manitoba Hydro and the KCN have been working collaboratively for a number of years to discuss the various Project components and various siting and design alternatives were considered during the planning phases of the main Project components (start-up camp, road and main camp (phase one)). Alternatives were also considered for other infrastructure including the stream crossing at Looking Back Creek, potable water supply and waste disposal (sanitary and solid). Appendix A2 contains a summary of the outputs of this process.

5.4 PHYSICAL EFFECTS AND MITIGATION

5.4.1 Atmosphere, Air Quality and Noise

The Project will result in an increase in vehicular traffic (described further in Section 5.7.5) that will increase vehicle emissions of nitrogen oxide, sulphur dioxide and greenhouse gases. Vehicular traffic could also cause local increases in dust (particulates). Vehicles and equipment that are used will be properly maintained to limit the increase of airborne emissions. Acceptable dust control measures will be used on the roadway, as necessary, to limit the amount of airborne dust.

Refuelling of vehicles and storage of fuels and other possible hazardous materials has the potential to cause localized effects. The EnvPP contains standard environmental practices for the storage of fuels and lubricants which will be followed to reduce this risk. Spill-containment measures will be applied and a spill response plan will be developed. The potential contribution of greenhouse gases to the atmosphere from the proposed Project is uncertain but it is expected to be very minor.

No data are available for ambient noise levels; however, existing levels are expected to be low and typical of a relatively undisturbed area. Noise levels from earth-moving equipment and truck traffic will increase during construction and could disturb animals that are hunted or trapped. This could result in a temporary redistribution of animals in the area, but not a reduction in the overall regional abundance. The noise may also affect resource harvesters in the area. Provisions are included in the EnvPP to address Project noise, in particular blasting, including limiting activities during the peak bird breeding season, whenever possible, and minimizing blasting within a 5 km radius of active caribou calving habitats.

Odour from the septic field is a potential effect if normal operation is disrupted and careful management will be required to comply with provincial regulations and guidelines.

Potential environmental effects and mitigation measures are summarized below (Table 5.4-1).

Table 5.4-1: Atmosphere, Air Quality and Noise Effects Assessment Summary

Potential Environmental Effect	Mitigation Measures	Residual Environmental Effect	Evaluation of Residual Effect
Increased atmospheric emissions from construction vehicles and heavy equipment.	• Limit unnecessary idling • Regular vehicle/equipment maintenance • Limit traffic to construction vehicles/equipment • AMP • EnvPP	Small residual effect; unlikely that emissions would be detectable outside the local area.	Adverse, moderate magnitude, Local Study Area, continuous, short term and not reversible.
Increased fugitive dust levels from construction activities and vehicle/heavy equipment traffic.	• Apply acceptable dust control measures as required • Limit construction vehicle speeds • AMP • EnvPP	Small residual effect; unlikely that dust levels would be detectable outside the local area.	Adverse, low magnitude, Local Study Area, continuous, short term and not reversible.
Increased atmospheric emissions from fuel storage tank facility	• Comply with Manitoba regulations, guidelines and licence conditions • Adhere to CCME guidelines • EnvPP	Minor releases of volatile organic carbons unavoidable during fuelling.	Adverse, low magnitude, Local Study Area, continuous, short-term and reversible.
Disturbance of wildlife and resource users due to construction noise.	• Provide notice of blasting events • Limit blasting and drilling during sensitive periods • EnvPP	Construction noise will occur, but effects during most sensitive periods will be limited.	Adverse, moderate magnitude, Local Study Area, short-term and reversible.
Odours from septic field	• Comply with Manitoba regulations, guidelines and Licence conditions • EnvPP	Minor odours may occur if normal operation is disrupted.	Adverse, low magnitude, Local Study Area, sporadic, long-term and reversible.

5.4.2 Physiography and Topography

The proposed road route follows an existing winter trail along the top of the Gull Esker for much of its length. Eskers are uncommon in northern Manitoba. Animal habitats and heritage resources are often located along eskers (Sections 3.4.2.5 and 3.6.2). To reduce the effects of road construction on the esker, the road route was moved to the edge of the esker for much of its length as part of the route selection process (Appendix A2).

Potential residual effects of the proposed Project on physiography and topography are expected to be adverse, confined to the Project Footprint, occur once, long term, low to moderate in magnitude and not reversible (Table 5.4-2).

Table 5.4-2: Physiography and Topography Effects Assessment Summary

Potential Environmental Effect	Mitigation Measures	Residual Environmental Effect	Evaluation of Residual Effect
Alteration to a local esker due to road ROW, borrow areas and infrastructure locations.	• Road route moved to the edge of the esker for portion of route • Recontour/regrade borrow areas • Minimize extent of infrastructure clearing • EnvPP	Configuration of the esker will be permanently altered.	Adverse, low to moderate magnitude, Project Footprint, long term, occurs once and not reversible.

5.4.3 Soil and Permafrost

Project activities will create the potential for erosion of the soils that are cleared of vegetation during construction activities. Soils on slopes will be particularly susceptible to erosion. To reduce the effects of erosion on soils, sediment erosion and sediment control practices will be employed, as described in the EnvPP. This will include maintaining gentle grades, applying geotextile and other erosion-control methods (e.g. erosion control mats, silt fences, settling basins) as required on a site-specific basis. Vehicular access will be limited to the ROW and other existing trails to minimize soil compaction and disturbance. Clearing will take place in winter months and existing drainage patterns will be maintained. The contractor will suspend construction activities during periods of extreme weather or wet conditions. Extra precautions will be taken in areas that are more susceptible to soil erosion.

Vegetation clearing, surface organic layer removal, compaction and/or rutting contribute higher soil temperatures which increase the chance of permafrost thaw. Permafrost thaw could lead to settling of soils and may cause subsidence and slumping at the ground surface (Dingman and Koutz 1974, Shuhua *et al.* 2007). Erosion associated with permafrost thaw and shifts in surface soils has been shown to increase sediment, nutrient and carbon loading in nearby aquatic ecosystems with the ultimate effect of reducing abundance of organisms and biodiversity (Wrona *et al.* 2006). Road construction techniques have been developed to address permafrost areas. Erosion control methods including geotextile mats may reduce the loss of insulation following vegetation removal. Potential

effects on permafrost will be avoided or minimized through EnvPP measures such as clearing after the ground is solidly frozen to avoid rutting and machines sinking, minimizing clearing and disturbance to the extent feasible and maintaining vegetation and ground cover to the extent feasible.

The potential residual effects of the proposed Project on soil and permafrost are expected to be adverse, confined to the Project Footprint, low magnitude, sporadic, short term and not reversible (Table 5.4-3).

Table 5.4-3: Soil and Permafrost Effects Assessment Summary

Potential Environmental Effect	Mitigation Measures	Residual Environmental Effect	Evaluation of Residual Effect
Contamination of soils from spills of oil, fuels, lubricants and solvents (fuel storage facility, fuel spills/releases, accidents).	• Use approved storage tanks/ containers • Provide spill prevention measures and procedures • Follow Manitoba Hydro Hazardous Material Handbook • Follow fuelling procedures as per EnvPP and maintain records • Emergency response plan with spill containment/cleanup procedures • EnvPP	Small residual effect; minor residues after spill containment and cleanup.	Adverse, low magnitude, Project Footprint, sporadic, short term and not reversible.

Table 5.4-3: Soil and Permafrost Effects Assessment Summary			
Potential Environmental Effect	**Mitigation Measures**	**Residual Environmental Effect**	**Evaluation of Residual Effect**
Erosion of soils due to clearing and construction activities.	• Minimize clearing and soil disturbance to the extent possible • Limit vehicle/equipment use to the road ROW • Maintain natural drainage and regrade disturbed areas to limit risk of future erosion • Use erosion control mats, geotextiles, silt fences and other methods to control erosion and limit sedimentation • Conduct clearing during winter months to the extent feasible • Preserve vegetation buffers around waterbodies • Suspend construction activities during extreme weather events • Revegetate disturbed areas not required for Project infrastructure • EnvPP	Small residual effect; minor erosion of soil is likely.	Adverse, low magnitude, Project Footprint, sporadic, short term and not reversible.
Permafrost thawing and slumping of soils due to clearing and construction activities.	• Minimize clearing and soil disturbance to the extent possible • Apply knowledge regarding known permafrost locations in the ROW to modify construction and clearing to reduce impact to these areas • EnvPP	Moderate residual effect; permafrost thawing and slumping are likely in some locations given the permafrost body size and degree of clearing.	Adverse, low magnitude, Local Study Area, sporadic, potentially long term depending on permafrost body size, and not reversible.

5.4.4 Surface Water

The proposed Project could potentially affect the surface water regime and quality in the Project Footprint with the possibility of effects in the Local Study Area. Potential environmental effects include changes to surface water regime from crossing Looking Back Creek, modification of surface water drainage from culvert placement and increased sediment levels in streams from clearing and grubbing, and bridge and culvert placement. Proposed mitigation measures include adhering to federal, provincial and Manitoba Hydro guidelines, providing erosion and sediment control measures and following good management practices. Follow-up includes implementation of the EnvPP.

The potential residual effects of the proposed Project on surface water regime and quality are expected to be minimal or not applicable given the measures used to manage them (Table 5. 4-4).

Table 5.4-4: Surface Water Effects Assessment Summary

Potential Environmental Effect	Mitigation Measures	Residual Environmental Effect	Evaluation of Residual Effect
Changes to surface water regime from construction of bridge crossing on Looking Back Creek.	• Adhere to Department of Fisheries and Oceans Operational Statement on Clear-Span Bridges • Follow Manitoba Stream Crossing Guidelines for Protection of Fish and Fish Habitat • EnvPP	No residual effect on surface water regime with clear-span bridge design.	Not applicable.
Modification of surface water drainage patterns from culvert placement at unnamed tributary creek.	• Follow Manitoba Stream Crossing Guidelines for Protection of Fish and Fish Habitat • EnvPP	Minor local modifications to surface water regime expected during spring and from beaver activities.	Not applicable.
Increased sediment levels in streams during infrastructure construction activities.	• Use erosion control and sediment management measures to prevent sediments from entering streams from construction site or local runoff • Follow Manitoba Stream Crossing Guidelines for Protection of Fish and Fish Habitat • EnvPP	Small amounts of sediments may periodically be introduced into the streams at the two crossings during construction.	Minimal risk.
Increased presence of hydrocarbons in streams during construction from equipment operation, surface runoff and potential spills/ releases.	• Locate fuel storage 100 m away from surface waters • Prohibit maintenance and fuelling within 100 m of waterbodies • Regular vehicle maintenance of oil leaks • EnvPP	None, given proposed mitigation.	Not applicable.

5.4.5 Groundwater

The proposed road route may traverse some permeable soils that could be more susceptible to localized groundwater contamination from spills of oil, fuels or solvents. The potential for similar effects to occur as a result of road construction, such as oil spills and vehicle emissions is small, site-

specific and primarily dependant on occasional occurrences of accidental events (e.g., fuel/oil spills). Spill prevention and implementing petroleum handling procedures as outlined in the EnvPP will minimize the risk of spills and manage consequences (Appendix C). To reduce the risk of groundwater contamination, standard environmental practices will be followed for the proper handling of fuels, solvents and other hazardous materials. Spill containment equipment will be available on-site and the contractor will follow the EnvPP to ensure proper practices are used.

There is some potential for septic field operation to cause local groundwater contamination. The risk is considered to be very low and provincial regulations require careful management of operations.

Use of the groundwater well for drinking water at the start up camp could depress the local aquifer, but this will be managed by regular monitoring and adherence to provincial regulations.

Potential residual effects of the proposed Project on groundwater quality and quantity are expected to be adverse, confined to the Project Footprint, low magnitude, sporadic, short term and not reversible (Table 5.4-5).

Table 5.4-5: Groundwater Effects Assessment Summary

Potential Environmental Effect	Mitigation Measures	Residual Environmental Effect	Evaluation of Residual Effect
Contamination of groundwater from spills of oil, fuels, lubricants and solvents (fuel storage facility, fuel spills/ releases, accidents).	• Use approved storage tanks/containers • Provide leak detection, spill prevention measures and procedures • Follow Manitoba Hydro Hazardous Materials Handbook • Follow fuelling procedures as per EnvPP and maintain records • Emergency response plan with spill containment/cleanup procedures • EnvPP	Very low risk of minor groundwater quality impairment.	Adverse, low magnitude, Project Footprint to Local Study Area, sporadic, short term and not reversible.
Contamination of groundwater from septic field	• Comply with Manitoba regulations, guidelines and Licence conditions • Locate septic field down gradient from potable water wells • EnvPP	Very low risk of groundwater quality impairment.	Adverse, low magnitude, Project Footprint to Local Study Area, sporadic, short term and not reversible.
Modification of groundwater regime due to pumping of water.	• Limit water use to degree necessary. • Testing of well/aquifer to ensure adequate water supply available • Allow for reasonable return period. • EnvPP	Locally depressed aquifers.	Adverse, low magnitude, Project Footprint to Local Study Area, short-term and reversible.

5.5 AQUATIC EFFECTS AND MITIGATION

5.5.1 Potential Environmental Effects

Watercourse crossings are proposed to include a clear-span bridge at Looking Back Creek and a through-grade culvert at the unnamed tributary. Potential environmental effects associated with construction of these crossings may include:

- Physical disturbance or damage to in-stream and riparian habitat;
- In-filling of stream channel from placement of culvert and roadbed material;
- Reduced productive capacity or food supply for fish due to damage or disruption of riparian habitat or in-stream invertebrate communities;
- Introduction of runoff and sediment into watercourses during construction or reclamation, resulting in water quality degradation and sedimentation of downstream habitats;
- Introduction of hydrocarbons (e.g., oil, gasoline, lubricants or hydraulic fluids) from construction equipment;
- Blockage or alteration of watercourse flow, impeding fish movement and passage; and
- Stranding of fish during watercourse flow isolation for excavating and installing the culvert crossing and constructing bridge abutments.

5.5.2 Proposed Mitigation Measures

Potential effects on aquatic habitat and biota at the two stream crossings will be mitigated by the following measures:

- Follow the Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat (Fisheries and Oceans Canada and Manitoba Natural Resources 1996);
- Follow the Fisheries and Oceans Canada Operational Statement for Timing of Work for Construction of Stream Crossings (winter construction (Fisheries and Oceans Canada 2007d);
- Follow the Fisheries and Oceans Canada Operational Statement for Beaver Dam Removal, Version 3 (if required) (Fisheries and Oceans Canada 2007e);
- Install a clear-span bridge at the Looking Back Creek crossing with all work conducted above the high water mark to avoid any infilling and loss or alteration of fish habitat;
- Follow Fisheries and Oceans Canada Operational Statement for Clear-Span Bridges, Version 3 (Fisheries and Oceans Canada 2007b). Key design features include:
  - Placing the bridge entirely above the ordinary high water mark;
  - Not locating the bridge on meander bends, braided streams, alluvial fans, active flood plains, or any other area that is inherently unstable and may result in the alteration of natural steam functions or erosion and scouring of the bridge structure;
  - Constructing the bridge no greater than two lanes in width and not encroaching on the natural channel width because the placement of abutments, footings or rock armouring will be placed above the high water mark;
  - No realignment of the watercourse;
  - No alteration of the streambed or banks or infilling of the channel; and

  - Incorporation of measures to protect fish and fish habitat.
- Stabilize banks where work occurs close to the shoreline to avoid bank erosion and downstream sedimentation (Fisheries and Oceans Canada and Manitoba Natural Resources 1996);
- Prevent sediment-laden runoff from roadside ditches from entering the watercourse;
- Apply permanent erosion measures (Fisheries and Oceans Canada and Manitoba Natural Resources 1996); and
- Follow the EnvPP measures and best management practices for erosion and sedimentation control.

Summary of Effects

Implementation of the mitigation measures will address predicted adverse effects on aquatic biota and habitat within the streams as a result of the input of substances (e.g., sediment). By following the criteria listed in the Operational Statement for Clear-Span Bridges, Version 3 (Fisheries and Oceans Canada 2007b), any effects to the fish community at Looking Back Creek will be avoided, in terms of habitat loss or alteration to fish movements. No measurable effect on fish production from the unnamed tributary is expected as a result of installation of a culvert at this crossing location. Only a small area of habitat within the stream will be covered by the culvert and associated infill, and the affected habitat is classified as low sensitivity fish habitat (potentially used by small-bodied species and not used by large-bodied species due to lack of access and overwintering habitat). Potential residual effects are associated with small, episodic inputs of sediments during crossing construction. This crossing would be classified as low risk under the Department of Fisheries and Ocean's risk management framework (Fisheries and Oceans Canada 2007a) due to the combination of a low scale of effect on a low sensitivity habitat. Environmental effects and mitigation within such environments are well understood, resulting in a high degree of certainty.

Potential residual effects of the proposed Project on the fish community in the unnamed tributary are expected to be adverse, confined to the Project Footprint, low in magnitude, sporadic, short-term and reversible. No effects on the fish community in Looking Back Creek are expected (Table 5.5-1).

Table 5.5-1: Aquatic Biota and Habitat Effects Assessment Summary			
Potential Environmental Effect	**Mitigation Measures**	**Residual Environmental Effect**	**Evaluation of Residual Effect**
• Impairment of water quality. • Physical alteration or loss of in-stream and riparian aquatic habitats affecting productive capacity of fish habitat. • Impediment to fish movement due to blockage or alteration of stream flow. • Stranding of fish during stream flow isolation during excavating and installation of culvert.	• Installation of a clear-span bridge at Looking Back Creek • Follow DFO Operational Statement for Clear-Span Bridges • Follow Manitoba Stream Crossing Guidelines for Protection of Fish and Fish Habitat • Follow DFO Operational Statement for Timing of Work for construction of stream crossings • Conduct salvage fishery(ies) if portions of stream channel are dewatered during construction • EnvPP	No effects on fish community in Looking Back Creek.	Not applicable.
		Loss of habitat within footprint of culvert will not cause detectable change in fish community in the unnamed tributary in the vicinity of the culvert. Episodic inputs of sediments during construction may cause a local shift in fish distribution to avoid sediment plumes.	Adverse, low magnitude, Project Footprint, sporadic, short term and reversible.

5.6 TERRESTRIAL EFFECTS AND MITIGATION

5.6.1 Terrestrial Ecosystems and Habitat

5.6.1.1 Ecosystem Diversity

The Project Footprint could directly and indirectly affect up to 2,597 ha of terrestrial habitat, which is calculated as 0.24% of Regional Study Area land area (Appendix B2). Two-thirds of the affected area consists of young regeneration on peatlands and black spruce communities on peatlands, which are common in the region. Most of the remaining area is young regeneration on mineral soils, low vegetation on all soils, black spruce communities on mineral soil, jack pine mixture communities on all soils, black spruce mixtures and mixedwoods on all soils and tall shrub communities on peatlands.

Based on the total percentage of terrestrial habitat loss, residual Project effects on **ecosystem** diversity are expected to be low. Relocating the road from the top to the bottom of the esker along the western portion of the route and limiting clearing to the road ROW along this segment avoided substantial effects on habitat composition. The Project Footprint could permanently remove up to 0.16% of terrestrial habitat in the Regional Study Area. The actual area affected is expected to be substantially lower than this because the refined borrow area footprints are much smaller than the

borrow area zones (Figure 1.4-3) used for the assessment. The borrow area zones reflect the originally anticipated extent of potential borrow area use when the quantitative habitat effects assessment was completed. Subsequent engineering analysis has reduced the anticipated borrow area extents to those shown in Figure 2.1-1.

Indirect and other direct Project effects could extend up to 150 m beyond the Project Footprint in some areas. In the unlikely scenario that all of the habitat within 150 m of the Project Footprint and borrow area zones is altered, indirect and other direct habitat effects would only increase to 0.24% of the Regional Study Area land area. As already noted, actual borrow area use is expected to be substantially than what was considered in the assessment. Clearing within the ROW will be minimized to the extent possible, which could further reduce the total area affected.

Total terrestrial habitat loss as a percentage of total land area can be a misleading indicator of Project effects if some habitat types are disproportionately affected. The proposed Project will not reduce the total number of habitat types and is not expected to substantially change the proportion of any common or uncommon habitat type (Appendix B2). Potential effects on the very uncommon habitat types are considered in Section 5.6.1.2. The total area affected would be less than assessed because the refined borrow footprints are smaller than those used in the assessment; further, minimizing clearing within the ROW to the extent possible could also reduce the area affected.

5.6.1.2 Habitat Types

Predicted environmental effects on **priority habitat types** will be mitigated by a number of measures. Two important measures that substantially reduced- potential effects on priority habitat types were relocating the proposed road from the top to the bottom of the esker in the western half of the route and limiting clearing to the road ROW along this segment. Considering these mitigation measures, the Project could directly and indirectly affect more than 1% of the Habitat Mapping Area for 15 of the 30 priority habitat types in the highly unlikely event that the full extent of the borrow area zones are used (Appendix B2).

The EnvPP includes the following three measures specifically directed towards further reducing potential project effects on priority habitats:

- Clear only within the road, camp, and refined borrow area footprints;
- All priority habitat patches identified for avoidance (EnvPP) will be clearly marked prior to construction; and
- Existing trails through or near the priority habitat patches identified for avoidance will be blocked at potential access points along cleared areas.

These mitigation measures are expected to reduce potential Project effects to 1% or less of the Habitat Mapping Area for the majority (26 of 30) of the priority habitat types and to 3% or less for the remaining types. The portions of the Regional Study Area outside of the Habitat Mapping Area are expected to contain sufficient area to reduce regional effects below 1% for the remaining four priority habitat types. Limiting clearing within the road ROW to the maximum extent possible could further reduce area affected for some priority habitat types.

In extreme cases a single accidental fire could either extirpate a habitat type or substantially reduce its abundance, depending on the nature of the fire. Some of the potential effects of accidental fires, such as degrading site conditions, could persist over the long term. The risk that such a fire may occur, or that the proposed Project will affect fire intensity and/or severity will be minimized through EnvPP measures such as:

- Maintaining existing and natural fire guards;
- Carry out fire prevention practices during construction; and
- Providing fire suppression equipment on-site.

Potential residual effects of the proposed Project on ecosystem diversity and priority habitats are expected to be adverse, local, low in magnitude, continuous, long term and not reversible (Table 5.6-1).

Table 5.6-1: Ecosystem Diversity and Habitat Effects Assessment Summary

Potential Environmental Effect	Mitigation Measures	Residual Environmental Effect	Evaluation of Residual Effect
Possible reduction in the total number of habitat types and possible substantial change in the proportion of habitat types.	• Road relocated from top to bottom of esker along western portion of route • Clear only within the road, camp, and refined borrow area footprints • Limit clearing within road ROW and infrastructure footprints to the maximum extent possible • EnvPP • AMP	No change in the number of habitat types. No substantial change in the proportions of habitat types.	Adverse, low magnitude, Local Study Area, long term, continuous and reversible.
Loss and alteration of some habitat types due to road, infrastructure and borrow area footprints and related incidental disturbance and indirect effects.	• Road relocated from top to bottom of esker along western portion of route • Clear only within the road, camp, and refined borrow area footprints • Limit clearing within ROW to the maximum extent possible • All priority habitat patches identified for avoidance (EnvPP) will be clearly marked prior to construction • Block existing trails through or near priority habitat patches identified for avoidance in areas that will be cleared • EnvPP • AMP	Loss less than 1% of region for every habitat type. Small proportion of occurrences of each habitat type affected.	Adverse, low magnitude, Local Study Area, long term, continuous and not reversible.

Table 5.6-1: Ecosystem Diversity and Habitat Effects Assessment Summary			
Potential Environmental Effect	**Mitigation Measures**	**Residual Environmental Effect**	**Evaluation of Residual Effect**
Possible extirpation or substantial reduction of some habitat types due to fires. Possible alteration of terrestrial habitat composition and ecosystem diversity due to fires.	• Maintain existing/natural fire guards • Carry out fire prevention practices during construction • Develop Emergency Response Plan • Provide fire suppression equipment on-site • EnvPP	No change.	Minimal risk of an accidental fire.

5.6.1.3 Wetland Function

Changes to peatland composition, high quality wetland composition and local hydrology are used as a proxy for potential effects on wetland function. Peatland composition is serves as a proxy for carbon storage since most carbon is stored in peatlands in the region.

Substantial changes to wetland function are not anticipated. Substantial effects on carbon storage in soils are not expected since the proposed Project would affect less than 0.5% of regional peatland area. As well, the Project is expected to have little effect on hydrology and high quality wetlands. The road and other Project footprints will be designed to avoid altering existing surface and subsurface drainage patterns. Before mitigation, approximately 11 ha, or less than 0.5%, of high quality wetlands in the region could be affected by the Project if all of the potential borrow area zones are used. Potential effects will be lower than this for two reasons. First, most of the high quality wetlands in the borrow area zones are outside of the refined borrow area footprints. Second, some of the high quality wetland patches are also priority habitat patches that will be avoided (Section 5.6.1.1).

Potential residual effects of the proposed Project on function are expected to be adverse, local, low in magnitude, continuous, long term and not reversible (Table 5.6-2).

Table 5.6-2: Wetland Function Effects Assessment Summary			
Potential Environmental Effect	**Mitigation Measures**	**Residual Environmental Effect**	**Evaluation of Residual Effect**
Loss and alterations of peatlands from direct and indirect effects of clearing and infrastructure.	• Design road and other footprints to avoid altering existing surface and subsurface drainage patterns • Limit clearing within the footprints to the maximum extent possible • Re-vegetate disturbed areas not required for Project infrastructure • EnvPP • AMP	Less than 0.5% of affected regional peatlands would be affected. No measurable change to wetland function.	Adverse, low magnitude, Local Study Area, continuous, long term and reversible.
Possible loss or impairment of high quality wetlands in the region if all borrow areas are excavated.	• Design road and other footprints to avoid altering existing surface and subsurface drainage patterns • Clear only within the road, camp, and refined borrow area footprints • Limit clearing within the footprints to the maximum extent possible • All priority habitat patches identified for avoidance (EnvPP) will be clearly marked prior to construction • Block existing trails through or near priority habitat patches identified for avoidance in areas that will be cleared • EnvPP	Less than 11 ha, or less than 0.5%, of high-quality wetlands in the region would be affected. No measurable change to wetland function.	Adverse, low magnitude, Local Study Areal, continuous, long term and not reversible.

5.6.1.4 Plant Species

No plant species listed by MESA, SARA (Schedule 1) or COSEWIC were found during field studies in the Local Study Area. No listed species have a high potential to occur based on observations elsewhere in the surrounding region.

Some species of high provincial conservation concern may be present but were not detected in the Local Study Area. Pre-construction surveys will be conducted in footprint areas not previously surveyed that have high potential for including plant species ranked as S1 to S2 by the CDC. Within the borrow areas, the boundaries of any locations that support populations of S1 species will be clearly marked and avoided. The boundaries of any areas that support populations of S2 species will be flagged and avoided to the extent feasible.

Substantial effects on plant species that may be near a range limit are not expected. Only two of nine known locations of hairy goldenrod may be affected by the proposed Project. It is likely that there are other hairy goldenrod locations in the Local Study Area and the surrounding region. The known

locations for the remaining three range limit species are either outside of the Project Footprint or are within the priority habitat patches that will be flagged and avoided (Section 5.6.1.1).

Accidental fires could affect priority plants in a manner similar to priority habitats. The risk that a fire may occur or that the proposed Project will affect fire intensity and/or severity will be minimized through the same EnvPP measures identified in Section 5.6.1.1.

Reed canary grass and white sweet clover are the only invasive species known to be present in the area. The Canadian Botanical Conservation Network (2008) considers both of these species to have low invasive potential beyond small areas. White sweet clover appears to be confined to disturbed areas where the organic topsoil has been removed. Measures to minimize the risk of introducing or spreading invasive and/or non-native plants in the EnvPP will include the following:

- Contractors utilizing equipment and machinery that was recently used more than 150 km from the Project area will wash that equipment and machinery prior to transport to the Project area; and
- Areas that are rehabilitated using a seed mixture will be seeded with a mixture that only contains native and/or non-invasive introduced plant species.

Potential residual effects of the proposed Project on plant species are expected to be adverse, local, low in magnitude, continuous, long term and reversible (Table 5.6-3).

Table 5.6-3: Plant Species Effects Assessment Summary			
Potential Environmental Effect	**Mitigation Measures**	**Residual Environmental Effect**	**Evaluation of Residual Effect**
Possible loss of priority plant species due to clearing, disturbance and indirect effects.	• Road relocated from top to bottom of esker along western portion of route • Clear only within the road, camp, and refined borrow area footprints • Limit clearing within ROW to the maximum extent possible • Clearly mark designated priority habitat patches and avoid to the maximum extent possible • Block existing trails through or near priority habitat patches identified for avoidance in areas that will be cleared • Conduct pre-construction surveys in footprint areas that have high potential Clearly mark and avoid S1 plant areas if identified in pre-construction borrow area surveys • Clearly mark S2 plant areas if identified in pre-construction borrow area surveys and avoid to the extent feasible. • Limit clearing activities to the extent possible • EnvPP	Not measurable.	Adverse, low magnitude, Project Footprint, continuous, long term and reversible.
Possible extirpation or substantial reduction of priority plant species due to fires.	• Maintain existing/natural fire guards • Carry out fire prevention practices during construction • Provide fire suppression equipment on-site • EnvPP	No change.	No effect. Minimal risk of an accidental fire.
Possible introduction or spread of invasive and/or non-native plant species.	• Contractors utilizing equipment and machinery that was recently used more than 150 km from the Project area will wash that equipment and machinery prior to transport to the Project area. • Areas that may be seeded to assist rehabilitation and prevent erosion will be seeded with a mixture that only contains native and/or non-invasive introduced species. • EnvPP	Not measurable if mitigation and follow-up are effective.	Adverse, low magnitude, Project Footprint, continuous, long term and reversible.

5.6.1.5 Fragmentation

The Project would increase road density from 0.03 to 0.05 km/km^2, which is well below the 0.16 km/km^2 benchmark used for one of the North American animal species that are most sensitive to roads (Appendix B2). Quantitative results are only available for the central portion of the Habitat Mapping Area, but the final conclusion is unchanged since the expectation is that Regional Study Area road density is lower than that of the Habitat Mapping Area.

Potential residual effects of the proposed Project on fragmentation are expected to be adverse, local, low in magnitude, continuous, long term and not reversible (Table 5.6-4).

Table 5.6-4: Fragmentation Effects Assessment Summary

Potential Environmental Effect	Mitigation Measures	Residual Environmental Effect	Evaluation of Residual Effect
Increased fragmentation and linear disturbance.	•No mitigation identified	Habitat Mapping Area road density increases from 0.03 km/km^2 to 0.05 km/km^2 (below the 0.16 km/km^2 benchmark for sensitive animal species).	Adverse, low magnitude, Local Study Area, continuous, long term and not reversible.

5.6.2 Wildlife

The effects of the proposed Project on wildlife are based on the assessment conclusions for terrestrial ecosystems and habitats in Sections 5.6.1. The following sections assess potential effects on invertebrates, amphibians, birds and mammals. Mitigation measures are proposed to avoid or minimize adverse effects on wildlife.

5.6.2.1 Invertebrates

Given the small scale of most invertebrate home ranges and the associated abundance of microhabitat available to individuals and communities within the Project Footprint, potential adverse effects are not measurable, given very high and widely distributed population levels and high recruitment rates that are most often associated with invertebrate species.

No terrestrial invertebrate species at risk (MESA or SARA (Schedule 1) are known to occur in the region or within the Hayes River Upland Ecoregion surrounding this area. Mitigation measures developed for other affected environmental components will also address potential effects on invertebrates.

Potential residual effects of the proposed Project on invertebrate populations are expected to be adverse, confined to the Project Footprint, low in magnitude, short term and reversible.

5.6.2.2 Amphibians

Amphibian species potentially affected by the proposed Project include the wood frog, boreal chorus frog and northern leopard frog, although the latter has not been observed during any project-related amphibian surveys (Section 3.4.2.2).

Most of the Project Footprint to be disturbed is located in black spruce pure on peatland habitat (Figure 3.4-3). This habitat type generally provides suitable foraging habitat for frogs. The small, long-term loss of amphibian habitat due to construction activities will be partially offset by slight improvements in other habitats, where increased ponding may occur in low areas adjacent to the road and borrow area.

The risk of collision with construction vehicles could be an issue of concern in areas adjacent to wetlands. Studies will be conducted to confirm whether this is an issue during the construction period, but it is not expected to be substantial.

Hydrocarbon residues, salts and sediment from road runoff can have adverse effects on amphibian populations (Carr and Fahrig 2001). The potential for adverse effects to occur as a result of fuel spills is small, site-specific and primarily dependant on the occurrence of accidental events (e.g., fuel/oil spills).

The potential effects of the Project on amphibians will be reduced by minimizing the amount of clearing, clearing during the winter, retaining a minimum 30-m buffer of shrubs and trees near streams and other waterbodies, and using silt fences to minimize in-stream siltation. Placement of slash away from streams and the development of culverts at crossings will help to maintain corridors between breeding wetlands and year-round frog habitat.

Species at Risk

The northern leopard frog has the potential to occur in the region and is listed as a species of special concern by SARA and COSEWIC. Some high quality wetlands near the proposed road may support higher amphibian populations; however, none of these wetlands occur within the proposed road ROW or within the refined borrow areas (Figure 3.4-5). In addition, there are high quality wetlands present within the surrounding Local Study Area and Regional Study Area (Figure 3.4-5) that would be suitable habitat for this species. As the overall habitat loss for this group of species will be minimal near the proposed road, and these habitats are available elsewhere, the Project is highly unlikely to have a measurable effect on individuals which may reside in the Local Study Area, or to the regional populations of the northern leopard frog.

Summary of Effects

Potential effects of the proposed Project on amphibians are associated with clearing of habitat for infrastructure, fragmentation affecting frog breeding and over-wintering habitat, mortality associated with construction vehicles, and creation of breeding habitat in low-lying areas. Potential residual effects of the proposed Project on amphibian populations are expected to be adverse, confined to the Project Footprint, low in magnitude, continuous, long term and reversible (Table 5.6-5).

Table 5.6-5: Amphibian Effects Assessment Summary			
Potential Environmental Effect	**Mitigation Measures**	**Residual Environmental Effect**	**Evaluation of Residual Effect**
Removal of frog habitat due to clearing, blasting and other construction activities.	• Limit clearing and blasting (if any) to the extent feasible • Limit clearing activities within the road ROW • Limit clearing activities to the winter months • Retain a 30-m buffer of trees and shrubs adjacent to waterbodies • Place clearing debris away from waterbodies • Revegetate disturbed areas not required for Project infrastructure • EnvPP	Small loss of some frog habitat.	Adverse, low magnitude, Project Footprint, long term, continuous and reversible.
Fragmentation of frog breeding and over-wintering habitats from road and other infrastructure development.	• Limit clearing and blasting (if any) to the extent feasible • Retain a 30-m buffer of trees and shrubs adjacent to waterbodies • Install through-grade culverts to maintain corridors drainage between wetlands • Revegetate disturbed areas not required for Project infrastructure • EnvPP	Small loss of frog habitat.	Adverse, low magnitude, Project Footprint, long term, continuous and reversible.
Increased mortality rate and habitat impairment due to road runoff containing hydrocarbon residues, salts and sediments.	• Use erosion control mats, geotextiles, silt fences and other methods to control erosion and limit sedimentation • Use approved dust control measures • EnvPP	Small increase in frog mortality.	Adverse, low magnitude, Project Footprint, long term, continuous and reversible.
Contamination of breeding ponds due to accidental spills of fuels, lubricants, solvents, etc.	• Locate fuel storage away from surface waters • Store fuels in approved storage tanks and follow storage procedures • Prohibit fuelling within 100 m of waterbodies • Use approved storage tanks/ containers • EnvPP	Small increase in frog mortality.	Adverse, low magnitude, Project Footprint, long term, sporadic and reversible.

Table 5.6-5: Amphibian Effects Assessment Summary			
Potential Environmental Effect	**Mitigation Measures**	**Residual Environmental Effect**	**Evaluation of Residual Effect**
Increased adult frog mortality due to vehicle collisions.	• Limit vehicle speed on road • Post signs warning drivers about wildlife collisions • AMP • EnvPP	Small increase in frog mortality.	Adverse, low magnitude, Project Footprint, long term, sporadic and reversible.

5.6.2.3 Reptiles

The effects of the proposed Project on reptiles are not expected to be an issue of concern because the region is outside the known distribution range of reptiles and there is no evidence or sightings of reptiles in the area (Section 3.4.2.3).

5.6.2.4 Birds

Bird species that will be affected by the proposed Project are primarily forest-dwelling species that breed within plant communities of the Local Study Area (i.e., younger regenerating and moderate-age black spruce-dominant forests and woodlands; Section 3.4.1.1; Figure 3.4-1). These plant communities and the birds that breed within those habitats are common throughout the northern boreal region of Manitoba (Erskine 1977).

Songbirds (Passerines)

Based on studies undertaken in support of this EA report, the most abundant birds found within the region during spring are songbird species. Several of these species are experiencing possible long-term population declines that are due in part to destruction of breeding and overwintering habitat (e.g., Blancher 2003). The footprint of the proposed Project will remove a maximum of approximately 1,766 ha of potential bird habitat, which is approximately 1.2% of the Regional Study Area (Section 5.6.1). Birds breeding and foraging adjacent to the construction activity areas may seek alternative cover in the Local Study Area for breeding/foraging as a result of construction disturbance. Project development will provide suitable habitat for some species of songbirds and have adverse effects on others. Species that breed in areas with edge habitat would benefit from the increased structure and food resources, but may be adversely affected by the increased risk of nest predation by other birds such as the American crow and common raven and mammals such as squirrels (Yahner and Scott 1988). Positive effects include increased diversity of nesting structure (i.e., presence of shrubs, young trees and grasses) and food sources (e.g., insects, berries, seeds) associated within reseeded and regenerating cleared areas.

Gamebirds

Forest-dwelling upland gamebirds (e.g., spruce grouse and ruffed grouse) will potentially experience some loss of terrestrial habitat from construction activities. The activities will result in less cover and

less breeding and foraging habitat. Although clearing at borrow areas will initially result in the loss of upland gamebird habitat, rehabilitation of disturbed areas will result in more open areas of young regenerating vegetation, providing suitable habitats for ptarmigan and sharp-tailed grouse (Storch 2000). Newly created edges due to clearing activities are often colonized by hardwood shrubs, which provide foraging habitat for ruffed grouse (Rusch *et al.* 2009).

Gamebirds may also limit habitat use within the vicinity of construction areas due to noise and presence of machinery and people (e.g., Baydack and Hein 1987). Additional hunting pressure due to increased access for hunters via the road could also affect grouse populations. Implementation of the Access Management Plan is expected to mitigate the adverse effects of hunting.

Raptors

Many raptor species, including members of the hawk, falcon and owl families, use edge habitats and clearings for hunting purposes. The proposed Project would create edge habitat and forest clearings, which would create some raptor foraging habitat. This benefit may be somewhat offset, as there may be long-term removal of some nesting and perching habitat (e.g., trees). Great gray owls are known to be adversely affected by forest clearing activities. This species may be present in the Project Footprint (Bull and Duncan 1993). Artificial perches have not proven to completely replace natural perching/nesting trees for great gray owls. Therefore, this species is less common in areas that have been cleared (Bull and Duncan 1993). With the exception of ground-nesting snowy owls, short-eared owls and northern harriers, all of the raptor species observed and expected to be present in the Regional Study Area nest in trees (Alsop 2001, Houston *et al.* 1998, Duncan and Duncan 1998, Marks *et al.* 1994, Holt and Leasure 1993, Bull and Duncan 1993).

Shorebirds

Some species of shorebird (e.g., lesser yellowlegs) use wooded muskeg areas for nesting and foraging purposes (Tibbitts and Moskoff 2009). Areas cleared for the Project infrastructure would remove or degrade some of this habitat. At least one species of shorebird (e.g., killdeer) forages along roadsides, and often nests on gravel edges of roads and at open gravel areas such as borrow pits (Jackson and Jackson 2009). The Project may create some foraging and nesting habitat for killdeer.

Waterbirds

Although the majority of proposed Project clearing and construction activities will occur away from waterbodies, the road will pass adjacent to several ponds and will come in the vicinity of Gull Lake at Gull Rapids. Waterbirds potentially affected by construction activities include birds using the Gull Lake area near Gull Rapids (e.g., nesting gulls at Gull Rapids), ducks and geese using the lake and inland ponds, and cranes, rails and bitterns using bogs and fens adjacent to construction activities. Bird surveys undertaken in support of this EA report have indicated that waterbird activity is minimal in the immediate vicinity of the proposed road and main camp (phase one) at Gull Lake. Waterbird use of the area is concentrated at exposed rock reefs at Gull Rapids where up to 600 pairs of gulls nest. Gull nesting colonies at Gull Rapids are unlikely to be substantially disturbed by construction activities because the proposed road and camp areas are 0.5 km away.

Given that the region is not recognized by the Canadian Wildlife Service for providing important breeding, migration or staging habitat for waterbirds (Poston *et al.* 1990), the potential effects of road construction on waterbird populations is anticipated be site-specific and minor.

Species at Risk

A number of the listed bird species use similar wetland habitat. The yellow rail is listed as a species of special concern under SARA (Schedule 1) that may occur in grassy marsh/fen habitat in the region (Bookhout 2009). The short-eared owl, which is listed as a species of special concern by COSEWIC, also requires large grassy marsh/fen areas for breeding (Holt and Leasure 2009). The rusty blackbird, listed as a species of special concern under Schedule 1 of SARA, nests along marshy lake margins, slow-moving streams, peat bogs and beaver ponds. These wetland habitats, although they do occur to a limited extent in the Project Footprint and Local Study Area, are considered common and widely distributed in the surrounding area (Figures 3.4-3 and 3.4-5). As the overall habitat loss for this group of species will be minimal near the proposed road, and these habitats are available elsewhere, the Project is highly unlikely to have a measurable effect on individuals which may reside in the Local Study Area, or to the regional populations of the yellow rail, the short-eared owl, and the rusty blackbird.

The common nighthawk, listed as threatened by COSEWIC, is known to occur and likely nests in the Regional Study Area, based on studies undertaken in support of this EA report. This species nests on bare rock or gravel and forages along rock outcrops, recent burns and other forest clearings (Poulin *et al.* 2009). Recently burned, regenerating habitat is widespread throughout the Local Study Area (Figure 3.4-3), and is considered to be high quality habitat for this species. As common nighthawks prefer edge habitat, openings, and nest on bare rock, there could actually be a small gain in foraging and roosting/nesting habitat following the Project (i.e., in cleared borrow areas once human activities have ceased) for this species. Nesting opportunities for common nighthawk may be temporarily limited due to disturbances during the construction period, but the creation of small forest clearings and remaining rock outcrops would increase habitat in the longer term. Similar to songbirds, species at risk that may breed and forage adjacent to the construction activity areas may seek alternative cover in the Local Study Area for breeding/foraging as a result of construction disturbance.

The olive-sided flycatcher, a threatened species under COSEWIC, uses recent burns, clearings, riparian zones and forest edges and nests in conifers (Manitoba Naturalists Society 2003). This species is often found in wet forest areas with standing dead trees, typical of recent burns present in the Local Study Area. As often occurs in northern Manitoba following burns (where the fire is severe enough to remove surface organic material), there can be melting of ground ice resulting in pooling of water at the soil surface. Recently burned, regenerating habitat is widespread throughout the Local Study Area (Figure 3.4-3), and is considered to be high quality habitat for the olive-sided flycatcher.

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 (i.e., high nesting cliffs) does not occur in the area. As such, it is not expected that the Project will have any effects on this species.

Summary of Effects

The potential effects of Project construction activities on birds are anticipated to be small and localized because the vegetated areas to be disturbed are widely available in the areas surrounding the Project Footprint. The effects on birds will be reduced through minimizing the amount of clearing to the extent possible, clearing during winter prior to the peak breeding season (May, June, July), and retaining buffers of shrubs and trees for cover and nesting habitat near streams and other waterbodies. Other effects on birds related to construction activities include occasional construction vehicle strike mortalities, hunting pressure from construction workers and increased access to the area by local hunters. These potential effects will be mitigated in part through the Access Management Plan (Appendix E). Speed restrictions for construction vehicles and limiting access to the road will reduce bird mortalities due to vehicle collisions and hunting during construction.

Spills or leaks of hazardous substances such as petroleum products (e.g., fuels, oils, lubricants) during construction may adversely affect terrestrial and aquatic habitat in areas where birds forage and nest. The effects of petroleum product spills on birds would generally be very small and site-specific if they occur in terrestrial habitat. The risks and magnitude of potential effects of hazardous material spills are expected to be minimized through the implementation of measures outlined in the EnvPP (e.g., proper containment and storage of fuels away from waterbodies and other potentially sensitive sites).

Potential residual effects of the proposed Project on bird populations are expected to be adverse, confined to the Project Footprint, low in magnitude, short term, sporadic to continuous and reversible (Table 5.6-6).

Table 5.6-6: Bird Population Effects Assessment Summary

Potential Environmental Effect	Mitigation Measures	Residual Environmental Effect	Evaluation of Residual Effect
Removal of bird habitat due to clearing for Project infrastructure.	• Clearing will occur outside the peak bird breeding season (April - July) to the extent feasible • Clearing will be limited to the extent feasible • Disturbed areas not required for Project infrastructure will be revegetated • EnvPP	Minimal, local loss of bird habitat.	Adverse, low magnitude, Project Footprint, continuous, long term and reversible.

Table 5.6-6: Bird Population Effects Assessment Summary			
Potential Environmental Effect	**Mitigation Measures**	**Residual Environmental Effect**	**Evaluation of Residual Effect**
Bird avoidance of Project areas due to clearing, blasting and other construction activities.	• Clearing and blasting (if any) will occur outside of peak bird breeding season (April – July**) to the extent feasible • Limit clearing and blasting (if any) to minimum extent possible • EnvPP	Avoidance of some local areas by some birds.	Adverse, low magnitude, Local Study Area, continuous, long term and reversible.
Increased bird mortality due to vehicle collisions along the road.	• Limit vehicle speed on the road • Post signs warning drivers about wildlife collisions • Educate drivers about avoiding wildlife collisions • EnvPP • AMP	Minimal increase in bird mortality.	Adverse, low magnitude, Project Footprint, continuous, long term and reversible.
Increased game bird mortality due to increased hunter access.	• Limit road access by hunters and trappers • Post 'no hunting' signs in the Project area • EnvPP • AMP	No residual effects expected due to access restriction on the road.	Not applicable

5.6.2.5 Mammals

Ungulates

Ungulates in the Regional Study Area use a wide variety of habitats that include forested areas, sparsely treed peatlands and riparian areas. Winter and summer food and cover for moose and caribou range from uncommon to common in the Local Study Area and in the surrounding region. Burned habitats in the Local Study Area tend to attract moose (Franzmann and Schwartz 2007), while caribou avoid these habitats until foods such as lichens re-grow (Schaefer and Pruitt 1991, Dunford 2003). In the Local and Regional Study Areas, priority habitat includes calving habitat complexes and islands. Other habitats are not expected to be as important, or potentially limiting, to caribou or moose populations in the Local Study Area, and the surrounding region. Although physical habitat losses may occur during clearing of the ROW and construction of the road which may result in further habitat alienation, substantial effects are not expected for these species as habitat availability does not appear to be a limiting factor for these populations.

Although there is potential for the esker to be used as a short-distance travel corridor by moose and caribou, there is little evidence to indicate that the Local Study Area is an important migration corridor. Qamanirjuaq and Cape Churchill animals tend to move mainly in a north/south direction

in the region. While the Pen Islands caribou tend to move in an east/west direction, these movements occur mainly to the south of the Nelson River, and not in the Local Study Area, based on studies undertaken in support of this EA report.

Mammals such as moose are often attracted to habitat edges to forage, including road ROWs (James *et al.* 2004). Consequently, there may be increases in wildlife-vehicle collisions as well as higher mortality through increased accessibility for hunters and predators. Multiple factors may limit populations at various measurable scales (Dussault *et al.* 2005). As hunting and trapping is expected to increase adjacent to the proposed road, this may result in an increased mortality rate for some mammal species. Priority species such as moose and caribou that generally have low population recruitment rates are most likely to be adversely affected by the proposed road (James *et al.* 2004), particularly if the additive overall mortality rate exceeds sustainable levels for small populations.

Furbearers

Broadleaf habitats are often found on mineral soil (e.g., trembling aspen mixture on mineral soil, jack pine mixedwood on mineral soil and tamarack mixture on mineral soil). Terrestrial furbearers and small mammals tend to occur at higher densities in these uncommon habitat types. Mitigation measures include minimizing the loss of uncommon habitats in borrow areas. Where habitats cannot be avoided in the ROW, a few mammal populations may experience marginal declines in abundance resulting from this habitat loss. These potential changes are likely to be small (i.e., not measureable at the population level).

The construction of the proposed road and associated infrastructure may result in increased human-wildlife encounters that may require management actions, typically for beaver and black bear. Standard mitigation measures to minimize these potential effects include consultation with Natural Resource Officers, keeping garbage away from wildlife, properly managing grey water, not feeding wildlife, and educating construction personnel and the public.

Species such as beaver, with high population recruitment rates are least likely to be adversely affected from increased access. An Access Management Plan is expected to reduce the potential effects of hunting and trapping that may be attributed to increased access along the proposed road.

Potential effects, including decreased habitat effectiveness, habitat fragmentation and wildlife-vehicle collisions, are similar to those discussed for ungulates. These effects are also anticipated to be small for furbearers.

Potential residual environmental effects of the Project on furbearer species including beaver are expected to be adverse, local to regional, low magnitude and long term.

Physical habitat losses may occur for some priority mammal species during clearing of the ROW and construction of the road, which may result in habitat alienation. Substantial effects are not expected for species that may be near their range limit (i.e., wolverine, raccoon and porcupine), where animals may be uncommon due to large home range size or where habitat is limited. It is unlikely that important habitats for these species would be adversely affected by the road.

Consideration of priority and wetland habitats during routing of the road and mitigation measures prescribed in Sections 5.3.1.2, 5.3.1.3 and 5.3.1.5 ensures that minimal amounts of habitat will be affected.

Small Mammals

Mammals with small home ranges (e.g., mice, voles or shrews) may experience higher levels of habitat fragmentation (Andren 1994), but these potential adverse effects are not measurable, given very high and widely distributed population levels and high recruitment rates that are most often associated with small mammal species.

Species at Risk

For the purposes of this environmental assessment, summer resident caribou (and their respective habitats) are treated as a woodland caribou ecotype. For this group of animals, important and critical habitat losses are expected to be small to none. The Local Study Area has a small amount of caribou calving habitat compared to the surrounding region. One moderate quality potential caribou calving complex and four low quality potential calving complexes are present in sparsely treed peatlands adjacent to the ROW for the proposed road. Potentially significant adverse effects on caribou calving habitat in the Local Study Area were mitigated by adjusting the alignment of the road. This mitigation avoids caribou habitat and, as measured to the nearest potential calving island, provides a 500 m or greater buffer against sensory disturbances and possible habitat alienation.

Edge habitat along roads can facilitate the movement of mammals, especially during winter when snow can impede travel (Forman and Alexander 1998, James *et al.* 2004, Belisle 2005). Conversely, large **berm**s (e.g., snow, debris, earth piles) may act as barriers to movements (Belisle 2005). Although the road may act as a semi-permeable barrier, most mammals with moderate to large home ranges such as caribou and moose will continue to cross the road (Dyer *et al* 2001, Belisle 2005). Furthermore, predators such as wolves may also use the roads and trails associated with the proposed Project as they may act as conduits for travel (James *et al.* 2004). If this occurs, predation rates could increase and vulnerable species such as woodland caribou may be affected. The proposed Project is predicted to increase the road density from 0.03 km/km^2 to 0.05 km/km^2; therefore, potential effects on the movements and distribution of wolves and other mammal populations are anticipated to be small.

Vehicle traffic along the road and increased vehicle traffic along PR 280 may result in an increased risk of wildlife-vehicle collisions. Measures to reduce wildlife-vehicle collisions include reducing traffic speeds, posting wildlife warning signs and careful planning to allow for increased visibility along the ROW.

Summary of Effects

The presence of humans and machinery along the road and in the borrow areas may influence habitat effectiveness through sensory disturbances, including physiological stress related to auditory, visual and physical stimuli (Jalkotzky *et al.* 1998, Dyer *et al* 2001). Habitat effectiveness measures the degree to which identified quality habitat will be used by a species after accounting for human

disturbance (Dykstra 2004). The loss of habitat effectiveness is not anticipated to extend beyond one kilometre on either side of the ROW and borrow areas in most circumstances. Portions of one moderate quality and four low quality potential caribou calving complexes may be affected by sensory disturbances within one kilometre of the road. As the surrounding region contains more than 100 potential calving complexes in bogs and at least 33 additional verified calving islands in lakes, these potential effects are considered small given the quantity of available habitats in the region. Mitigation measures proposed to reduce these effects include limiting access to construction traffic and planning initiatives such as limiting blasting (if any) to outside sensitive periods (mid-May to early July). Buffers may be used to provide protection against sensory disturbances in proximity to sensitive habitat types. The summer resident caribou may require additional protection. Prior to blasting, the level of calving activity will be verified in the Local Study Area. Mitigation measures include no blasting (to the maximum extent possible) within a 5 km radius of active calving habitats and limiting borrow activity within two kilometres of adjacent calving sites from mid-May to early July.

The proposed Project is not expected to substantially affect habitat fragmentation as measured by road density. As described previously, the total road density increases from 0.03 km/km^2 to 0.05 km/km^2 which is well below the 0.16 km/km^2 benchmark used for one of the North American animal species that are most sensitive to roads. Past studies that have used benchmarks for linear feature density focused on road density. In other regions, road densities below 0.16 km/km^2 are not expected to affect grizzly bears, which are considered to be one of North America's most sensitive species to roads. Even though grizzly bears are not expected in the study area (COSEWIC 2002), this species is often used as a benchmark for assessing the effects that a road may have on other wildlife species that are likely less sensitive to fragmentation. The regional predicted post-construction road density is well below this benchmark; consequently, the expected level of fragmentation by the road should not have a measurable effect on other mammal species found in the Regional Study Area.

Potential residual effects of the proposed Project on protected and other priority mammal species are expected to be adverse, local to regional, low magnitude and long term. Substantive environmental effects are not expected for any other mammal species or their habitats given the mitigation measures identified. A summary of the effects of the proposed Project on mammals is provided in Table 5.6-7. Follow-up will be implemented to ensure that mitigation measures implemented are effective.

Table 5.6-7: Mammal Population Effects Assessment Summary

Potential Environmental Effect	Mitigation Measures	Residual Environmental Effect	Evaluation of Residual Effect
Removal of mammal habitat due to clearing for Project infrastructure. Loss of mammal habitat: 1.6% to 7.1% of Local Area and 0.16% - 0.71% of region.	• Limit clearing to the minimum extent feasible • Revegetate disturbed areas not required for the Project infrastructure • EnvPP	Minimal loss of mammal habitat.	Adverse, low magnitude, Project Footprint to Regional Study Area, continuous, long term and reversible.

Table 5.6-7: Mammal Population Effects Assessment Summary			
Potential Environmental Effect	**Mitigation Measures**	**Residual Environmental Effect**	**Evaluation of Residual Effect**
Fragmentation of mammal habitat due to clearing for the road and other infrastructure. Region road density increases from 0.03 km/km^2 to 0.05 km/km^2 which are well below the 0.16 km/km^2 benchmark.	• Limit clearing to the minimum extent feasible • Revegetate disturbed areas not required for Project infrastructure • EnvPP	Effects not measurable for small mammal species.	Adverse, low magnitude, Project Footprint to Regional Study Area, continuous, long term and reversible.
Mammal (esp. summer resident caribou) avoidance of Project area due to increased sensory disturbance, including physiological stress related to auditory, visual, and physical stimuli.	• Schedule construction so as to minimize blasting (if any) to the maximum extent during sensitive young-rearing months (mid-May to early-July) • Limiting access to construction traffic • Limit construction vehicle speeds • EnvPP • AMP	Minimal avoidance of the Project area.	Adverse, low magnitude, Project Footprint to Regional Study Area, sporadic, short term and reversible.
Modified movement patterns for mammal species – both predator and prey species.	• Limit clearing to the minimum extent feasible • Prohibit use of salt for dust and ice control • EnvPP	Minimal risk of changes to mammal population movement patterns.	Adverse, low magnitude, Project Footprint to Regional Study Area, continuous, long term and reversible.
Increased mammal mortality due to vehicle collisions along the road.	• Limit vehicle speed on the road • Post signs warning drivers about wildlife collisions • Educate drivers about avoiding wildlife collisions • EnvPP • AMP	Minimal risk of mammal mortality.	Adverse, low magnitude, Project Footprint to Regional Study Area, sporadic, short term to long term and reversible.
Increased mammal mortality due to increased access for hunters and trappers.	• Limit road access by hunters and trappers • Post 'no hunting' signs in the Project area • EnvPP • AMP	No residual effects expected due to road restriction.	Not applicable

Table 5.6-7: Mammal Population Effects Assessment Summary			
Potential Environmental Effect	**Mitigation Measures**	**Residual Environmental Effect**	**Evaluation of Residual Effect**
Increased mammal mortality due to human-wildlife encounters with problem wildlife.	• Consult with Natural Resources Officers, if required • Use proper garbage handling and disposal procedures • Use proper grey water management procedures • Prohibit feeding of wildlife • Educate construction personnel to avoid creating problem wildlife • EnvPP • AMP	Negligible reduction in mammal populations.	Adverse, low magnitude, Local to Regional Study Area, sporadic, short term and reversible.
Increased physiological stress on summer resident caribou during calving and rearing season.	• Road alignment designed to avoid sensitive caribou habitat • Schedule and limit construction so as to minimize blasting (if any) to the maximum extent possible within 5 km of active calving habitats from mid-May to early July • Limit borrow activity within 2 km of active calving sites from mid-May to early July • EnvPP	Minimal risk of mammal mortality.	Adverse, low magnitude, Regional Study Area, sporadic, short term and reversible.

5.7 SOCIO-ECONOMIC EFFECTS AND MITIGATION

5.7.1 Direct Employment and Business Opportunities

This section examines the direct employment and business effects of the proposed Project on the four First Nation communities in the KCN Community Study Area. It examines the nature and timing of the employment opportunities that will be available, identifies key factors that will influence the ability of KCN residents to participate in these opportunities, and assesses the potential extent of their involvement in these opportunities. Where relevant, employment effects on other groups, in particular northern Aboriginal residents beyond the KCN communities, will be noted. Only construction employment effects are considered as Project jobs are concentrated in this period of the work. Operation and maintenance employment opportunities will be minimal.

5.7.1.1 KCN Community Study Area Direct Employment Effects

Overview

The KCN communities have higher than average unemployment levels and the labour force will continue to grow as a result of the high proportion of youth in the communities. A number of converging factors would enable KCN Community Study Area residents to secure a high proportion of the jobs available from the proposed Project. These factors are as follows:

- Occupation mix;
- Pre-project training;
- Hiring process; and
- Capacities to meet DNC requirements.

Occupational Mix

Project workforce requirements include occupations in which KCN Community Study Area residents have relevant experience or training acquired through work on local construction projects, such as house or road building, employment on construction of other hydroelectric projects, such as Wuskwatim or Limestone, or completion of Keeyask Pre-Project Training. Table 5.7-1 presents a summary breakdown of the person-years of employment by broad occupational category and notes those categories where KCN participation could be high (e.g. construction support, non designated and selected designated trades). These categories account for 73% of the person-years of Project construction employment. The remaining three categories would likely have some positions that could also be filled by KCN members.

Table 5.7-1: Occupations Where KCN Participation Could Be High

Labour	Quarterly Peak Employment Opportunities	Person Years of Employment	% of Total Person Years	Potential for High Local Region Participation
NON-DESIGNATED TRADES (CONSTRUCTION, TRANSPORTATION AND INDUSTRIAL)				
All Occupations	60	80	43%	✔
DESIGNATED TRADES (CONSTRUCTION, TRANSPORTATION AND INDUSTRIAL)				
Carpenter, Electrician, Plumber	13	14	8%	✔
Other Non Designated Trades	8	9	5%	
SUPPORT OCCUPATIONS				
Catering, Security, First Aid, Employee Retention Support	22	41	22%	✔
Other Support Occupations	4	4	2%	
OTHER				
All Occupations	19	36	19%	
Infrastructure Project Estimated Workforce	126	184	100%	73%

*Source: Derived from Figure 5.7-1 and Appendix A3.

Pre-Project Training

Since 2001, the KCN communities have been undertaking Pre-Project Training programs heavily oriented towards Wuskwatim and Keeyask (proposed) construction employment opportunities, as part of the Hydro Northern Training and Employment Initiative. These programs have provided training to prepare KCN residents for:

- Designated trades that would be locally useful after construction (e.g. carpenter, electrician, plumber) as well some specialized construction trades (e.g. crane operator);
- Non designated trades (e.g., heavy equipment operator, truck drivers); and
- Construction support occupations (e.g., security, catering).

More than 200 KCN residents have completed their course work in construction trades and occupations providing a pool of people who would be interested in, and partially or fully qualified for Project related jobs.

Hiring Process

Under the Burntwood Nelson Collective Agreement, which governs wages and working conditions, including hiring processes, northern Aboriginal businesses that have negotiated contracts can directly hire northern Aboriginal residents for their workforce. This means the direct hire process applies to 10 of the 11 contract packages that are part of the proposed Project. The DNCs with each KCN are being undertaken by contractors whose majority ownership is from a KCN community. The ability of these contractors to direct hire maximizes the likelihood of qualified Aboriginal residents of KCN communities being hired for a Project related job before someone else is hired.

For the competitively bid bridge contract, Aboriginal residents of KCN communities will share first hiring preference with other northern Aboriginal residents living in communities in the vicinity of the Churchill, Burntwood and Nelson Rivers. Hiring for this contract will be done through the job order process set out in the Burntwood Nelson Collective Agreement. Manitoba Hydro staff will be hired using the Corporation's standard hiring process which includes employment equity criteria.

In addition to these factors, participation in Project employment opportunities will be influenced by how interested and willing KCN residents are to pursue these jobs. Job seekers will be motivated by the opportunity to earn substantial income in a short period of time, to improve their future employment prospects and to be employed rather than unemployed. Some KCN residents may be deterred by having to work in unfamiliar conditions away from their family for extended periods of time, by lack of adequate day care, or by concerns about experiencing discrimination.

Level of Participation in Project Employment Opportunities

Most of the proposed Project's employment opportunities are likely to be filled by KCN residents. Based on the factors discussed above, KCN residents could participate in a majority of these opportunities. This could result in an as much as 110 person-years of work for residents of the region, a sizeable contribution to the local economy. This level of participation is associated with a high level of interest in Project jobs by qualified KCN residents and the assumption that KCN

communities will be able to secure the DNC contracts that are available to them. Uptake by KCN residents would lower at lesser levels of interest, resulting in less than full realization of the DNC contracts by KCN communities. Uptake by some KCN residents (e.g., York Factory First Nation and War Lake First Nation) could also be lower due to logistical challenges faced by community members in traveling to the Project location. This is of particular concern during the "shoulder seasons" in spring and fall when access by ferry or winter road is not available. For the remaining times of the year, community members could travel to Split Lake or Gillam where bussing to the Project site may be available.

Due to the direct and preferential hiring provisions, other northern Aboriginal residents would also benefit from Project related employment. This group is larger and has a wider range of construction skills than in the KCN Community Study Area. Other northern Aboriginal residents would fill the jobs available when the pool of interested and qualified KCN residents is depleted. The combination of KCN residents and other northern Aboriginal residents could account for up to 75% of construction employment opportunities.

Effects of Project Employment

Those employed on the proposed Project will benefit from higher incomes, as well as contributing to increased business activity and induced employment in their home communities and in the regional service centers of Thompson and Gillam. KCN community members who are able to secure jobs will obtain work experience that will enhance their ability to access future potential Keeyask GS construction jobs as well as other construction jobs in their community and elsewhere in northern Manitoba. There may also be some adverse effects, including unpleasant work experiences leading to voluntary quitting or involuntary discharge, easier access to drugs or alcohol, and disruption of family and community life from being away from home.

A summary of effects of the proposed Project on KCN Community Study Area employment is provided in Table 5.7-2 below.

Table 5.7-2: KCN Community Study Area Employment Effects Assessment Summary

Potential Socio-Economic Environmental Effect	Mitigation Measures	Residual Socio-Economic Environmental Effect	Evaluation of Residual Effect
Increased KCN employment as well as increased pre-project training and northern Aboriginal employment.	• DNCs will help enhance Project employment opportunities for KCN residents and other northern Aboriginal residents.	Increased construction related employment for KCN residents and other Northern Aboriginal Residents.	Positive, moderate magnitude, short term, KCN Community Study Area, Northern Manitoba Study Area.

Table 5.7-2: KCN Community Study Area Employment Effects Assessment Summary			
Potential Socio-Economic Environmental Effect	**Mitigation Measures**	**Residual Socio-Economic Environmental Effect**	**Evaluation of Residual Effect**
Increased stress and anxiety for workers in new environments and away from families and home communities for extended periods.	• Support services and employee retention services will be available. • Ongoing communication with KCN communities to identify and address issues.	Some degree of stress and anxiety due to new work situations and periods away from home will persist.	Adverse, moderate magnitude, short term, KCN Community and Northern Manitoba Study Areas.
Increased worker exposure to drugs and alcohol.	• Camp rules and policies • Support services and employee retention services will be available. • Worker education. • Ongoing communication with communities to identify and address issues. • Liaison with local RCMP • EnvPP	Some potential for exposure to drugs and alcohol and drug and alcohol abuse will remain.	Adverse, low magnitude, short term. KCN Community and Northern Manitoba Study Areas.

5.7.1.2 KCN Community Study Area Business Opportunities

With 10 of the 11 work packages for the construction of the Project being DNC's provided to businesses largely owned by KCN communities, nearly all of the direct business opportunities from the proposed Project will accrue to KCN businesses. The experience gained from working on these contracts could result in long-term benefits through enhanced capacity to compete on future contracts. A summary of effects of the proposed Project on business opportunities is provided in Table 5.7-3 below.

Table 5.7-3: KCN Community Study Area Employment Effects Assessment Summary			
Potential Socio-Economic Environmental Effect	**Mitigation Measures**	**Residual Socio-Economic Environmental Effect**	**Evaluation of Residual Effect**
Increased KCN Community Study Area Business Activity. Increased employment income will induce business activity in the KCN communities.	• DNCs will help maximize KCN community business opportunities.	Increased direct and induced business activity in KCN communities.	Positive, moderate magnitude, short term, KCN Community Study Area.

5.7.2 Regional Supplies and Services

Increased demand for supplies and services in the regional service area, primarily Thompson and Gillam, will be created by purchases by Manitoba Hydro and Project contractors and spending by workers visiting these communities during time off. Services and facilities most likely to experience effects would include community recreation services, restaurant/hospitality services, health services, social services, and policing and enforcement services. Services and facilities with unused or under-utilized capacity will benefit from higher demand while those beyond the limits of their capacity may be adversely affected. Even in the heated economy that Thompson is currently experiencing, the magnitude of effect is expected to be low due to the relatively small scale and short duration of the proposed Project.

A summary of effects on regional supplies and services is provided in Table 5.7-4 below.

Table 5.7-4: Regional Supplies and Services Effects Assessment Summary

Potential Socio-Economic Environmental Effect	Mitigation Measures	Residual Socio-Economic Environmental Effect	Evaluation of Residual Effect
Increased demand for services and facilities in Thompson and Gillam.	• Maintain communication with communities including providing information about construction activities and timing.	Some additional demand for local supplies and services.	Both positive and adverse, moderate magnitude, sporadic, short term, Northern Manitoba Study Area.

5.7.3 Resource Use

5.7.3.1 Community and Domestic Resource Use

The proposed Project will displace and disrupt community/domestic resource use in the Project Footprint Study Area for the life of the Project. This may lead to increased pressures on resource use activities in areas outside of the Project Footprint. In the event the infrastructure is decommissioned, the Project Footprint will be rehabilitated and resource use activities could be restored in the area.

Manitoba Hydro on behalf of the Limited Partnership has negotiated separate Adverse Effects Agreements with Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation and York Factory First Nation. The agreements have been ratified and signed by each community. Adverse effects on resource use that arise from this Project will be addressed through offsetting program arrangements set out in these Agreements with any required program adjustments agreed to by the parties to each Agreement.

The Adverse Effects Agreements deal with the negative consequences of the planning, construction and operation of the proposed Project, either direct or indirect, which effect or change the physical, chemical or biological quality of the environment and includes, without limitation, risks or injuries to the health, safety, well-being, comfort or enjoyment of the First Nations and their members and impacts on interests in lands, pursuits, activities, opportunities, lifestyles and assets of the First Nations and their members. The agreements provide for releases from losses or damages related to the foreseeable adverse effects of the proposed Project.

Funding is provided for offsetting programs. The purpose of the offsetting programs is to provide appropriate replacements, substitutions and opportunities to offset unavoidable Keeyask adverse effects on the practices, customs and traditions integral to the distinctive cultural identity of the First Nations, including social, cultural, health and economic impacts.

5.7.3.2 Commercial Resource Use

The proposed Project may displace and disrupt trapping activities in the Project Footprint Study Area for the life of the Project. The proposed Project is not anticipated to have adverse effects on other forms of commercial resource use.

Although there is currently no registered holder of Trapline 15, there are a number of Tataskweyak Cree Nation families who use the area for trapping. Manitoba Hydro, on behalf of the Limited Partnership, intends to negotiate arrangements with affected trappers to compensate for any loss of commercial trapping income and damage to personal property that may arise from Project construction. It is seeking to have agreements and releases in place with trappers impacted by the proposed Project before construction begins.

While forested areas will be cleared and a volume of potentially useable timber will be removed, this will have no effect on the forest industry in Manitoba or the land base under forest management by the Province because the Project Footprint is outside the commercial forest zone. Historically, there has been no commercial scale timber demand in the region, nor is there any currently. The effect of clearing this forest area to the local timber supply is minimal as the affected area is far removed from any communities. Timber supplies required primarily for heating purposes in surrounding communities are readily available in closer proximity to all communities. Although the effect of clearing forestry resources is not reversible for the life of the proposed Project and therefore long term in nature, clearing is limited to the Project Footprint and comprises only a very small portion of the KCN Community Study Area.

A summary of effects on resource use is provided in Table 5.7-5 below.

Table 5.7-5: Resource Use Effects Assessment Summary			
Potential Socio-Economic Environmental Effect	**Mitigation Measures**	**Residual Socio-Economic Environmental Effect**	**Evaluation of Residual Effect**
Community/domestic resource use displaced and disrupted in the Project Footprint.	• Implementation of offsetting programs as set out in Keeyask Adverse Effects Agreements with program adjustments made as required. • EnvPP.	Minimal. Displaced / disrupted community domestic resource use offset by implementation of offsetting programs to create appropriate replacement resource use opportunities.	Residual adverse effects of low magnitude following implementation of offsetting programs, Project Footprint.
Commercial trapping displaced and disrupted in the Project Footprint.	• Compensation for loss or damage to be agreed to with affected trappers. • EnvPP. • AMP.	Minimal. Income loss or damage to personal property will be compensated for in agreements with affected resource users.	Residual adverse effects of low magnitude after compensation agreements resolved, Project Footprint Study Area.
Forested areas will be cleared but no effects on commercial forest industry; minor effects on local wood supply.	• Timber salvage to the extent feasible. • EnvPP.	None on commercial forestry; minor on local wood supply.	Adverse, low magnitude, long term, Project Footprint Area, not reversible.

5.7.4 Individual and Community Health, Safety and Wellness

The proposed Project could directly and indirectly affect the wellness, health and safety of both workers and members of the public in communities near the construction site. These effects, which could be positive as well as negative, may occur as a result of working on the Project, workers being away from their families and communities for weeks at a time and the off hours interaction of Project workers with community members. Effects can be summarized as follows:

- Accidents and injuries could occur in the workplace although there are strong preventative and response measures in place in this regard.

- The added income and self esteem that arise from being employed on the Project can have a beneficial effect on the well-being of Project workers and their families, while being away from home for extended periods can place strains on workers and families. Increased exposure or access to alcohol and drugs from having more money or a greater presence of people selling these products is another potential avenue for impacts on worker and family well-being.
- Concerns have been expressed about workers interacting or developing inappropriate relationships with young women from nearby communities during off-hours visits to these communities. Fox Lake Cree Nation members in the Gillam area have experienced this effect during construction of past hydroelectric projects taking place nearby (Fox Lake Cree Nation 1997).

First Nation communities have also identified effects at the community and individual level related to the stress and anxiety associated with becoming proponents in the Project. These effects are not easy to describe or assess. The proponents recognize and respect this and have worked to address their concerns through their planning, comments, and membership involvement, and current and future programming. Nevertheless, some stress and anxiety remains.

Adherence to Manitoba health and safety legislation, Manitoba Hydro safe construction practices and appropriate camp rules and policies, along with on-site worker education and support programs and communication with local communities to identify and address issues will minimize the likelihood and severity of potential effects. Elements of programs identified in Fox Lake Cree Nation's Adverse Effects Agreement may be useful in addressing adverse worker interaction issues.

A summary of effects on health, safety and wellness is provided in Table 5.7-6 below.

Table 5.7-6: Health, Safety and Wellness Effects Assessment Summary

Potential Socio-Economic Environmental Effect	Mitigation Measures	Residual Socio-Economic Environmental Effect	Evaluation of Residual Effect
Potential effects on worker health and safety while working on the Project and at the camps.	• Adherence to provincial workplace health and safety legislation and regulations. • Manitoba Hydro safe construction practices. • Camp security measures. EnvPP..	Some potential for construction accidents and injuries as well as security issues at the camp will remain.	Adverse, low magnitude, sporadic, short term, KCN Community and Northern Manitoba Study Areas.
Improvements to well-being from employment income and the self-esteem associated with being employed.	• Covered in Section 5.7.1on employment effects.	Enhanced well being from employment income and self-esteem of being employed.	Positive, moderate magnitude, short term, KCN Community and Northern Manitoba Study Areas.

Table 5.7-6: Health, Safety and Wellness Effects Assessment Summary			
Potential Socio-Economic Environmental Effect	**Mitigation Measures**	**Residual Socio-Economic Environmental Effect**	**Evaluation of Residual Effect**
Potential effects on workers and their families from workers being away from home and from increased exposure to alcohol and drugs.	• .Support services and employee retention services will be available. • Camp rules and policies. • Worker education. • Ongoing communication with communities to identify and address issues. • Liaison with local RCMP.	Some potential for effects on workers and their families.	Adverse, low to moderate magnitude following mitigation, short term, KCN Community and Northern Manitoba Study Areas.
Potential effects of workers interacting inappropriately with community members, especially young women, during off-hours visits to Gillam and Thompson.	• Camp rules and policies. • Worker education and cross-cultural training. • Implementation of Fox Lake Cree Nation Adverse Effects Agreement with adjustments made as required. • Offsetting programs that address adverse effects associated with an influx of workers. • Maintaining communication with surrounding communities to identify concerns.	Some potential for incidents will remain.	Adverse, moderate magnitude following mitigation, short term, KCN Community and Northern Manitoba Study Areas.

5.7.5 Traffic

The Project will increase traffic volumes on PR 280 between Thompson and Gillam. Additional trips will be generated to move freight, supplies, people and providers of incidental services such as mail to and from the Project site. In the absence of the Project, two way traffic volumes on PR 280 are projected to average between 77 and 335 vehicles per day in 2009, with lowest volumes occurring at the junction of PR 280 and PR 290 in the Gillam area and the highest occurring in the vicinity of the Split Lake turnoff.

It is estimated that the proposed Project could generate an average of 50 to 58 trips per day. Freight traffic would account for 6 to 8 trips, incidental service traffic for 12 trips and personnel shuttles and personal vehicles for 32 to 38 trips. An estimated 42 to 48 of these trips would originate from Thompson and Split Lake. The remaining 8 to 10 trips would be coming from and returning to Gillam. The impact of this project-related traffic on PR 280 traffic levels varies by location. The 42 to 48 daily trips originating in Thompson and Split Lake would increase average daily traffic in the

vicinity of the Split Lake turnoff about 13–14 %. Traffic levels at the junction of PR 280 and PR 290 would increase about 10 to 13%.

While this increase in volume will be visible to others travelling along this route, the overall increase in traffic levels from the proposed Project should not materially affect the level of safety or operational characteristics of the roadway nor increase collision rates. The proportion of collisions to traffic volume and severity distribution is expected to remain about the same as currently exists. Project summer peak traffic levels are within the range identified for a Secondary Highway (i.e., under 500 AADT)[12].

While this traffic volume is within the capacity of this type of facility, many areas requiring improvement have been identified along this section of PR 280. A road improvement program has been approved for funding, with work currently scheduled for 2011. Improvements include curve shaving, widening and grade improvements at numerous locations between Thompson and the access road turnoff.

A summary of effects on traffic is provided in Table 5.7-7 below.

Table 5.7-7: Traffic Effects Assessment Summary

Potential Socio-Economic Environmental Effect	Mitigation Measures	Residual Socio-Economic Environmental Effect	Evaluation of Residual Effect
Increased number of traffic accidents on PR 280.	• Safe driving practices for construction workers and service vehicles. • Improvements (e.g., bypass lane) at junction of PR280 and access road.EnvPP. • Where appropriate, bussing of workers to / from local and regional centres. • Use of borrow sources near the Project, reducing extent of on road hauling.	Added traffic accidents on PR 280 at similar rate as without the Project.	Adverse, moderate magnitude, short term, reversible, KCN Community and Northern Manitoba Study Areas.

5.7.6 Access

Access created by the existence of the ROW will have effects on the pursuit of traditional resource use activities. It will be important to provide safe, coordinated access to the proposed Project site for authorized users and to support sustainable use through the protection of the area's natural resources. The ROW may also enable others from outside the communities to access these areas. Particular concerns include ATV and snowmobile use by construction workers. A Preliminary

[12] AADT: Average Annual Daily Traffic is defined by Manitoba Infrastructure and Transportation as the number of vehicles passing a point on an average day of the year.

Access Management Plan has been prepared (Appendix E) to address issues of concern. This Plan includes provisions for general security protocols (e.g. security gate and guard), firearms restrictions and access user conditions.

A summary of effects on access is provided in Table 5.7-8 below.

Table 5.7-8: Access Effects Assessment Summary

Potential Socio-Economic Environmental Effect	Mitigation Measures	Residual Socio-Economic Environmental Effect	Evaluation of Residual Effect
The proposed Project will create access to areas used for traditional resource use.	• No private recreational vehicles will be allowed at the camps. • EnvPP. • *Preliminary* AMP.	Access will exist but be managed and monitored under the Preliminary Access Management Plan.	Adverse, moderate magnitude, continuous, short term, KCN Community Study Area.

5.8 HERITAGE RESOURCES EFFECTS AND MITIGATION

In several years of study, no heritage resources have been identified within the access road and borrow areas for the proposed Project. Results from the ongoing field investigations of the start-up camp and main camp (phase one) will be provided in a supplementary filing. All heritage resources sites currently registered with the Province of Manitoba Archaeological Site Inventory occur outside the areas proposed for infrastructure. However, there is potential for heritage resources to be present, since the route selected may have been used as a travel corridor by early Aboriginal people.

The construction phase of the proposed Project has the greatest potential to affect unknown heritage resource sites and marked and unmarked burials, particularly during clearing, grubbing and grading phases. Excavating structural foundations along with heavy equipment operations and storage can also affect heritage resources. Potential effects can be summarized as follows:

- ROW clearing operations can inadvertently disturb heritage resource sites and burial sites. Features and artifacts are often located below the ground surface and can be easily missed, especially in wooded areas.
- The development of structural foundations is site specific and may affect heritage resources if the area is scraped and levelled, and where sewer and water pipes or foundations are excavated.
- Operations and storage of heavy equipment may cause destruction of heritage resource and burial sites. Areas which have been cleared for the ROW and which do not appear to contain any archaeological material may contain heritage resources below the ground surface. Continued disturbance of the soil surface may dislodge artifacts and scatter them. The weight of heavy equipment in storage areas can crush or dislodge subsurface artifacts and features.

The range of mitigative options for heritage resource sites includes site avoidance, preservation and excavation. While site avoidance is the preferred mitigative option, having a clear, enforceable protocol in place should any resources be uncovered during construction is an effective mitigation measure.

Heritage resources protection measures have been developed and incorporated into the EnvPP , which will advise construction crews about the established protocols to be followed should heritage resources or burial sites be encountered. All heritage resource sites are protected by *The Heritage Resources Act* and Manitoba's *Policy Respecting the Reporting, Exhumation and Reburial of Found Human Remains (1987).*

A summary of effects on heritage resources is provided in Table 5.8-1 below.

Table 5.8-1: Heritage Resources Effects Assessment Summary

Potential Environmental Effect	Mitigation Measures	Residual Environmental Effect	Evaluation of Residual Effect
The Project may inadvertently disturb heritage resources and burial sites.	• Heritage protection. • EnvPP.	Disturbance of heritage and burial sites is still possible if they are present in the Project Footprint, but the likelihood of adverse effects is substantially reduced due to implementation of heritage resource protection provisions.	Adverse, unlikely, low magnitude due to on-site monitoring, long term, Project Footprint and irreversible.

6.0 MONITORING AND FOLLOW UP

Appendix C contains an overview of the environmental protection program that will be implemented for this Project. In addition to the EnvPP and AMP, the program involves the development of Project-specific environmental monitoring plans as a follow-up to effects predictions made in the EA Report. They are designed to verify predictions or identify unanticipated effects and would consist of two documents:

- Terrestrial, Aquatic and Heritage Resource Monitoring Plan
- Socio-Economic Monitoring Plan

It is not possible to finalize these plans until the Licence conditions for this project are issued, but in general, they would likely follow the methodologies described in Appendix B.

The terrestrial, aquatic and heritage resource monitoring plan would be developed primarily to study effects on the terrestrial environment as this is largely a terrestrial-based Project. However, aquatic monitoring to cover the work at Looking Back Creek and the requirements for managing a heritage resource find will be included. The monitoring plan would include both western science studies and Aboriginal Traditional Knowledge to gain a holistic understanding of changes to the environment as a result of the proposed Project. As results become available they will be analysed to determine if adaptive management is required to mitigate unforeseen effects if they occur.

The socio-economic monitoring plan would be developed to study the effects of the proposed Project on the Partner communities. It would include tracking employment statistics and the economic activity that the proposed Project is generating.

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8.0 GLOSSARY

AADT: The average annual daily traffic is defined by MIT as the number of vehicles passing a count station on an average day of the year.

Adaptive management: The implementation of new or modified mitigation measures over the construction and operation phases of a project to address unanticipated environmental effects. The need for the implementation of adaptive management measures may be determined through an effective follow-up program.

Alluvium: Sediment deposited by flowing water, as in a riverbed, flood plain or delta.

Alternative means of carrying out a project: The various technically and economically feasible ways, other than the proposed way, for a project to be implemented or carried out. Examples include other project locations, different routes and methods of development, and alternative methods of project implementation or mitigation.

Alternatives to a project: The functionally different ways, other than a proposed project, to meet the project need and achieve the intended purpose. For example, if a need for greater power generation has been identified, a proposed project might be to build a new power generation facility. An alternative to that project might be to increase the generation capacity of an existing facility.

Aquatic peatland: A peatland bordering on a water body or waterway. The peat adjacent to the water's edge is usually floating.

Aquifer: An underground bed or layer of earth, gravel or porous stone that yields water.

Baseline environment: A description of the environmental conditions at and surrounding a proposed action.

Bedrock: The solid rock that lies beneath the soil and other loose material on the Earth's surface.

Berm: A length of raised earth, snow, or debris which may act as a barrier towards movement.

Biological diversity (Canada): Means the variability among living organisms from all sources, including, without limiting the generality of the foregoing, terrestrial and marine and other aquatic ecosystems and the ecological complexes of which they form a part and includes the diversity within and between species and of ecosystems (*Canadian Environmental Protection Act, 1999*).

Biological diversity (Manitoba): Means the variability among all living organisms and the ecological complexes of which they are part, including diversity within and among species and among ecosystems.

Blanket bog: A bog with an organic layer that is between 1 and 2 m thick.

Bog: A peatland where vegetation receives nutrient inputs from precipitation and dryfall only. Peat mosses (Sphagnum species) are the dominant peat forming vegetation in bogs.

Borrow area zone: An area representing the originally anticipated extent of potential borrow area use at the time the quantitative habitat effects assessment was completed. Subsequent engineering analysis has reduced the anticipated borrow area extent (shown by the refined borrow areas).

Boulder lag: An accumulation of boulders remaining on a surface after finer materials and smaller rocks have been removed by wind or water.

Brunisols: Poorly developed mineral soils that have a B horizon that is at least 5 cm thick and lacks the diagnostic properties specified for other soil orders.

Canadian Shield: A broad region of Precambrian rock that encircles Hudson Bay. In total it covers 8 million km^2 and is made up of some of the Planets oldest rock, largely granite and gneiss.

Cataclastic: The structure produced in a rock by the actions of severe mechanical stresses that occur during metamorphic rock formation.

CDC: See **Conservation Data Centre.**

CI: See **Confidence Interval.**

Clear-Span Bridge: Small-scale bridge structure that completely spans a watercourse without altering the stream bed or bank, and that are a maximum of two lanes wide. The bridge structure (including bridge approaches, abutments, footings, and armouring) is built entirely above the ordinary high water mark.

CNP: See **Cree Nation Partners.**

Community knowledge: Information held by community members, such as farmers, hunters, fishers and naturalists, who are familiar with the environment in a specific geographic area. Community knowledge may be used in the environmental assessment of a proposed project. For example, fishermen in a specific area may know where the best "fishing spots" are, and therefore may contribute to identifying potential fish habitat.

Compliance monitoring: A broad term for a type of monitoring conducted to verify whether a practice or procedure meets the applicable requirements prescribed by legislation, internal policies, accepted industry standards or specified terms and conditions (e.g., in an agreement, lease, permit, license or authorization).

Conservation Data Centre (CDC) ranking: A Manitoba Conservation status rank assigned to a species by the Conservation Data Centre on the basis of the species' province-wide status. Species are assigned a numeric rank ranging from 1 (very rare) to 5 (demonstrably secure).

Construction: Includes activities anticipated to occur during Project development.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): Committee established by the *Species at Risk Act* as the authority for assessing the conservation status of species that may be at risk of extinction in Canada.

Confidence Interval (CI): This quantifies the uncertainty in measurement and is usually reported as the 95% CI which is the range of values within which it can be 95% certain that the true value for the whole population lies.

Country foods: Traditional foods from the land, such as wild animals, birds, fish, plants and berries.

Cree Nation Partners (CNP): A partnership formed in 2001 amongst Tataskewayk Cree Nation and War Lake First Nation.

Critical habitat: An area of habitat or the place in which an organism lives that is essential in providing the requirements needed for a specific species to live.

Cryoboreal: Refers to species characteristic of the colder parts of the Boreal Zone.

Cryosols: Soils that are characterized by either the presence of permafrost within 1 m of the surface or permafrost within 2m of the surface and evidence of cryoturbation.

Decommissioning: Planned shut-down, dismantling and removal of a building, equipment, plant and/or other facilities from operation or usage and may include site cleanup and restoration.

Development: Any project, industry, operation or activity, or any alteration or expansion of any project, industry, operation or activity which causes or is likely to cause: a) the emission or discharge of any pollutant to the environment, or b) an effect on any unique, rare or endangered feature of the environment, or c) the creation of by-products, residual or waste products not regulated by *The Dangerous Goods Handling and Transportation Act*, or d) A substantial utilization or alteration of any natural resource in such a way as to pre-empt or interfere with the use or potential use of that resource for any other purpose, or e) A substantial utilization or alteration of any natural resource in such a way as to have an adverse effect on another resource, or f) The utilization of a technology that is concerned with resource utilization and that may induce environmental damage, or g) A significant effect on the environment or will likely lead to a further development which is likely to have a significant effect on the environment, or h) A significant effect on the social, economic, environmental health and cultural conditions that influence the lives of people or a community insofar as they area caused by environmental effects (*The Environment Act*).

Direct effect: An environmental effect that is a change that a project may cause in the environment; or change that the environment may cause to a project. A direct effect is a consequence of a cause-effect relationship between a project and a specific environmental component.

Directly Negotiated Contract (DNC): A type of contract that is non-tendered and directly negotiated between parties of interest.

Diverse habitat type: Habitat type that typically includes a relatively high number of plant species and/ or a relatively high degree of structural diversity.

DNC: See **Directly Negotiated Contract.**
Drumlin: A smooth hill formed by deposits of glacial till; the long axis parallels the direction of former glacial flow.

EA: See **Environmental Assessment.**

Ecodistrict: A cartographical delineation of distinct ecological areas, identified by their geology, topography, soils, vegetation, climate conditions, living species, and water resources. An ecodistrict provides a useful approximation of ecosystem potentials.

Ecoregion: A subdivision of the ecozone, characterized by distinctive large order landforms or assemblages of regional landforms, small order macro-or mesoclimates, vegetation, soils, water, and regional human activity pattern/use.

Ecosystem: A functional unit including the living and the non-living things in an area, as well as the relationships between those living and non-living things. For example, a decaying log comprises the ecosystem for a microbe because the log provides everything that the microbe needs to survive and reproduce.

Ecosystem diversity: A form of **biological diversity**. Measured in this report as the number of habitat types and distribution of area amongst them.

Ecozone: A large geographical region having a distinct biodiversity of flora and fauna; boundaries also defined by major physiological land features.

EIS: See **Environmental Impact Statement.**

Endangered: A species facing imminent extirpation or extinction (COSEWIC).

Environment: The components of the Earth and includes: a) land, water and air, including all layers of the atmosphere, b) all organic and inorganic matter and living organisms, and c) the interacting natural systems that include components referred to in paragraphs a) and b) (*Canadian Environmental Assessment Act*).

Environmental assessment (EA): Process for identifying project and environment interactions, predicting environmental effects, identifying mitigation measures, evaluating significance, reporting and following-up to verify accuracy and effectiveness leading to the production of an Environmental Assessment report. EA is used as a planning tool to help guide decision making, as well as project design and implementation.

Environmental component: Fundamental element of the physical, biological or socio-economic environment, including the air, water, soil, terrain, vegetation, wildlife, fish, birds and land use that

may be affected by a proposed project, and may be individually assessed in the environmental assessment.

Environmental effect: In respect of a project, a) any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the *Species at Risk Act*, b) any effect of any change referred to in paragraph a) on i) health and socio-economic conditions, ii) physical and cultural heritage, iii) the current use of lands and resources for traditional purposes by Aboriginal persons, or iv. any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or any change to the project that may be caused by the environment; whether any such change or effect occurs within or outside Canada (*Canadian Environmental Assessment Act*).

Environmental Impact Statement (EIS): A document that presents the findings of an environmental assessment in response to specific guidelines or terms or reference. The term EIS is often used in the context of an assessment by a review panel and in the environmental assessment regimes of other jurisdictions.

Environmental monitoring: Periodic or continuous surveillance or testing, according to a pre-determined schedule, of one or more environmental components. Monitoring is usually conducted to determine the level of compliance with stated requirements, or to observe the status and trends of a particular environmental component over time.

Environmental Protection Program (EPP): Provides a framework for delivery, management and monitoring of environmental protection activities in keeping with issues identified in the environmental assessment, regulatory requirements and public expectation.

Environmental Protection Plan (EnvPP): Within the framework of an Environmental Protection Program, an Environmental Protection Plan prescribes measures and practices to avoid and minimize potential environmental effects of a proposed project.

EnvPP: See **Environmental Protection Plan.**

EPP: See **Environmental Protection Program.**

Erosion: Natural process by which the Earth's surface is worn away by the actions of water and wind.

Esker: A long winding ridge of stratified sand and gravel that is formed from drift deposited in tunnels running through a glacier.

Eutric: Referring to a soil with a relatively high degree of base saturation, and lack of well-developed surface horizon.

Fen: A type of peatland in which the vegetation is influenced by mineral enriched surface and/or groundwater. Water chemistry is neutral to alkaline. Sedges, brown mosses and/or Sphagnum mosses are usually the dominant peat forming vegetation.

Fibrisols: Organic soils consisting predominantly of relatively undecomposed plant material, such as Sphagnum mosses, with clearly visible plant fragments.

First-order stream: A stream that has no permanent tributaries. Feeds larger streams.

Fish habitat: Spawning, nursery, rearing, food supply and migration areas upon which fish depend (*Fisheries Act*).

Follow-up program: A program for: a) verifying the accuracy of the environmental assessment of a project, and b) determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the project (*Canadian Environmental Assessment Act*).

Fragmentation: The breaking up of contiguous blocks of habitat into increasingly smaller blocks as a result of direct loss and/or sensory disturbance. Eventually, remaining blocks may be too small to provide usable or effective habitat for a species. The features breaking up habitat blocks may reduce the ease by which animals, plant propagules and other ecological flows move from one area to another area.

Game Hunting Area (GHA): Designated areas in Manitoba in which game hunting is regulated by species, quota, means, etc. (Manitoba Conservation).

Generating Station (GS): An industrial facility for the generation of electric power (also referred to as power station, power plant or powerhouse).

Geological overburden: Material overlying a useful mineral deposit or desired bedrock anchor.

GHA: See **Game Hunting Area.**

GHG: See **Greenhouse Gas.**

Glaciolacustrine: Pertains to lakes fed by glacial meltwater or sediments deposited into lakes that have come from glaciers.

Greywacke gneisses: Gneiss (c.v.) consisting of any of various dark gray sandstones that contain shale.
Granite gneisses: Gneiss composed of a high degree of granite.

Granite: A common, coarse-grained, light-coloured, hard igneous rock consisting chiefly of quartz, orthoclase or microcline and mica.

Granular: Composed of granules or grains of sand or gravel.

Greenhouse Gas (GHG): Gases e.g., methane, carbon dioxide, chlorofluorocarbons emitted from a variety of sources and processes that contribute to global warming by trapping heat between the Earth and the upper atmosphere.

GS: See **Generating Station.**

Habitat: The place where an organism lives. Since all natural areas are habitat for something, "habitat" refers to all habitats. Habitat for a particular species is identified with a species prefix (e.g., fish habitat, jack pine habitat, moose habitat).

Habitat Mapping Area: The central 1,502 km^2 of the Regional Study Area, within which detailed habitat mapping has been developed.

High quality wetland: A type of wetland that has high primary productivity, has high species richness, is critical habitat for a rare species, and/or is high quality habitat for a wildlife species. Relative to many other habitat types, wetlands make disproportionately high contributions to ecosystem functions such as cleaning water, storing water and storing carbon.

High Water Mark (Ordinary) (HWM): The visible high water mark of any lake, stream, or other body of water where the presence and action of the water are so common and usual and so long continued in all ordinary years as to mark upon the soil of the bed of the lake, river stream, or other body of water a character distinct from that of the banks, both in vegetation and in the nature of the soil itself. Typical features may include, a natural line or "mark" impressed on the bank or shore, indicated by erosion, shelving, changes in soil characteristics, destruction of terrestrial vegetation, or other distinctive physical characteristics (Operational Statement for Clear-Span Bridges, Version 3 (Fisheries and Oceans 2007b).

Horizons: A specific layer in the soil which parallels the land surface and possesses physical or chemical characteristics which differ from the layers above and beneath.

Horizontal peatland: A flat, featureless peatland where the water table is close to the surface.

HP Piles: A steel support structure.

Hydrostratigraphic: Refers to the layers of aquifers and water-bearing deposits occurring within a given area. The hydrostratigraphy can be mapped and is predictable based on ground-water models.

HWM: See **High Water Mark (Ordinary).**

Igneous intrusive: An injection into pre-existing rocks of new rocks or minerals formed by the cooling and hardening of magma or molten lava. Basalt and granite are examples of igneous rocks which may intrude into older existing rock formations.

Impermeable: Relating to a material through which substances, such as liquids or gases, cannot pass.

Indicators: Anything that is used to measure the condition of something of interest. Indicators are often used as variables in the modeling of changes in complex environmental systems. In an environmental assessment, indicators are used to predict changes in the environment and to evaluate their significance.

Indirect effect: A secondary environmental effect that occurs as a result of a change that a project may cause in the environment. An indirect effect is at least one step removed from a project activity in terms of cause-effect linkages. For instance, a river diversion for the construction of a hydro power plant could directly result in the destruction of fish habitat causing a decline in fish population. A decline in fish population could result in closure of an outfitting operation causing loss of jobs. Thus, the river diversion could indirectly cause the loss of jobs.

Intertill: Layers of soil or granular deposits which lay between layers of till (c.v.).

Joint Keeyask Development Agreement: An agreement between Tataskweyak Cree Nation and War Lake First Nation operating as Cree Nation Partners, and, York Factory First Nation, and Fox Lake Cree Nation, and, The Manitoba Hydro-Electric Board regarding the partnership, ownership, development and operation of the Keeyask Project.

KCN: See **Keeask Cree Nations**.

KCN Community Study Area: This area includes the four First Nation communities in the vicinity of the proposed Project: Tataskweyak Cree Nation (TCN) at Split Lake; York Factory First Nation (YFFN) at York Landing; War Lake First Nation (WLFN) at Ilford; and Fox Lake Cree Nation (FLCN) at Bird and Gillam.

Keeyask Cree Nations: Tataskweyak Cree Nation (TCN) at Split Lake; York Factory First Nation (YFFN) at York Landing; War Lake First Nation (WLFN) at Ilford; and Fox Lake Cree Nation (FLCR) at Bird and Gillam.

Linear feature: A geographic feature, such as a trail or road, which can be represented by a line.

Local Study Area (LSA): A 7,870-ha (78.7-km^2) Local Study Area was established to include the spatial area immediately adjacent to the proposed Keeyask Infrastructure Project where some direct and indirect environmental effects may occur. The Local Study Area includes the project footprints as well as a 1.15-km buffer around these areas. Potential local effects on landscape level issues such as landscape diversity, fragmentation and wetland function are captured by the Local Study Area.

LSA: See **Local Study Area.**
Luvisols: Mineral soils where clay particles from the upper layer have been transported to the layer below to the extent that a Bt horizon has developed.

MESA: See ***The Endangered Species Act*** **(Manitoba).**

Mesisols: Organic soils which are more highly decomposed and contain less fibrous material than Fibrisols (c.v.).

Metamorphic: Rocks that have been transformed by extreme heat and pressure

Metasedimentary: Sedimentary rocks which have been deposited, and the undergone subsequent metamorphosis, and thus can be classified as neither fully sedimentary nor metamorphic

Mitigation: In respect of a project, the elimination, reduction or control of the adverse environmental effects of the project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means (*Canadian Environmental Assessment Act*).

Mitigation monitoring: A type of monitoring program that may be used to verify that mitigation measures were properly implemented and that such measures effectively mitigate the predicted adverse environmental effects.

Monitoring: Continuing assessment of conditions at and surrounding an activity. This determines if effects occur as predicted or if operations remain within acceptable limits and if mitigation measures are as effective as predicted.

Moraine: Soil and rock material that has been transported by a glacier and then deposited.

Neotropical migrant: A bird species that breeds in North America during the spring and early summer and migrates south to Mexico, the Caribbean and Central and South America for the winter.

Net merchantable: The commercially useable volume of wood fibre within an area. It includes all trees with a diameter at breast height of 9.1 cm and greater and includes the application of the regions specific cull factors as determined by Manitoba Conservation.

Northern Manitoba Study Area: This is the broadest spatial scope used for the socio-economic assessment. This area is defined as Statistics Canada Census Divisions 22 and 23.

Organic: Containing plant and animal residues at various stages of decomposition (i.e., organic soil contains decomposing plant fibres).

Passerine: Perching birds mostly small and living near the ground with feet having 4 toes arranged to allow for gripping the perch; most are songbirds.

Peat plateau bog: A generally flat-topped **peatland**, elevated above the surrounding area by ground ice that may or may not extend downward into the underlying mineral soil.

Peatland: A peatland is a **wetland** where organic material has accumulated because dead plant material production exceeds decomposition..

Peatland disintegration: Net reduction in peatland area and/or volume. Peatland disintegration can result from a variety of influences such as climate warming, fires or flooding.

Permafrost: A condition where soil temperature remains below 0°C for at least two consecutive years.

Permeability: The degree to which fluids or gases can pass through a barrier or material.

Physiography: Physical geography, i.e. the study of physical features of the surface of the Earth.

Potentially salvageable timber: Timber that is of sufficient size (stem diameter and length) to be useable for commercial or non-commercial purposes, exclusive of economic and logistical considerations.

Precambrian bedrock: Extremely stable bedrock composed of ancient crystalline rocks whose complex structure attests to a long history of uplift and depression, mountain building and erosion.

Pre-construction: Includes all project activities (surveying, staking, mapping) that lead up to but do not include project construction, including all field studies (aquatic, plant, wildlife) and related public liaison activities.

Priority habitat type: Generally refers to a habitat type that is rare, uncommon, highly diverse, highly sensitive to disturbance, plays a key functional role, is critical habitat for a particular plant or animal species, and/or is highly valued by people. Priority habitat types in the terrestrial habitat and ecosystem assessment are habitat types that are regionally rare and/or highly diverse (i.e., habitat type that typically includes a relatively high number of plant species and/or a relatively high degree of structural diversity). Habitat types that are highly sensitive, play a key functional role and/or are critical habitat for a particular plant species are also captured in the wetland function topic area. Priority habitat for a particular animal species is considered in the animal sections and referred to relative to the species (e.g., priority moose habitat).

Priority mammals: Generally refers to mammal species that is important to local people, has regulatory requirements, plays an important role in ecosystem function, whether it can be used as an indicator, is rare or uncommon, and whether there is the potential for measurable effects from the project.

Priority plant species: Plant species that are rare, near a range limit, invasive or non-native. Several degrees of rarity were recognized. The Manitoba Conservation Data Centre (CDC) assigns conservation status ranks to species as an indication of their degree of provincial conservation concern. Species with ranks ranging from "S1" to "S3?" indicate that these species are provincially very rare to uncommon and of potential conservation concern. Of these plant species, the ones of highest concern are those that are listed by the Manitoba Endangered Species Act (MESA), the Species At Risk Act (SARA) or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Invasive and non-native plants are included as priority plants because they can crowd out other plant species and, in extreme cases, change vegetation composition.

Project activity: Elements of a project component that may result in environmental effects or changes. Example project activities include clearing, grubbing, excavating, stockpiling, reclaiming, etc.

Project component: A component of the project that may have an effect on the environment. Example project components include access road, construction camp, wastewater treatment facility, etc.

Project Footprint: This includes the physical works and associated activities where direct environmental effects are expected to occur as well as incidental physical disturbance in adjacent areas and indirect effects on habitat. This 2,597-ha (26-km^2) area for the proposed Keeyask Infrastructure Project includes the proposed road, borrow areas, camp areas and associated infrastructure footprints as well as a 150-m buffer surrounding these areas. Potential localized effects on priority habitat types, priority plant species and stand-level ecosystem diversity are captured by the Project Footprint.

Proponent: A person who is undertaking, or proposes to undertake a development or who has been designated by a person or group of persons to undertake a development in Manitoba on behalf of that person or group of persons (*The Environment Act*).

Qualitative analysis: Analysis that is subjective. Also refers to analysis that does not involve precise numerical analysis, often addressing differences as direction of change or orders of magnitude.

Quantitative analysis: Analysis that uses environmental variables represented by precise numbers or ranges and is often accompanied by numerical modeling or statistical analysis.

Regional Study Area (RSA): The ecologically appropriate area that is used to assess the effects of the project on habitat composition is one that is large enough to capture a natural, fire-driven shifting habitat mosaic. An analysis of fire history data indicated that an area of approximately 14,000 km^2 would be needed to assess the effects of the proposed Keeyask Infrastructure Project.

Rehabilitation: To restore a disturbed structure, site or land area to good condition, useful operation or productive capacity.

Residual environmental effect: An environmental effect that remains, or is predicted to remain, even after mitigation measures have been applied.

Risk: A state of uncertainty where some of the possibilities involve a loss, catastrophe or other undesirable outcome. Quantitatively, risk is proportional to both the expected losses which may be caused by an event and to the probability of this event. The greater loss and greater event likelihood result in a greater overall risk.

Resource Management Area (RMA): An area to be jointly managed by a Resource Management Board established by agreement between Manitoba and a First Nation or a local Aboriginal community.

Right-of-Way (ROW): Area of land controlled or maintained for the development of a road, pipeline or transmission line.

Riparian: Along the banks of rivers and streams.

Riprap: Rock or other material used to armor shorelines streambeds, bridge abutments, pilings and other shoreline structures against scour, water or ice erosion.

RMA: See **Resource Management Area.**

RSA: See **Regional Study Area.**

ROW: See **Right-of-Way.**

SARA: See ***Species at Risk Act.***

Scoping: An activity that focuses the environmental assessment of a proposal on relevant issues and concerns, types of effects, alternatives for consideration, timeframe, methodology, and establishes the boundaries of the assessment.

SD: See **Sustainable Development.**

Second-order Stream: A stream formed by the confluence of two first-order streams, or of a first-order stream and a second-order stream. Generally forms on steep slopes and flows quickly.

Septage: Partially treated waste stored in a septic tank.

Special concern: A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events (COSEWIC).

Species at risk: Means an extirpated, endangered or threatened species or a species of special concern (*Species at Risk Act*).

Species at Risk Act **(SARA):** The federal Act which provides for the legal protection for wildlife species listed under 'Schedule 1' of that Act.

Significance: A conclusion about whether adverse environmental effects are likely to be significant, taking into account the implementation of appropriate mitigation measures. Significance is determined by a combination of scientific data, regulated thresholds, standards, social values and professional judgment.

SLRMA: See **Split Lake Resource Management Area.**

Split Lake Resource Management Area (SLRMA): Formed by a Comprehensive Implementation Agreement between Tataskweyak Cree Nation and Manitoba in 1992 the area covers about 4,150 ha in northern Manitoba,

Start-up Camp: A temporary 125-person camp to be established at the onset of the proposed Keeyask Infrastructure Project and to be decommissioned at the conclusion of the proposed Project.

Stratigraphy: Scientific study of rock strata, especially the distribution, deposition, correlation, and age of sedimentary rocks.

Surface permafrost: Permafrost that occurs within the top 2 m of the surface materials.

Sustainability: Capacity of a thing, action, activity or process to be maintained indefinitely in a manner consistent with the spirit of Manitoba's Principles and Guidelines of Sustainable Development.

Sustainable development (SD) (Canada): Development that meets the needs of the present, without compromising the ability of future generations to meet their own needs (*Canadian Environmental Assessment Act*).

Sustainable development (SD) (Manitoba): Meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Tectonic: Pertaining to the structure or movement of the earth's crust.

The Endangered Species Act **(Manitoba) (MESA):** Enacted: 1) to ensure the protection and survival of endangered and threatened species in the province; 2) to enable the reintroduction of extirpated species into the province; and 3) to designate species as endangered, threatened, extinct or extirpated. Additions or deletions to list of species under each designation are recommended by the Endangered Species Advisory Committee.

Third-order Stream: A stream formed by the confluence of two second-order streams, or of a second-order stream and a third-order stream.

Threatened: A species likely to become endangered if limiting factors are not reversed (COSEWIC).

Threshold: A limit or level which if exceeded likely results in a noticeable, detectable or measurable change or environmental effect that may be significant. Example thresholds include water-quality guidelines, acute toxicity levels, critical population levels and wilderness criteria.

Till: An unstratified, unconsolidated mass of boulders, pebbles, sand and mud deposited by the movement or melting of a glacier.

Timber: The wood of growing trees suitable for structural uses; the body, stem or trunk of a tree.

Trap Night: A unit of measure used to standardize small mammal trapping effort (e.g., 100 TN is equivalent to setting 100 snap traps in an area for a period of 24 hours).

Topography: The surface features of a region, such as its hills, valleys or rivers.

Uncertainty: The lack of certainty or a state of having limited knowledge where it is impossible to exactly describe existing state or future outcome, more than one possible outcome. In environmental assessment not knowing the nature and magnitude of environmental effects or the degree to which mitigation measures would prevent or reduce adverse effects.

Uncommon habitat type: Covers between 1% and 10% of regional land area.

Unconsolidated: Not compact or dense in structure or arrangement; i.e., "loose gravel."

Varved: A layer or series of layers of sediment deposited in a body of still water in one year. Varves are typically associated with glacial lake deposits and consist of two layers: a lower, light-coloured layer that consists primarily of sand and silt, and a darker upper layer that consists primarily of clay and organic matter.

Veneer bogs: A type of bog with thin peat (i.e., less then 1.5 thick). In the Keeyask area, veneer bogs generally occur on gentle slopes and contain discontinuous permafrost.

Very uncommon habitat type: Covers 1% or less of regional land area.

Watershed: The region draining into a river, river system or other body of water.

Wetland: A land ecosystem where periodic or prolonged water saturation at or near the soil surface is the dominant factor shaping soil attributes and vegetation composition and distribution. Peatlands are wetlands where organic material has accumulated because dead plant material production exceeds decomposition.

APPENDICES