TABLE OF CONTENTS

LIST OF TABLES

8.0 ENVIRONMENTAL EFFECTS ASSESSMENT

8.1 Principles and Objectives

This Section provides a summary of the method followed to assess environmental effects as a result of activities conducted during construction and operations/maintenance of the PR 304 to Berens River All-Season Road Project (the Project), as well as a summary of the residual or "net" environmental effects that are expected to remain following the implementation of (mitigation) measures that will be implemented to reduce, minimize or eliminate the potential environmental effects. An analysis of the residual effects and their significance is also provided. A description of the Project is provided in Section 3.0.

This Section also provides:

- An analysis of the effects that could be caused to the physical, biological, socio-economic and cultural environments as a result of Project activities during construction and operations/maintenance;
- An analysis of the environmental effects that could be caused to the environment as a result of accidents and malfunctions during Project construction and operations/maintenance;
- An analysis of the effects of the environment on the project; and
- An analysis of the cumulative effects that could be caused to the environment as a result of the combination of Project activities together with the effects of other projects and planned activities in the study area and surrounding region over the foreseeable future.

The assessment of environmental effects was conducted with reference to the project scoping document (East Side Road Authority, May 2009). The assessment was also conducted to be consistent with current guidelines and policies of the federal Canadian Environmental Assessment Agency and Manitoba Conservation in reference to the Manitoba Environment Act, as well as accepted best management practices (BMPs) within the industry. An additional reference source was the Transport Canada's *Environmental Assessment Screening Report Template*.

The specific objectives of the environmental effects assessment were to:

- Provide a description of potential linkages and/or interaction(s) between the Project, existing environmental conditions and valued ecosystem components (VECs);
- Provide sufficient information to understand the nature, extent, and significance of potential effects to VECs within the physical and biological environments resulting from activities conducted during the construction, operation, and maintenance of the Project, as well as effects to the socio-economic, and cultural environments that might arise from those physical and biological effects;

- Describe mitigation measures that can be applied to reduce, minimize or eliminate the significance of potential environmental effects;
- Describe all residual effects to VECs that are expected following consideration of mitigation, and provide an assessment of the significance of each residual effect;
- Identify and assess the cumulative effects of the Project that may be anticipated to occur in combination with other projects or planned activities in the study area;
- Provide an assessment of the effects that could be caused by accidents and malfunctions during construction and/or operations/maintenance of the Project; and
- Provide an assessment of the effects the environment could have on the Project;

In addition to providing an understanding of the potential Project interactions with the environment in the study area, the environmental effects analysis also provides other benefits:

- Provides a basis for evaluation of the sustainability of the Project;
- Assists with the identification of environmental monitoring and follow-up activities to be undertaken during the construction and operations phases of the Project in order to determine the actual effects of the Project compared to the predicted effects (verification of predictions), and to assess the effectiveness of mitigation measures;
- Assists the Project proponent with decision-making and design;
- Provides an understanding of the Project, the environment that could be affected by the Project, potential effects of the Project, mitigation measures/commitments the Proponent has agreed to implement to reduce the significance of environmental effects;
- Demonstrates how issues raised by local residents and study area communities, the wider public and stakeholder/ interest groups have been considered through the development of the Project; and
- Provides a summary of commitments that have been made to protect communities and the broader environment.

8.1.1 Context of the Assessment

The environmental effects assessment considers environmental effects of the Project to the environment that currently exists in the study area. The existing environmental setting (Section 7.0) provides a baseline of information which characterizes the study area before the project is developed, in order to better identify and assess the potential

effects of the proposed road and the changes that might be caused to the affected area. The existing environmental setting includes the study area from PR 304 to Berens River, primarily centred on the existing Rice River Road, winter roads and power distribution lines, as described in Section 1.3. Data for the baseline characterization was obtained from published data sources, previous studies, TEK studies and field studies. Details are described in Section 7.0.

The environmental effects assessment analyzed the environmental effects of the Project that have been defined at this stage of project development, including ancillary facilities required for the construction of the road (e.g., temporary access roads and camps, quarry sites, etc.), as described in Section 3.0.

Two phases of Project development were examined in this environmental effects assessment, construction; and operations and maintenance. The construction phase of the project is discussed in Section 3.2. The operational phase of the project refers to the post-construction period during which the road is being used. Although decommissioning of the ancillary construction related components such as access roads, camps and quarries, was considered, the environmental effects of decommissioning the entire Project were not considered as it is expected to be operational for a long period of time and there are no foreseeable plans to decommission the road. The effects of decommissioning will be considered at the time a decision is made to decommission the road.

The environmental effects analysis conducted for this Project considered the significance of potential environmental effects that are expected to occur both before and after mitigation measures have been implemented.

Environmental effects were categorized as follows:

- Physical environment – land (physiography, geology and soils), water (surface and groundwater resources), and air(climate, air quality, and noise);
- Biological environment – aquatic and terrestrial habitats and species; and aquatic or terrestrial species at risk;
- Socio-economic environment – present and planned land and resource uses and traditional aboriginal land uses; and
- Cultural environment – archaeological, cultural and heritage features including any site or feature of historical significance that could be affected by a physical aspect of the project.

.

The environmental impact assessment (EIA) process includes input from a comprehensive community engagement program that facilitated the exchange of information and opinions with local community members and stakeholders. Opinions and comments received were considered / addressed during the environmental effects assessment. Traditional Ecological Knowledge (TEK) studies were also conducted with the communities within the study area. TEK was conducted to develop a comprehensive understanding of aboriginal traditional uses of the land potentially affected, as well as cultural and spiritual aspects. Information from the TEK studies was used to corroborate

information from the western science environmental baseline to ensure a balanced and comprehensive analysis of the environmental effects of the Project. A discussion of the TEK studies conducted, and an analysis of some implications of the proposed road on traditional land uses and spiritual cultural ties to the land is provided in Section 6.0 of this EIA.

The environmental baseline of the study area provided the project team a thorough characterization of the environment that could be potentially affected, including an identification of VECs within the study area. At an early stage in the EIA process, this information was used to identify environmental constraints which influenced the identification and evaluation of alternative road alignments/corridors, as described in Section 4.0. As a result of this analysis of alternatives, a recommended road alignment was selected for detailed assessment that:

- Avoided or minimized crossing areas that would result in potentially significant biophysical environment effects;
- Followed terrain units favorable for construction; and
- Enhanced positive environmental effects.

8.2 Data Sources Used in the Environmental Effects Analysis

Information collected and used to conduct the environmental effects analysis for this Project were obtained from a variety of sources, and included both published and primary (field) data. The following were the major sources of information used:

- Government publications and various reports;
- Published material obtained from non-government sources;
- Published reports, studies, etc. obtained from the study area communities;
- Information obtained through the community engagement program;
- Information obtained from TEK surveys/interviews conducted in the study area communities;
- 1:10,000 (circa 2009) digitally corrected ortho photos of a 3 km corridor encompassing the proposed road alignment; and
- Field studies conducted between May and July 2009.

A compilation of all data sources is provided in the References Section located at the end of the EIA document.

The information obtained from the various data sources was used to prepare a description of environmental baseline conditions (existing environment) within the study area. Local community members were consulted both in meetings and through individual interviews in regard to community use of the land and resources within the

study area, and other TEK such as the location of historic burial grounds and traditional campsites, traditional harvesting areas, and wildlife concentration areas.

8.3 Factors Considered in the Environmental Effects Analysis

The environmental effects analysis was conducted on the basis of potential effects to VECs. VECs are those aspects or elements of the existing environment that are considered valuable and important to protect against the potential effects of the Project.

The Canadian Environmental Assessment Agency defines VECs as:

"*The environmental element of an ecosystem that is identified as having scientific, social, cultural, economic, historical, archaeological or aesthetic importance. The value of an ecosystem component may be determined on the basis of cultural ideals or scientific concern. Valued ecosystem components that have the potential to interact with project components should be included in the assessment of environmental effects.*" (Canadian Environmental Assessment Agency, Glossary of Terms. *http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=B7CA7139-&offset=1&toc=show.)*

VECs were used to focus the assessment on important elements of the physical, biological socio-economic and cultural environments that have the potential to be affected by the Project, or conversely might exert an effect on the Project. The VECs assessed in the environmental effects analysis for this Project were defined by the multi-disciplinary project team undertaking the assessment based on:

- Identified regulatory requirements;
- Consultation with regulatory authorities;
- Information derived from published and unpublished date sources;
- Information and comment received during the engagement of local communities;
- Traditional Knowledge surveys conducted within aboriginal communities in the study area– defining features of cultural importance and significance; and,
- Biophysical field surveys.

VECs examined in the environmental effects analysis of the physical environment are

listed in Table 8-1. VECs examined in the environmental effects analysis of the biological environment are listed in Table 8-2.

Table 8 - 1: Physical Environment VECs

Physical Environment VECs
• Soils and Bedrock • Air quality • Surface water quantity and quality • Groundwater quantity and quality

Table 8 - 2: Biological Environment VECs

Terrestrial Biology VECs
• Rare and Endangered Species (Caribou) • Moose • Other Wildlife • Migratory Birds • Vegetation
Aquatic Biology VECs
• Fish Species and Habitat • Rare and Endangered Species

VECs examined in the environmental effects analysis of the socio-economic environment are listed in Table 8-3.

Table 8 - 3: Socio-economic Environment VECs

Socio-economic Environment VECs
Human Health and Well-Being • Community water supply • Community food supply • Medicinal plants • Human health related to air quality (noise and dust)
Local Economy • Tourism • Commercial trapping • Commercial fishing • Commercial forestry • Wild rice harvesting

VECs examined in the environmental effects analysis of the cultural environment are listed in Table 8-4.

The assessment of effects to both the socio-economic and cultural environments includes aboriginal traditional land uses and activities, features, and areas of cultural and spiritual importance identified through published sources and the TEK studies conducted in the study area communities for this Project. A discussion of potential effects specific to aboriginal traditional land use and culture is provided in Section 6.0 of this EIA.

Table 8 - 4: Cultural Environment VECs

Cultural Environment VECs
• Archaeological resources • Heritage features • Aboriginal Traditional Land Uses

8.4 Methodology for the Environmental Effects Analysis

The environmental effects analysis conducted for this Project considered how the Project could affect the environment and how the environment may in turn affect the Project.

CEAA, defines 'environmental effects' as:

> *(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
>
> (c) *any change to the project that may be caused by the environment; whether any such change or effect occurs within or outside Canada*
>
> Source: Canadian Environmental Assessment Act (section 2 (1) of the Act)

Accordingly, the effects listed under definition item (b) must result from a change to the physical environment identified pursuant to definition item (a).

Consistent with the Canadian Environmental Assessment Agency and Manitoba Conservation guidance and Transport Canada's *Environmental Assessment Screening Report Template*, the environmental effects assessment was conducted in three steps:

- Establishment of the scope of the assessment;
- Analysis of the environmental effects of the Project prior to consideration of mitigation; and
- Analysis of the residual or "net" environmental effects of the Project following the consideration/application of mitigation.

The methodology applied in each of these steps and results of the analysis are provided in the following sections.

8.4.1 Scope of the Assessment

Table 8-5 presents the results of the scoping of the environmental effects assessment. The table shows the extent to which various Project components, during the construction and operations phases of the Project, could affect broad categories of the environment.

The assessment identifies: (1) the direct environmental effects on the physical and biological environment; and (2) the indirect effects on the socio-economic and cultural environments.

In accordance with federal and provincial regulatory guidelines, only those effects resulting from a project activity on the physical or biological environment must be considered in the assessment of socio-economic and cultural effects.

Table 8 - 5: Potential Project Environment Interaction Matrix

PROJECT PHASES / COMPONENTS	ENVIRONMENTAL COMPONENTS																														
	DIRECT ENVIRONMENTAL EFFECT																				INDIRECT ENV. EFFECTS[1]							OTHER	
	Land					Water					Air			Natural Systems								Socio-Economic				Cultural				
	Bedrock	Soils	Swampy Areas, Muskeg, & Peatlands			Surface Water Quality	Surface Water Quantity	Groundwater Quality	Groundwater Quantity	Other	Air Quality	Climate Change	Other	Forest Vegetation	Wetlands	Species at Risk	Migratory Birds	Wildlife / Wildlife Habitat	Fish and Fish Habitat	Other	Human Health / Safety	Navigation Related	Land Use	Other	Cultural heritage	Aboriginal Use [2]	Historical / Archaeological [3]	Noise	Waste
CONSTRUCTION PHASE																													
Mobilization:												X																	
• Equipment and Supplies																				X		X							
• Set-up, functional Staging Areas, Laydown Areas		X																				X		X		X		X	
• Temporary Camps (potable water, power, sewage, waste)		X				X	X	X	X									X	X		X					X	X		X
• Temporary Fuel Delivery and Storage		X				X		X													X								
• Winter Road Access																					X								
Construction:												X																	
• Surveying - Geotechnical investigations		X	X			X								X					X		X		X				X		
• ROW Clearing		X	X								X			X	X	X	X	X	X		X		X		X	X	X	X	
• Brush & Timber Disposal			X											X				X			X		X					X	X
• Grubbing		X				X	X				X			X				X	X		X						X	X	
• Quarrying (rock)/Crushing	X	X				X	X				X			X				X			X		X					X	
• Blasting	X	X				X	X				X				X			X			X			X	X			X	
• Borrow pits (sand & granular materials)		X				X	X				X							X			X		X					X	
• Grading and Fill Placement	X	X	X			X	X				X				X			X	X		X							X	
• Road Bed Excavation & Ditching	X	X	X			X	X				X				X			X			X							X	
• Construction Equipment Maintenance		X				X															X								X
• Petroleum, Oils, and Lubricants (POL)- Transport, Storage Depots, & Handling		X					X	X							X						X								
• Bridge & Culvert Replacement(s)		X	X			X	X							X	X		X	X	X		X	X				X	X	X	X
• Culvert Installations		X	X			X	X							X	X			X	X		X	X				X	X	X	
• Slope works (cuts & fills)	X	X	X			X	X							X	X						X							X	

PROJECT PHASES / COMPONENTS	ENVIRONMENTAL COMPONENTS																													
	DIRECT ENVIRONMENTAL EFFECT																				INDIRECT ENV. EFFECTS[1]							OTHER	
	Land					Water					Air			Natural Systems							Socio-Economic				Cultural				
	Bedrock	Soils	Swampy Areas, Muskeg, & Peatlands			Surface Water Quality	Surface Water Quantity	Groundwater Quality	Groundwater Quantity	Other	Air Quality	Climate Change	Other	Forest Vegetation	Wetlands	Species at Risk	Migratory Birds	Wildlife / Wildlife Habitat	Fish and Fish Habitat	Other	Human Health / Safety	Navigation Related	Land Use	Other	Cultural heritage	Aboriginal Use [2]	Historical / Archaeological [3]		Noise	Waste
• Watercourse Crossings (temporary)		X	X			X	X									X			X		X	X								
• New Bridge Crossings (abutments & approaches)	X	X	X			X	X		X					X	X	X	X	X	X		X	X			X	X	X	X		
• Foundation Works (piers & abutments)	X	X				X	X		X					X					X		X							X		
• In-stream works (dredging, coffer dams, diversions)		X				X	X									X			X		X	X								
• Erosion and Sediment Control	X	X				X	X												X		X									
• Construction Site Restoration/Rehabilitation	X	X	X			X	X							X	X			X	X		X						X			
• Accidents & Malfunctions	X	X	X			X		X			X										X									
Operations																														
• Road Usage											X	X									X					X		X		
General Maintenance																														
• Quarrying (rock)/Crushing	X	X				X	X				X					X		X			X					X	X	X		
• Borrow pits (sand & granular materials)		X				X	X				X							X			X					X	X	X		
• Normal Road Supervision (Road Patrols, traveler assistance))																					X									
• Normal Road Maintenance (grading, erosion control, etc)		X	X			X	X					X																		
Seasonal Maintenance																														
• Snow Clearing and Ice Control						X						X							X		X									
• Bridge Maintenance		X				X					X	X				X			X		X								X	X
• Culvert Maintenance		X	X			X	X					X				X			X		X									X
Special Maintenance Activities																														
• Slope Failures	X	X				X	X												X		X									
• Culvert washouts		X	X			X	X									X			X		X									
• Road settlement/Break-up		X	X																		X									

PROJECT PHASES / COMPONENTS	ENVIRONMENTAL COMPONENTS																												
	DIRECT ENVIRONMENTAL EFFECT																			INDIRECT ENV. EFFECTS[1]							OTHER	
	Land					Water					Air			Natural Systems							Socio-Economic				Cultural				
	Bedrock	Soils	Swampy Areas, Muskeg, & Peatlands			Surface Water Quality	Surface Water Quantity	Groundwater Quality	Groundwater Quantity	Other	Air Quality	Climate Change	Other	Forest Vegetation	Wetlands	Species at Risk	Migratory Birds	Wildlife / Wildlife Habitat	Fish and Fish Habitat	Other	Human Health / Safety	Navigation Related	Land Use	Other	Cultural heritage	Aboriginal Use [2]	Historical / Archaeological [3]	Noise	Waste
• Third Party Damage (due to accidents, etc)	X	X				X								X	X						X								
Accidents and Malfunctions (Construction, Operations and Maintenance)																													
• Vehicular collisions – wildlife, people						X									X			X	X		X					X			X
• Material/Product Spills		X				X								X	X			X	X		X					X			X
• Fires				X																	X				X	X			
• Explosions											X										X					X		X	
Decommissioning/Demobilization (Ancillary Facilities)												X																	
• Borrow Sources/Quarries	X	X				X	X							X				X	X		X		X			X	X		
• Temporary Camps/Staging Areas		X				X	X							X				X	X		X		X			X			

Footnotes:
1. Only indirect environmental effects resulting from a project effect on the environment must be considered in the EA.
2. The current use of lands and resources for traditional purposes by aboriginal persons.
3. Include any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

8.4.2 Environmental Effects and Mitigation Measures

The effect of undertaking the Project activities listed in Table 8.5 on the VECs described in Section 8.3, was undertaken as a multidisciplinary analysis by teams of specialists with knowledge and experience in their respective discipline.

The effects analysis was conducted using the categories of VECs described in Section 8.3, and those applied in determining the scope of the assessment as summarized on Table 8.5:

- Physical environment;
- Biological environment (aquatic and terrestrial);
- Socio-economic environment; and
- Cultural environment.

The physical environment analysis of the proposed route alignment focused on:

- The effects of the road design on the need for cut and fill on soils and bedrock;
- The effects of construction and operation on surface water supply and water quality;
- The effects of construction and operation on ground water supply and water quality; and
- The effects of construction and operation on air quality (noise and dust).

The aquatic biology analysis focused on the evaluation of the fisheries habitats and fisheries resources with respect to:

- Effects from the construction of watercourse crossings;
- Effects from other road construction activities;
- Effects from the operation of the all-season road;
- Effects to SARA (species at risk) fish species.

The terrestrial biology analysis focused on the effect of construction and road operations activities on:

- Effects to high value habitats and populations, features or attributes (flora and fauna);
- Effects to migration or movement of caribou and other animals; and
- Effects to SARA species (flora and fauna).

The socio-economic analysis addressed issues pertaining to the indirect environmental effects of physical effects on the human environment, including aboriginal traditional uses of land, human health and well-being and the local economy.

The cultural environment analysis focused on the potential for the project to affect known or high potential archaeological or heritage resources, primarily traditional areas of cultural or spiritual significance.

Mitigation Measures

Mitigation measures are Project design elements, controls and preventative measures that are implemented to eliminate or reduce the significance of a potential effect to a valued ecosystem component. These are typically:

- Project design elements that add to, or alter the design of a particular component of the Project to reduce the potential severity of an effect, such as drainage ditches along the roadside to capture and control surface water runoff, thereby reducing the severity of water quality effects to watercourses resulting from erosion and the deposition of sediment, both during the construction and operations phases of the Project.
- Project controls that can be implemented to ensure that Project construction or operations are implemented in an environmentally acceptable manner, such as restricting the re-fuelling of construction equipment to designated re-fuelling areas which are established to prevent the contamination of water and soils by providing low permeability barriers, double-walled fuel storage containers, and management controls to ensure that any accidental spills are contained and cleaned up, thereby minimizing the potential severity of contamination to soils resulting from construction activities.
- Preventative measures that can be implemented to avoid the occurrence of an effect, and/or reduce the frequency that an effect will occur, such as constructing watercourse crossing structures in the winter season to prevent or reduce the potential for effects to fish habitat, thereby reducing the potential severity of the effect of Project construction to the local fishery.

The mitigation measures applied in the assessment of effects of the PR 304 to Berens River All-Season Road Project are considered to be reasonably available, have been previously applied on other Projects (i.e., are not experimental), are straight-forward to implement, are cost-effective, and are generally within the control of those responsible for construction and operations/maintenance of the Project. Where changes to land use designations provide mitigative measures (i.e. changes to Atikaki Park boundary), the provincial Crown will be responsible.

Project-specific Best Management Practices will be further developed during detailed design. The list of BMPs that are included in Appendix 7.2 include:

- Riprap armouring;
- Gabions;
- Stabilized work site entrance;
- Rolled erosion control products (RECP);
- Slope texturing/Grading;
- Synthetic Permeable Barrier;
- Straw Bale Barrier;
- Earth Dyke Barrier;
- Brush or rock berm;
- Check dam;
- Temporary stream diversions;
- Energy dissipators;
- Cellular confinement systems;
- Slope drains (temporary pipes);
- Off-take ditch (intercept ditch);
- Plants trees and shrubs;
- Fibber rolls and wattles;
- Silt fence;
- Continuous berm;
- Sediment traps and basins;
- Storm drain inlet sediment barrier;
- Turbidity curtains;
- Pumped silt control systems;
- Cofferdam;
- Seeding;
- Mulching;
- Hydroseeding;
- Soil tackifiers (chemical stabilization);
- Riparian zone vegetation;
- Gravel blankets; and
- Scheduling.

General environmental protection guidelines are included in Appendix 7.1 and these guidelines will be used to minimize any potential negative effects on the physical, terrestrial and aquatic environments during construction of PR 304 to Berens River. These guidelines also ensure that employees and contractors are aware of their responsibilities in the protection of the environment during work on the Project.

8.4.3 Environmental Effects Analysis - Significance Determination

The environmental effects analysis and resulting determination of the significance of environmental effects to VECs, was conducted in three steps:

- Identification of potential interaction between project activities and the environment;
- Assessment of the potential effects of Project activities on the environment, prior to the consideration of mitigation measures; and
- Assessment of the residual changes to the environment caused by Project activities, after the consideration of mitigation measures, to demonstrate the significance of potential changes to the environment, and to demonstrate the expected effectiveness of the mitigation measures considered. Effects were assessed considering Project activities undertaken during both the construction and operations phases of the Project.

The results of these analyses are contained in a series of matrices. Further explanation of the methodology conducted in each step of the effects assessment is provided in the following paragraphs.

Analysis of Environmental Effects Before Consideration of Mitigation

The assessment of effects to VECs without consideration of mitigation was conducted using a series of "effects analysis criteria" provided by the Transport Canada Environmental Assessment Screening Report Template, considering potential environmental effects during each project phase, as follows:

- ***Potential environmental effect –*** *a description of the potential change to the environment that could result from the Project activity being assessed.*
- ***Project Phase –*** *a description of the Project phase during which the Project activity being assessed, is to be conducted (i.e., construction phase or operations/maintenance phase).*

The effects analysis criteria were used to demonstrate the extent or severity of the potential change to the environment resulting from the Project activity being assessed prior to the consideration of mitigation measures. The effects analysis criteria provide a basis upon which to consider significance of the effect. A description of the levels used to assess the severity of potential effects in relation to each criteria, is provided in Table

8-6. The effects analysis criteria applied in the effects assessment of the Project (prior to consideration of mitigation), included:

- ***Ecological Context –*** *the extent to which a Project activity is expected to affect the biological or physical environment.*
- ***Geographic Extent –*** *the distance which the effect is expected to extend from the footprint of the Project activity and/or the areal extent of the effect.*
- ***Magnitude*** *– the expected strength of the adversity of the effect.*
- ***Duration –*** *the expected temporal nature of the effect (i.e., how long it will last over time).*
- ***Frequency*** *– how often the effect expected to occur over the life of the Project (i.e. is it a one-time event, or does the event repeat)*
- ***Permanence –*** *the extent to which the effect is expected to permanently change the environment, or whether the environmental change that occurred can be reversed.*
- ***Likelihood*** *– the effects assessment conducted for the Project included an indication of the certainty of the effect occuring.*

Table 8 - 6: Effect Analysis Criteria Definitions

Criterion	Low	Moderate	High
Magnitude (of the effect)	• Effect is evident only at or nominally above baseline conditions.	• Effect exceeds baseline conditions however is less than regulatory criteria or published guideline values.	• Effect exceeds regulatory criteria or published guideline values.
Geographic Extent (of the effect)	• Effect is limited to the project site/footprint.	• Effect extends into areas beyond the project site/footprint boundary.	• Effect is trans-boundary in nature.
Duration (of the effect)	• Effect is evident only during the construction phase of the project.	• Effect is evident during construction and/or the operational phase of the project.	• Effects will be evident beyond the operational life of the project.
Frequency (of conditions causing the effect)	• Conditions or phenomena causing the effect occur infrequently (i.e. < once per year).	• Conditions or phenomena causing the effect occur at regular intervals although infrequent intervals (i.e. < once per month).	• Conditions or phenomena causing the effect occur at regular and frequent intervals (i.e. > once per month).
Permanence (of effect)	• Effect is readily reversible over a short period of time (i.e. one growing season).	• Effect is not readily reversible during the life of the project.	• Effect is permanent.
Ecological Context (of effect)	• Evidence of environmental effects by human activities. Effect results in minimal disruption of ecological functions and relationships in the effected area.	• Relatively pristine area. Effect results in some disruption of non-critical ecological functions and relationship in the effected area.	• Pristine area / not affected by human activity. Effect results in disruption of critical ecological functions and relationship in the effected area.
Likelihood	• Not likely to occur; chance of effect occuring is unlikely	• Effect could occur, but not equally throughout the Project footprint	• Effect will occur

The level of severity of each effect, for each of the criteria, was categorized into the three levels described in Table 8-6.

Considering the combined levels of severity of a Project activity on a VEC as measured using the criteria described above, a "*severity of effect (without mitigation)*" rating was applied for each of the effects considered. This rating represents an estimate of the overall expected severity of the effect that a project activity could have on the environment, prior to the application of mitigation measures.

Analysis of Environmental Effects with Consideration of Mitigation

Following the determination of the severity of the effect without the consideration of mitigation measures, an assessment of the change that would occur to that severity rating was assessed with the consideration of mitigation measures that could be applied to reduce, minimize or eliminate an environmental effect. The result of this assessment was the "*Residual Effect*" rating. This is a rating of the severity or intensity of the change to the environment that is expected to be caused by a Project activity, after considering

mitigation. Based on the analysis of residual effects the level of significance is determined.

For this assessment, severity levels were categorized into two levels (significant, not significant and uncertain) and is based on the evaluation of residual effects:

Significant	The severity of the residual effect is expected to affect the functioning of the local or regional ecosystem or local community and/or any aspect of an identified VEC.
Not Significant	The severity of the residual effect is not expected to affect the functioning of the local or regional ecosystem or local community and/or any aspect of an identified VEC.
Uncertain	The severity of the residual effect cannot be determined for a given reason (i.e., insufficient data; insufficient knowledge of the Project activity, etc.).

A summary of the analysis of environmental effects with consideration of mitigation, and a summary the severity ratings with and without consideration of mitigation, is provided by Category in the sections that follow.

The requirement for monitoring or follow-up was identified as a component of the environmental effects analysis. Details of monitoring plans are provided in Section 10.0.

8.5 Environmental Effects on the Physical Environment

The analysis of environmental effects on the physical environment is summarized in Table 8-7.

Effects of the Project on the physical environment will depend upon the nature of construction activities in specific segments of the Project study area. The assessment of environmental effects in areas previously disturbed by an existing road or a power distribution line will generally result in environmental effects that have a more limited geographic extent than areas where the new all-season road will be established through areas that have not been previously disturbed.

For example, staging construction activities from an existing bridge structure will help to minimize the environmental effects of construction of the new bridge structure (e.g., abutments and foundations) through a reduced requirement to conduct in-stream activities. This will minimize the effects to water quality and will limit the disturbance of surface and sub-surface soils beyond the construction footprint. Utilizing existing bridge structures to stage construction will also minimize the need for temporary road crossings. Where new bridge structures are constructed adjacent to existing bridges, removal of portions of the old bridge structures from the new bridge will also result in minimized disturbance to soils and water quality as equipment can be staged from the bridge.

8.5.1 Environmental Effects on Soils and Bedrock

The effects of construction activities on surface and subsurface soils and bedrock will generally be limited to areas that are physically disturbed (ie. lands within the ROW, construction access roads, construction staging areas, and crushed rock supply facilities such as quarries and rock crushers).

Direct physical disturbance to soils within the ROW of the Project plus temporary construction access roads will generally be limited to the removal of soils (areas where soil removal is required to achieve desired grade/elevation), surface grading of soils directly within the construction footprint, and the placement of non-native materials in places where soils are not suitable for road construction. Soil and rock materials will also be removed from within identified quarry and borrow pit locations. Soil terrain units are not likely to be disturbed in areas used for construction staging or rock crushing.

At this stage of Project development, the estimate of soil and rock volumes to be removed and placed within the ROW alignment, and the location of potential quarry sites, is provided at a preliminary level of detail. A more accurate identification of the specific road alignment and the location of all ancillary facilities (such as quarries and temporary access roads) will be defined in greater detail during the detailed design phase. At that time, a more accurate estimate will be provided of the quantity of soils and rock materials to be removed in some locations (cut) and to be placed or added in other areas (fill).

In addition to the direct effects to soils, alteration to terrain units can result in other indirect effects such as alteration of drainage patterns, safety concerns with respect to rock falling from unstable blast slopes, noise and dust from blasting and grading, vibration effects, etc.

The choice of the proposed road alignment has minimized the effect of the Project footprint on the physical environment by reducing the need for cut and fill (at a preliminary level of detail). This has meant a reduction in cut and fill, and a corresponding reduction in blasting and quarrying. Refinements to further reduce these requirements will be undertaken during the detailed design stage.

The road will be constructed and maintained relying on Environmental Protection Guidelines and Best Management Practices (BMPs) developed for the Project as discussed in Section 10.0, and outlined in Appendix 7.1 and 7.2, respectively.

Environmental effects to surface and subsurface soils are expected to result in minor adverse effects, primarily removal, that can be mitigated to levels which are not considered significant through the application of standard construction procedures and best management practices such as riprap armouring, stabilized work site entrance, slope texturing/grading, seeding, mulching, hydroseeding, topsoiling and planting trees and shrubs. Effects on soils affected by activities to develop quarries and road foundation through muskeg/peatland/swamp areas will be monitored during construction and as part of the on-going road maintenance monitoring program and facilities. In addition, construction stage facilities and access roads will be closed and rehabilitated once construction activities have been completed. The overall significance of environmental effects to soils and bedrock is considered to be not significant.

8.5.2 Environmental Effects on Air Quality

As shown on Table 8-7, the Project will generate noise and dust from activities occurring within the road alignment and at quarry locations. During construction these effects will result from blasting, fill placement and grading, and potential dust generation (fugitive emissions) from stockpiled materials. It is not expected that the effects from quarries and construction along the main alignment will reach settlement areas/communities due to the distance. Most quarry locations are within 100 – 500 m of the road alignment with the exception of the Pigeon River quarry which is 2.5 km from the road alignment. However, some dust and equipment noise may be experienced in the communities from the construction and operation of construction access roads. These effects will be short-term in nature (construction period), and are expected to have limited geographic extent. These effects will be reversed by closure and rehabilitation of the access roads once the all-season road is constructed. During the construction period, some of these effects, especially noise and dust emitted from vehicle movements, can be mitigated through the application of water and chemical dust suppressants on the road. Dust and noise from excavation where it occurs in close proximity to a community or settlement area can also be reduced by restricting working hours to the daytime period. The construction period in areas close enough to affect communities, will be brief.

Environmental effects on air quality from dust and noise as a result of construction of the road will largely be localized to the immediate working areas around the construction activities, and will be short-term in nature. Overall, with the application of mitigation measures, the overall significance of effects to air quality is expected to be not significant.

The following provides a preliminary modeling estimate of gas emissions for a 24 hour period compiled for the projected 10 year Average Annual Daily Traffic (AADT) Volumes for the PR 304 to Berens River Road, based on a peak hour of 15% of AADT and 8% Heavy Vehicles.

Table 8 - 7: Preliminary Emissions Modeling Air Emissions PR 304 to Berens River ASR

Direction	Northbound	Southbound	Total
Average Speed (km/hr)	67	66	67
Total time travel (hr)	1	1	1
Distance Traveled	74	69	133
Fuel Consumed (l)	7	6	13
Fuel economy (km/l)	10.3	10.0	10.2
CO Emissions (kg)	0.13	0.11	0.24
NOx Emissions (kg)	0.03	0.03	0.05
VOC Emissions (kg)	0.03	0.03	0.06
Performance Index	0.1	0.1	0.2

Table 8 - 8: Measures Of Effectiveness (MOE) For Emissions Modeling Based On 10 Year AADT

MOE	Northbound	Southbound	All
Fuel Consumed (l)	46.7	40	86.7
Fuel economy (km/l)	68.7	66.7	68.0
CO Emissions (kg)	0.87	0.73	1.60
NOx Emissions (kg)	0.2	0.13	0.33
VOC Emissions (kg)	0.20	0.22	0.40

The preliminary estimate of total emissions greenhouse gas emissions for a 10 year operational period is estimated to be:

- CO Emissions 5.8 tonnes
- NOX Emissions 1.2 tonnes
- VOC Emissions 1.5 tonnes

8.5.3 Environmental Effects on Ground and Surface Water

Suspended Sediments

Despite the implementation of erosion and sediment control measures and stream isolation techniques, there is the potential for some sediment loading to watercourses during construction, especially at watercourse crossing locations along the alignment in certain weather conditions. However, it would likely be a localized event and there would likely not be any measurable increase in suspended sediment concentrations due to erosion, both during construction and operation.

As described in detail in Appendix 3.1 the majority of watercourses along the alignment are low-gradient channels (typically ponded by beavers) with dense vegetation in the channel and/or on the banks. In these watercourses, suspended sediments will tend to settle out in close proximity to the source, creating a short-term, localized effect.

In the larger rivers along the ASR alignment, sediments are expected to be carried farther downstream due to higher water velocities. However, the potential for an increase in measureable suspended sediment concentrations is expected to be low due to the dilution provided by the higher flows and the rock substrate at the crossing sites.

In both types of habitats (low-gradient streams and larger rivers), the effect of increased suspended sediment concentrations will be low. As the duration and frequency are expected to be low, it is anticipated that aquatic organisms will react primarily by moving from areas of higher sediment loading and temporarily relocating until concentrations return to background levels. Most species can withstand temporary increases in sediment loading that often occur due to localized erosion during flood conditions.

The potential for effects to domestic water supplies is also considered to be minimal, as only the Bloodvein and Berens Rivers provide domestic water supply, and potential Project-related elevations in suspended sediment concentrations in these rivers would be below the level of any adverse effect, particularly at the water intake locations, well downstream of the ASR crossings.

Contamination from Spills of Hazardous Substances

There is potential for water quality contamination from the spill of hazardous substances, such as fuel and oil, in any project involving the use of heavy equipment in close proximity to surface or ground water. The significance of potential effects will vary with the type of project, equipment and operational procedures for re-fuelling, etc.

For the ASR Project, with implementation of the Best Management Practices to prevent and manage/control/contain spills, the likelihood of an uncontained spill into or adjacent to a watercourse or aquifer is considered minimal. As a result, the potential for contamination of ground or surface water is also considered to be minimal.

Overall, environmental effects on surface water quality associated with the construction of the road will generally result from uncontrolled erosion and sediment release into local watercourses and the potential for contamination due to spills of hazardous materials such as fuel and oil.

It is expected that the effects will be localized to the immediate working areas of the construction activities, and are expected to be short-term in nature. The proposed road Project is sufficiently removed from the local NAC and First Nations communities that there should be no effect on either surface or ground water supplies (either quantity or quality). The effects caused by erosion and sediment can be effectively mitigated by adhering to Environmental Protection Guidelines and following Best Management Practices to be developed for the Project Erosion and Sediment Control Plan, during detailed design. The Best Management Practices are listed in Section 8.5.1. The effects from spills can largely be prevented through the adoption of BMPs for fuel and hazardous material handling, and by the Project Emergency Response Plan, also to be finalized during detailed design.

Environmental inspection and monitoring of surface and ground water will be required during construction and operation to ensure that mitigation is effective. Overall residual effect is considered low and overall significance is rated as not significant.

8.6 Environmental Effects on the Aquatic Biology Environment

The PR 304 to Berens River ASR alignment will cross a variety of aquatic habitat types, from headwater fens and beaver ponds to large rivers with rapids and rock substrate. A total of 84 watercourse crossings were assessed along the alignment, using the assessment methods and evaluation criteria described in Sections 2.0 and 4.1 of Appendix 3.1 of this EIA. Eighteen (18) of the 84 watercourses along the alignment were determined to provide no fish habitat; 45 watercourses were assessed to be marginal habitat and 21 watercourses were assigned fish habitat values of important. No critical habitats were identified in the course of the study.

Many of the habitats assessed were fens and beaver ponds in the headwaters of small drainages, and had little habitat value or diversity within or among them. Detailed, individual assessments, complete with field data, aerial and ground-level photographs and assessment rationale, are provided in Appendix 3.1 for all watercourses with drainage areas larger than 4 km^2 and all important habitats.

The analysis of effects to the aquatic biology environment was undertaken using the valued ecosystem components discussed in Section 8.3. Table 8-8 summarizes the results of the analysis of potential effects as a result of construction and operation of the Project prior to mitigation, and the analysis of the significance of residual effects following consideration of mitigation.

The following discussion summarizes the potential for environmental effects on the aquatic biology environment that could be expected to occur as a result of construction and operation of the ASR.

8.6.1 Environmental Effects on Fisheries and Fish Habitat

Habitat Sedimentation

Sediment loading into surface waters can potentially result from erosion during construction (prior to the reclamation of disturbed sites), from the erosion of streambeds or banks due to hydraulic alteration of flows at or near new crossing sites; and from on-going run-off and soil erosion during operations.

The majority of watercourses along the alignment are low-gradient channels (often ponded by beaver dams) with fine, organic substrate and heavily-vegetated borders. Moderate sediment loading to these streams would have a short-term and very small effect on the local aquatic habitat and biological community, as sediments would not be transported far downstream, and deposition of a moderate amount of fine sediment onto the existing fine substrate would have little effect on habitat function. At the crossings of the larger rivers such as the Bloodvein, Pigeon and Berens, the bedrock banks will not be susceptible to extensive erosion, and implementation of BMPs (Appendix 7.1 and 7.2 for guidelines and BMPs) will prevent the release of sediments at sufficient loads to effect downstream habitats.

Erosion control measures for the Project are implemented from the earliest stages of planning, including selection of a corridor which minimizes the potential for erosion, refinement of the corridor during design to ensure watercourse crossings are located at optimal locations to minimize erosion (including buffers and setbacks), during highway and watercourse crossing structure design to ensure that control measures are incorporated such as run-off and stormwater management control facilities (e.g., collection/conveyance ditches and stormwater collection ponds); through construction with the implementation of erosion controls such as proper isolation of in-stream working areas, surface treatments such as silt geotextile fabrics, sediment barriers such as silt fences and turbidity curtains, energy dissipation at pump and culvert outlets; re-vegetation, etc.; and on a continuous basis during operations and maintenance (eg., ensuring routine culvert and stormwater pond clean-out; re-vegetation of exposed soils/slopes, etc.).

Detailed design of the watercourse crossings will include hydraulic modeling to prevent the alteration of stream flows that could result in long-term channel erosion during the operations phase of the Project.

Because of the potential magnitude, duration and geographic extent of erosion and sedimentation, it is estimated that the potential effect would be moderate in severity. However, given the availability, proven effectiveness and reliability of mitigation measures, the residual effect following mitigation is considered to be low, with an overall significance of not significant. Ongoing monitoring during and following construction will provide for adaptive management measures should they be required.

Loss of Fish Habitat

In some cases, in-stream construction can result in a decrease in the productive habitat available to local fish stocks, including stocks supporting local fisheries and/or populations of rare species. This habitat loss can include roadbed construction on

floodplain habitat, replacement of natural streambed habitat with culverts or bridge piers, or disturbance of streambed or banks at temporary crossings or construction areas.

Under the terms of the federal *Fisheries Act*, the net loss of fish habitat (temporary or permanent) is prohibited if it is deemed by the Department of Fisheries and Oceans (DFO) to be harmful to a fishery. Where unavoidable loss of fish habitat is to result from a project, provisions exist to compensate for those losses through remediation or enhancement of habitat in other locations, under a No Net Loss guiding principle.

There is potential for Harmful Alteration, Disruption or Destruction (HADD) of fish habitat at approximately 21 watercourse crossings along the ASR alignment (see Table 3-4 in Section 3). At several of these crossings, clear-span bridges will be installed to prevent effects to fish habitat. As a condition of regulatory permitting, a fish habitat compensation plan will be implemented to offset the HADD of fish habitat that will occur at those crossings at which in-stream construction is required.

Opportunities for compensation have been identified at a preliminary level. Within the Berens River community, road crossings adjacent to the Berens River have been identified (UMA Engineering Ltd. 2006). Pending confirmation of authority/responsibility for these roads, upgrade of these crossings may provide opportunity for fish habitat enhancement as compensation for HADD. There are also off-site compensation options available including:

- Rehabilitation of winter road crossings at select sites on the east side of Lake Winnipeg.
- In the Fisher River, which flows into the west side of the north basin of Lake Winnipeg immediately across from the ASR alignment, several low-level crossings have been constructed with culverts that are hydraulically insufficient for the flows in the river.
- Studies conducted for the East Interlake Conservation District have identified approximately 122 sites of in-stream and riparian habitat degradation that may provide opportunities for fish habitat enhancement and rehabilitation.
- In a study conducted for the Manitoba Floodway Authority, 497 sites for potential habitat compensation were identified in the Red River watershed.

During the detailed design phase, these opportunities will be developed further and other opportunities will be identified for implementation in consultation with local communities, Manitoba Conservation, the Department of Fisheries and Oceans, and other parties/agencies with interest (see Sections 9.3.2 for additional details). Detailed habitat compensation plans will be developed for implementation.

Based on the assessment of the potential for the loss of fish habitat resulting primarily from construction of the ASR, it is considered that there is a moderate potential for loss of fish habitat prior to consideration of mitigation. It has also been estimated, due to the expected success of mitigation measures during alignment refinement to avoid direct effects on important habitat, together with the opportunity for developing high quality fish habitat through compensation plans, that the residual effect of the ASR on the loss of

fish habitat is considered to be low. Overall significance of this effect is considered to be not significant.

Blockage of Fish Passage/Migration

Structures installed at watercourse crossings, particularly culverts, have the potential to create barriers to fish passage by constricting stream flows and a corresponding increase in water velocities that exceed the swimming capabilities of some fish species. Velocity criteria have been developed by DFO to ensure that watercourse crossings downstream of fish habitat allow upstream fish movements at critical times (e.g., during periods of spawning/migration). These criteria will be adhered to in the design of all watercourse crossings along the ASR alignment to prevent effects to fish movements. The potential effect of ASR construction and operation on fish passage is considered to be low as the frequency is expected to be low and effects will tend not to be permanent. Mitigation including design features of watercourse crossings to meet DFO standards, and routine maintenance of culverts, is expected to result in a low residual effect and overall significance that is not significant.

Reduced Fish Populations

Establishment of the ASR will provide access to fishing areas that are not currently easily accessible. The increase in access will likely result in some increase in fish harvest through recreational and domestic fishing. However, access beyond the area of most watercourse crossings will be fairly limited, due to rapids that will hinder navigation by boat. As an increase in harvest within these short reaches of the rivers will likely be within the sustainable capacity of the overall river habitat, the effects on local fish populations is expected to be small. In the event that routine fisheries monitoring by the Province of Manitoba indicates effects to the local fish stocks, management options are available to control fishing in the form of license restrictions and fishing. Other measures that can be applied to reduce the potential for uncontrolled fishing at the alignment watercourse crossings include:

- Destroy and rehabilitate construction access roads and winter road access points following completion of construction;
- Prohibit construction crews from uncontrolled (unlicensed) fishing and actions that will disturb the fishery; and
- Restrict access to major watercourse crossings along the alignment (avoid convenient areas for parking within close proximity; slope treatment such as gabion or concrete slope protection and fencing to deter access to the water's edge).

The destruction of fish by means other than fishing is prohibited under s. 32 of the federal *Fisheries Act*. There are a number of guidelines that have been established by the Department of Fisheries and Oceans to prevent the destruction of fish through construction-related activities such as blasting, beaver-dam removal, and temporary stream diversion.

The construction of the ASR will be implemented in strict accordance with these guidelines, resulting in very low potential for the destruction of fish. In particular, fish salvage will be conducted during in-stream work area isolation operations if required, and the destruction of larval fish will be prevented by avoiding construction at the location of sensitive habitats, and reducing the potential for effects by conducting construction activities in the appropriate season by observing DFO Timing Windows.

It is estimated there is a low potential to reduce fish populations as a result of increased fishing and destruction as a result of blasting, beaver dam removal, culvert clean-out, etc. The effect of fishing on the overall population within the study area is considered sustainable. The frequency of fish destruction from other sources is expected to be low, due to low frequency, high degree of reversibility and DFO standards that ensure protection and compliance. The residual effect of the Project on fish populations is expected to be low, with an expected overall significance rating of not significant.

Rare and Endangered Species

Currently, no fish species identified within study area watercourses are listed under the Manitoba *Endangered Species Act* (Manitoba Conservation, 2009b). However, of the following five species are listed under COSEWIC of which two are listed under the federal *Species at Risk Act*.

SARA Listed Species

- Silver chub (*Macrhybopsis storeriana*). The silver chub is listed as a species of Special Concern on Schedule 1 of the federal Species At Risk Act (SARA). It generally inhabits slow to moderate-flowing rivers, is common in the Red and lower Assiniboine rivers, and has been collected from various locations in the south basin of Lake Winnipeg. Its Manitoba population appears secure, and no local recovery strategy exists for the species.
- Lake sturgeon (*Acipenser fulvescens*). The Red-Assiniboine rivers – Lake Winnipeg population of lake sturgeon has been designated as Endangered by COSEWIC, but it has not been listed under SARA. Lake sturgeon utilize fast, turbulent waters in medium to large rivers for spawning, and are known to inhabit the large rivers on the east side of Lake Winnipeg.

COSEWIC Listed Species

- Shortjaw cisco (*Coregonus zenithicus*). The shortjaw cisco has been designated as Threatened by the Committee on the Status of Endangered Wildlife In Canada (COSEWIC), and is listed as Threatened on Schedule 2 of SARA. The shortjaw cisco inhabits deepwater lake habitats, and individual populations are known to spawn in early spring or late fall, possibly ascending large rivers during this period (Stewart and Watkinson 2004).No local action plan exists for the recovery strategy for this species.

- Chestnut lamprey (*Ichthyomyzon castaneus*). The chestnut lamprey has been designated as a species of Special concern by COSEWIC, but it is not listed under SARA. The species occurs in low densities in the Lake Winnipeg watershed. Chestnut lamprey spawn in clean, sand-gravel substrate in small streams and develop in a filter-feeding larval stage for several years in these habitats before becoming the adult stage that is parasitic on a variety of host fish species. The streams on the east side of Lake Winnipeg in the vicinity of the ASR alignment are unlikely to provide spawning or rearing habitat for chestnut lamprey, due to a lack of sand and gravel substrate.
- Bigmouth buffalo *(Ictiobus cyprinellus*). The bigmouth buffalo has been designated as a species of Special Concern by COSEWIC, but is not listed under SARA. Its preferred habitats are large, turbid, slow-moving rivers, and it is fairly common in the Red and lower Assiniboine rivers in Manitoba. A single specimen has been captured in the Icelandic River (on the west side of Lake Winnipeg) (Stewart and Watkinson 2004), suggesting its possible presence in the south basin of the lake. The clear (non-turbid, albeit tea-stained) tributaries that cross the ASR alignment and flow into the east side of Lake Winnipeg do not likely provide preferred habitat for this species. Therefore, the potential for its presence at the ASR crossing locations is low.

The presence of the maple leaf mussel (*Quadrula quadrula*) has been confirmed in the Bloodvein River (Government of Canada, 2009). This mussel inhabits medium to large rivers, and has been designated as Endangered by COSEWIC, but is not listed under *SARA*. Similarly, the Lake Winnipeg physa snail (*Physa* sp.) has been designated as endangered by COSEWIC, but it has not been listed for protection under *SARA*. No other shellfish species inhabiting the study area have been identified as being at risk by COSEWIC.

No protection measures specific to any of the species listed above are currently legislated, although each is protected through the general fish and habitat protection measures set out in *SARA* (where applicable) and the federal *Fisheries Act*.

The potential for construction and operations/maintenance activities to affect rare and endangered aquatic species is considered low; it is no more severe than the potential effect of the Project on other aquatic species, recognizing that the size of populations is much smaller for a species that is rare or endangered, so the effect of Project activities on the species will be more significant should it occur. As discussed in the paragraphs above, mitigation measures available to minimize, even eliminate the effect of the Project on fish, including rare and endangered species, are considered to be readily available and effective. Any effects of the Project are not considered to be threatening to any species over the life of the Project. As a result, the residual effect of Project activities on rare and endangered species is considered low, and the overall significance rating is considered to be not significant.

monitoring measures, the residual effects of blasting on caribou were determined to be low and thus not significant.

The effects of vehicular noise during operation on caribou populations was also determined to be low, primarily due to the location of the ASR relative to the high use caribou area well east of the Project site. The effect of operational noise was deemed to be not significant.

Hunting Pressures

The proposed Project has the potential to indirectly affect the caribou population as a result of hunting pressures. Licenses for the hunting of caribou are not issued by the Province on the east side of Lake Winnipeg. However, traditional use hunting and illegal hunting of the species has the potential to occur during both construction and operation. The ASR will provide increased access for hunting of all species, including caribou, within and directly adjacent to the cleared corridor and along construction access roads. While seasonal access is already provided by the existing winter road and the existing Rice River Road, the ASR will increase access to areas not previously accessible by road in the spring, summer and fall. Accessibility to areas off the cleared road corridor, during non-winter months, will be limited by the swampy terrain in the surrounding landscape. This type of terrain makes up approximately 60% of the landscape surrounding the Project area between Bloodvein to Berens River. In relation to existing baseline conditions, the potential effect of the ASR on the caribou population as a result of increased access for hunting, was estimated to be moderate to high during construction and high during operation. This ranking is attributed primarily to the status of the species and the duration of the potential effect (Table 8-9). Several mitigation measures are available to reduce the severity of the effect.

During construction, access to the ASR corridor and related facilities (including construction access roads) will be restricted to construction employees only. During this time, crews will not be permitted to hunt in proximity to the Project site.

Following completion of construction, access roads to quarry and work camp sites, and segments of the winter road not incorporated into the ASR, will be decommissioned and rehabilitated as soon as they are no longer required. Where necessary, physical barriers preventing vehicular access to these roads will be installed.

During operation, extension of the Chief Barker Reserve, up the new ASR alignment, as suggested during recent engagement with local communities will inhibit hunting activity along the ROW. Signage along the road will communicate the reserve and hunting restrictions. Caribou tracking is proposed for a four year period to assess the effectiveness of mitigation measures and to monitor for changes in caribou movement patterns and population (Appendix 3.2 Annex E). This monitoring will allow for adaptive management measures to be undertaken such as fencing and other access controls. With the application of mitigation measures the effect was estimated to be low to moderate, and limited to cleared and accessible areas of the ASR. Overall significance is considered to be not significant.

Vehicular Collisions

The proposed ASR may result in caribou mortalities as a result of collisions with motor vehicles. Collisions with construction vehicles are considered to be unlikely due to the low speed of travel of the heavy equipment, the high degree of activity in and around areas of active construction and their limited period of operation in any one area. Mortality of caribou from vehicle collisions during the operations and maintenance period is possible. It was estimated that potential effects to the caribou population as a result of vehicle collisions would be low due in part to the relatively low frequency of vehicle movement and limited geographic extent (Table 8-9). Woodland caribou are attracted to roadways primarily in winter to travel and as relief area for deep snow. However, the major winter area for caribou is a considerable distance to the east. This analysis is confirmed by the experience on the Rice River Road where it has been demonstrated that caribou do not approach or use this road in winter. Summer use of the area in the vicinity of the road by caribou is not high, but limited movement is anticipated across the north section of the Bloodvein to Berens River in the vicinity of Pigeon River. The proposed monitoring program (Appendix 3.2 Annex E) will confirm the adaptive measures that should be applied such as wildlife fences and other movement controls, road signage and posted speed limit in key areas. These measures have proven effective in other situations. Vehicles expected to use the road will also be encouraged to install noise whistles that will warn animals of on-coming traffic and provide an opportunity to the clear road prior to collision. Monitoring results of caribou movements and concentrations in the vicinity of the ASR will be used to implement the appropriate adaptive management measures. (e.g. road signage during operations). With the application of mitigation measures the effect of collisions on caribou populations was estimated to be low. Overall, the effect is considered to be not significant.

Predation

Roads can provide an access corridor for wolves which results in an increase in predation levels. Significant increases in predation that effect the caribou population are not anticipated during construction as wolf populations will be discouraged from accessing the ASR alignment as a result of the noise, dust and general activity levels. While wolves already use the winter road corridor for access to the area during the winter, the ASR, during operation, will provide a corridor for year round access, potentially raising the risk of predation during sensitive calving periods. However, the magnitude of the effect is expected to be offset by several factors including traffic movements which will discourage wolf use of the ASR corridor, closure of the winter road and access roads which will thereby eliminate an existing corridor, and the natural limits of movement created by the existing landscape. Wolf predation is anticipated to be primarily localized to the cleared ROW during the spring, summer and fall months as limited access to (unfrozen) swampy areas (fen, bog, muskeg and peat terrain conditions) outside the cleared ASR corridor will inhibit the geographic extent of wolf movement during non-winter months. Calving habitat has not been identified within or adjacent to this area. It is expected that predation levels will not significantly exceed those experienced by pre-Project conditions provided by the winter road. The increase in predation is anticipated to be low with the effect assigned a ranking of moderate (Table 8-9) relative to current conditions. In addition, wolf collaring and surveys are

proposed for a four year period to monitor movements and hunting patterns and to offer an opportunity to apply adaptive mitigation measures if required. The overall effects ranking is deemed to be low with the caribou and wolf monitoring programs and the significance was determined to be not significant.

8.7.2 Environmental Effects on Moose

Project construction and operation has the potential to negatively affect moose populations, a keystone species, primarily within areas in close proximity to the ASR and associated facilities (quarries, borrow pits, construction access roads). Moose are an important resource in the study area and are generally considered ubiquitous throughout the region. Construction activities (disturbance and habitat loss), operational activities (traffic disturbance and collisions) and indirect affects associated with improved hunting have the potential to effect the local moose populations or behaviours in the study area. Effects will remain unchanged for the Rice River Road portion of the project and the analysis pertains to the section of road north of the Rice River Road through to Bloodvein and Berens River.

Habitat Removal

As with caribou, the effect of the removal habitat as a result of the road is deemed to be low. While the ASR clearing will remove habitat that is suitable for moose, this habitat is widely available in the study area. The loss of habitat is limited in relation to the baseline condition by efforts to avoid fragmentation by aligning the ROW with the existing winter road ROW or hydro distribution line where possible. Where the new ROW is in previously undisturbed areas, the loss of habitat will be compensated in part by the decommissioned portions of the winter road ROW, especially as the old ROW re-vegetates with browse species. The net loss of moose habitat as a result of the project relative to available habitat is deemed not significant.

Construction Disturbance

As with caribou, construction of the proposed ASR and quarry blasting will result in increased noise and vibration, primarily within close proximity to the ASR ROW and associated facilities (quarries, borrow pits, construction access roads). Noise and vibration may alter the potential use of areas by moose at and adjacent to Project facilities during the time that construction activities are occurring in any particular road segment. However, once the disturbance has ceased, moose will return to the area shortly after construction activity cessation. The potential adverse effects of construction activities on moose were estimated to be moderate (Table 8-9). Measures to mitigate the potential effects on moose populations include suspension of quarry blasting and other construction activities during spring months (May-June) when calving occurs. With mitigation and monitoring measures, the residual effects of blasting on moose were determined to be low and thus not significant.

Hunting Pressures

The proposed ASR development has the potential to indirectly affect the moose population through hunting pressures in excess of current levels occurring in the local area. The effect has been ranked as high as a result of the experience with moose hunting along the Rice River Road. Licenses for the hunting of moose are issued by game hunting areas with additional harvesting by aboriginal hunters as a treaty and aboriginal right. Licensed hunting is not anticipated to affect overall population numbers as harvest numbers are adjusted annually in response to population numbers.

Hunting of moose has the potential to occur during both construction and operational periods. The ASR will provide increased moose hunting access within and directly adjacent to the cleared corridor and along construction access roads. While seasonal (winter) access is already provided by the existing winter road and the existing Rice River Road, the ASR will increase access to areas north of Bloodvein not previously accessible by road in the spring, summer and fall. In non-winter months accessibility to areas off the cleared road corridor will be limited by the swampy terrain in the surrounding landscape. Relative to existing baseline conditions, the potential effect of the ASR on the moose population as a result of increased access for hunting, was estimated to be moderate during construction and potentially high during the operational period (Table 8-9). Based on the TK surveys, it was noted that south of Bloodvein moose hunting is strongly correlated to roads while north of Bloodvein, moose hunting activity is strongly correlated to rivers and streams which are the accessible transportation routes (Section 6.4). It is anticipated that with the opening of the road, the traditional patterns of moose hunting may shift over time, with a greater propensity for local hunters to access hunting areas from the road as compared to the rivers and streams. Therefore it is not anticipated that the local harvest numbers will change, but the location of the harvest in the region may shift. However, the road also provides access to hunters from other communities who, prior to the road, would have been unlikely to hunt in the area. As with caribou, several mitigation measures are available to reduce the severity of the effect on the moose population. Restricting access during construction to the ASR corridor and related facilities (including construction access roads) will reduce the potential accessibility for hunters. As well, construction crews will not be permitted to hunt in the vicinity of the Project. After completion of each construction segment, construction access roads and access points to the winter road will be decommissioned and rehabilitated as soon as they are no longer required. Where necessary, physical barriers to prevent vehicular access will also be installed. The proposed extension of the Chief Barker Reserve from the existing Rice River Road through the new ASR alignment will help to inhibit hunting activity directly along the ROW. Reserve and hunting restriction signage along the ASR will communicate the areas status to ASR users. The extension of the Wildlife Reserve requires extensive dialogue with the local aboriginal communities, but was already identified to the study team by community members during the first round of engagement.

Moose tracking is proposed for a four year period to assess the effectiveness of mitigation measures and to monitor for changes in movement patterns and population (Appendix 3.2 Annex F). This monitoring will allow for adaptive management measures to be undertaken such as policing or additional fencing and other access controls. With the application of mitigation measures the effect on regional moose populations is

estimated to be low, and limited to the local area in the vicinity of the ASR. Overall significance of hunting on regional moose populations and behaviour is considered to be not significant.

Vehicular Collisions

The proposed ASR may result in moose-vehicular collisions. Collisions with construction vehicles are considered to be unlikely due to the low speed of travel of the heavy equipment, the high degree of activity in and around areas of active construction. Mortality during the operations and maintenance period is more likely to occur. Moose are not generally deterred by vehicular traffic disturbance from using the ROW and edge habitat. The potential effects to moose populations as a result of vehicle collisions is estimated to be low due in part to the relatively low frequency of vehicle movement and limited geographic extent (Table 8-9). Moose make use of roadways for travel and browse and are subject to collisions at night. No specific habitat for moose has been identified along the propose road that would be expected to cause a concentration of animals in a specific location. However, if any susceptible areas are identified, through the proposed monitoring program (Appendix 3.2 Annex F) or observations adaptive measures can be applied including movement controls (wildlife fences), road signage and posted speed limits in key areas. In consideration of personal safety. vehicles users travelling the road, will also be encouraged to purchase and install noise whistles that will warn animals of on-coming traffic and provide an opportunity to clear road prior to collision. With the application of mitigation measures, the effect of collisions on moose populations is estimated to be low with the overall significance considered to be not significant.

Predation

Roads can provide an access corridor for wolves with the potential to increase predation levels of ungulates in the vicinity of the Project area. Significant increases in predation that effect the moose population are not anticipated during construction as wolf populations will be discouraged from accessing the construction area as a result of the noise, dust and general activity levels. As described in the assessment of wolf predation on caribou, wolves are already understood to use the winter road corridor for access to the area during the winter. The ASR will provide additional opportunities for access during the other seasons, potentially raising the risk of predation during calving periods. However, the magnitude of the effect is expected to be offset by several factors including traffic movements which will discourage wolf use of the ASR corridor, closure of the winter road and access roads which will thereby eliminate an existing corridor, and the natural limits of movement created by the existing landscape. Wolf predation is anticipated to be primarily localized to the cleared ROW during the spring, summer and fall months due to limited access to the surrounding landscape as a result of (unfrozen) swampy areas (fen, bog, muskeg and peat terrain conditions) that will inhibit the geographic extent of wolf movement during non-winter months. While it is expected that predation levels may exceed those experienced by pre-Project conditions, the net increase in predation is anticipated to be low with the effect assigned a ranking of moderate (Table 8-9) relative to current conditions. Wolf collaring and surveys are

proposed for a four year period to monitor movements and hunting patterns, offer an opportunity to apply adaptive mitigation measures if required. The overall effects ranking is deemed to be low and the significance was determined to be not significant.

8.7.3 Other Wildlife

Other Wildlife including furbearers, song birds, mammals, etc are expected to be potentially negatively affected in terms of disturbances from construction activity, and traffic, habitat fragmentation, harvest increase, and traffic effects. Although there is significant habitat for migratory birds along the Lake Winnipeg shoreline, migratory birds are not expected in any concentrations in the area of the Project.

Project construction and operation has the potential to negatively affect other wildlife populations and behaviours, including fur bearers, song birds and mammals, primarily within areas in close proximity to the ASR and associated facilities (quarries, borrow pits, construction access roads). Construction activities (disturbance and habitat fragmentation), operational activities (traffic disturbance and collisions) and indirect affects associated with increased harvesting have the potential to effect the local populations or behaviours in the study area. Generally, with the exception of some short term construction implications, effects will remain unchanged for the Rice River Road portion of the project. The analysis pertains to the section of road north of the Rice River Road through to Bloodvein and Berens River.

Construction Disturbance

Construction of the proposed ASR and quarry blasting will result in increased noise, vibration and activity levels within the segment of the road under construction. These effects will influence an area within close proximity to the ASR ROW and associated facilities (quarries, borrow pits, construction access roads). Noise and vibration may alter the potential use of construction areas over the short term by songbirds and fur bearers. Amphibians and reptiles are also likely to avoid the immediate area of construction but remain in the general area. However, once the disturbance has ceased, most species will return to the area shortly after construction activity cessation. The potential adverse effects of construction activities on wildlife were estimated to be moderate (Table 8-9). Measures to mitigate the potential effects on wildlife populations include suspension of quarry blasting and other construction activities during spring months (May-June) and clearing the ROW only during the winter months to avoid disruptions to nesting and denning activities. With the application of mitigation measures (timing of activities), the net loss of wildlife habitat as a result of the project relative to available habitat is deemed low and not significant. With mitigation and monitoring measures, the residual effects of construction activities were determined to be low and thus not significant.

8.7 Environmental Effects on the Terrestrial Biology Environment

The following section provides a summary of the analysis of effects to the terrestrial biological environment.

The environmental effects analysis of the terrestrial biological environment was conducted utilizing the factors/VECs described in Section 8.3. A summary of the analysis of environmental effects on the terrestrial biological environment is summarized in Table 8-9.

8.7.1 Environmental Effects on Woodland Caribou

Project construction and operation has the potential to negatively affect caribou populations, primarily within areas in close proximity to the ASR and associated facilities (quarries, borrow pits, construction access roads). The potential for effects will be limited to the areas of the new ASR, north of the Rice River Road primarily in the vicinity of Pigeon River. The key mitigation measure that has been applied to minimize effects to the caribou population is the selection of an ASR alignment located well east of areas of highest caribou concentration (calving and wintering areas) in proximity of the Atikaki Provincial Park, as defined by habitat suitability indices and confirmed with surveys and tracking information (Section 7.3 and Appendix 3, Annex E). Analysis of the alternative route alignments (Inner Shoreline and Central Route) and confirmed in discussions with Manitoba Conservation (D. Brannen pers. comm.). The Recommended Revised Shoreline Route was identified to have the least potential to cause adverse effects to caribou. The Habitat Suitability Index (HSI) analysis shows a marginal amount of rated habitat lost to the project (28.74 km2), none of which is optimal habitat (Appendix 3.2 Figure 8).

Construction and Operational Disturbance

Construction of the proposed ASR and quarry blasting will result in increased noise and vibration, primarily within close proximity to the ASR ROW and associated facilities (quarries, borrow pits, construction access roads). Noise and vibration may alter the potential use of areas by caribou at and adjacent to Project facilities during the time that construction activities are occurring. Construction will occur in stages along designated sections of the ASR and not along the entire length at any one time. The potential adverse effects of construction activities on caribou were estimated to be moderate (Table 8-9). Measures to mitigate the potential effects on caribou include selection of the route alignment well east of prime caribou use areas. Other measures include suspension of quarry blasting and other construction activities during spring months (May-June) when caribou calving occurs, although caribou calving areas are not known to occur in proximity of the ASR ROW. While changes in wildlife use patterns, including caribou can occur over time, the area is not ranked highly for caribou by the Habitat Suitability Index. Caribou tracking is proposed for a four year period to assess the effectiveness of mitigation measures and to monitor for changes in caribou movement patterns and population (Appendix 3.2 Annex E). This monitoring will allow for adaptive management measures to be undertaken should the need arise. With mitigation and

Habitat Removal and Shifts in Use Patterns

The effect of the removal habitat on other wildlife species as a result of the road construction is deemed to be moderate. While the ASR ROW clearing will remove habitat that is suitable for a variety of species, the removed habitat was not found to be critical for any particular key species. What habitat will be cleared for the ASR ROW is widely available in the study area. Habitat fragmentation effects are limited relative to the baseline condition by efforts to align the ROW with the other existing ROWs (winter road or hydro distribution line) where possible. Where the new ROW is in previously undisturbed areas, the loss of habitat will be partially compensated overtime by the re-growth in the decommissioned portions of the existing winter road ROW. The net loss of wildlife habitat as a result of the project relative to available habitat is deemed low and not significant.

Some minor shifting in wildlife use patterns in relation to the ASR operation may be observed in some songbird species. Songbirds will make use of available nesting habitat as they find it in the spring. Some species will avoid the ROW and others, such as insectivorous species, will make use of the edge habitat it provides. Amphibians and reptiles habitat use patterns in the project area are not anticipated to change substantially although ditching along the roadway may create preferred habitat for some. The effect of the ASR operations is expected to be low and not significant.

The avoidance or use of the ASR ROW by fur bearers will be dependant on the individual species' preference. Some may use the ditches and road embankments for denning areas. Mustellids (fisher and marten) may avoid the area if traffic counts are high. In general, fur bearers are highly mobile and will shift their habitat use according to the changes in their environment. The effects of the ASR operations by furbearers is expected to be low and not significant.

Wolves are expected to occur at low densities throughout the east side area and their territories cover wide areas. Pack sizes vary depending on the availability of primary prey species (ungulates) in local areas. The wolf population may shift in relation to the ASR operation. The ASR may marginally increase the ability of the wolf to travel along the corridor and hunt. The effect of this shift on caribou and moose relative to what exists with the Winter Road and distribution corridors is described in Sections 8.7.1 and 8.7.2 respectively.

Hunting Pressures

The proposed ASR road will provide all-season access into the area between the Bloodvein and Bernes Rivers as compared to the existing winter road access. This could potentially allow trappers improved access to trapline by providing "jumping off points" for backcountry trails. However, trapping activities occur in winter and the Winter Road already provided such "jumping off points'. It is therefore anticipated that hunting pressures will not substantially change from what is occurring already and that the effect on furbearing populations will be negligible.

Vehicular Collisions

The proposed ASR may result in mortalities as a result of vehicular collisions. Collisions with construction vehicles are considered to be unlikely due to the low speed of travel of the heavy equipment, the high degree of activity in and around areas of active construction. Mortality during the operations and maintenance period is more likely to occur. However, some species may be deterred from the area by vehicular traffic disturbance. Overall the incidents of collisions with vehicles are anticipated to be low and not adversely affect any one population. The effects are deemed to be not significant.

8.7.4 Environmental Effects on Forest Resources

There are two primary vegetative communities within the project area which provide wildlife habitat; forests and wet vegetative communities classified as fens and bog. The forest community is classified as Boreal. Bogs are generally acidic, limiting the species of vegetation that can grow in the environment. Fens also provide limited habitat. In the Study area no rare or endangered vegetative species were identified. The related effects on these vegetative communities associated with the Project are principally loss of area and loss of function associated specifically with invasive species. Generally, with the exception of some short term construction implications, effects will remain unchanged for the Rice River Road portion of the project. The analysis pertains to the section of road north of the Rice River Road through to Bloodvein and Berens River.

Construction Disturbance

Construction of the proposed ASR will result in removal of forest and fen/bog vegetation along the ROW. Fens and bogs will be infilled with rock along the ASR. Forest vegetation will also be cleared in the ASR ROW. Experience has shown that these communities change little along the edge of the cleared area and therefore the potential adverse effects of construction activities were estimated to be low (Table 8-9). Measures to mitigate the potential effects on these vegetative communities include minimizing construction to 60m within the ROW, limiting development quarry sites to within 500m of the ROW and providing adequate ditching and drainage to maintain fens and bogs adjacent to the ASR. Closure of access roads and access points to non-required sections of the winter road system will allow the vegetative communities to return to these areas, offsetting losses of vegetation within the cleared ROW. With the application of mitigation measures, the net loss of vegetation communities as a result of the project relative to available vegetation from these various communities in the Study region is deemed low and not significant.

Invasive Species

The proposed ASR runs north-south and has the potential to allow invasive plant species and non-native weeds to access forests north of the Bloodvein River. The vegetative survey found evidence of such movement in the southern part of the study area near PR

304. The invasive species identified near PR 304 will not adapt to the wet environments found north of the Bloodvein River and thus pose little risk of invading fen and bog communities. In forested areas non-natives and weedy species often do not perform well with the natural fire cycle of the boreal forest. The potential effects of invasive species on the vegetative communities in the Project area is ranked as low. However, to avoid the spread of non-natives and invasive species northwards the following mitigation measures will be applied during construction; growing medium for reclamation activities will be reclaimed from local sources and native species will be specified for replanting and where possible sourced from local seed stocks. With mitigation measures, the residual effects of construction activities were determined to be low and thus not significant.

8.7.5 Environmental Effects on Rare and Endangered Species

Currently there is only one species identified within the study area listed under the *Manitoba Endangered Species Act* (Manitoba Conservation, 2009b) and *SARA* which is the woodland caribou (*Rangifer tarandus caribou*). Woodland caribou are known to occur in the study area and the east side of Lake Winnipeg is one of the most important habitats for this species in Manitoba.

No protection measures specific to the woodland caribou are currently legislated although the species is protected through the general protection measures afforded to them set out in *SARA* (where applicable).

The potential for construction and operations/maintenance activities will cause a temporary increase in noise and vibration due to general construction and quarry blasting. This may alter the use of the area by caribou at and adjacent to the preferred alignment during this time period. With proper use of mitigation and monitoring measures it has been determined that the residual effects to affect the woodland caribou is considered low. The preferred alignment is located west of the caribou calving grounds which are considered to be the most sensitive habitat for the species. In general, the caribou will avoid the area during construction but will readily return to the area following completion of construction.

As discussed in Section 8.7.1, mitigation measures available to minimize, even eliminate the effect of the project on woodland caribou are considered to be readily available and effective, and any effects of the Project are not considered to be threatening to the caribou over the life of the Project. As a result, the residual effect of Project activities on rare and endangered species is considered low and the overall significance rating is considered to be not significant.

8.8 Environmental Effects on the Socio-Economic Environment

This section summarizes the analysis of effects to the socio-economic environment as a result of construction and operation of the PR304 to Berens River All-Season Road.

Consistent with Canadian Environmental Assessment Agency guidelines, the analysis examined effects to the socio-economic VECs described in Section 8.3, resulting from

changes to the biological and physical environments caused by ASR construction, operations and maintenance activities. A summary of the effects analysis for the socio-economic environment is provided in Table 8-10.

The analysis of effects to the socio-economic environment was conducted relying on information provided by the effects analysis conducted for the physical and biological environments, as well as information obtained through the Community Engagement Program and the Traditional Ecological Knowledge studies conducted in each community within the study area, as described in Section 6.0.

8.8.1 Environmental Effects to Human Health and Well-Being

Food Supply

As discussed in Section 6.0: Traditional Ecological Knowledge, members of First Nations and NAC communities actively engage in traditional harvesting activities such as hunting, trapping, fishing and berry picking. Results of the TEK study show that these activities are an important source of food for local community members. Moose hunting activity is particularly prominent in all First Nation and NAC communities within the study area. As identified in the TEK Study, moose, fish and berries are an important food source for community members and their families. Berry plants, as well as moose and fish populations are abundant thought the study area, including within close proximity to the local communities. Caribou are not as important as a food supply, especially to those communities located close to the Lake Winnipeg shoreline, as their concentrations are much farther to the east, beyond ready access to these community members. The TEK studies showed that food gathering is conducted in an opportunistic manner – along accessible corridors such as watercourses, the winter road, and the electricity distribution line. Food gathering tends to be concentrated closest to the community.

The ways in which food supplies could potentially be affected by construction and operations/maintenance include:

- Reduction in the supply of moose, caribou, small game and other wildlife (e.g., birds, waterfowl) due to disturbance from ASR construction and operations activities such as noise and dust; over-hunting by non-community members as a result of increased access into previously inaccessible areas, and fatalities along the roadway;
- Reduction in community fish supply as a result of reduced fish populations from over-fishing, altered/disturbed/destroyed habitat sedimentation, erosion and spills of hazardous materials; and
- Reduction in berry supply as a result of removal of plants in the cleared ROW, as well as camp locations, construction staging areas and quarries/pits; contamination of berry plants by dust during construction and operations; potential over-harvesting by non-community members.

Following the pattern of hunting and gathering in accessible areas closest to the community, it is expected that the ASR will provide community members additional

access, into areas that were not previously used for hunting, fishing and gathering to the same extent as in areas closer to the communities. One concern is that the additional access could result in increased hunting, fishing and berry-picking by road users from outside the local area, causing additional pressure on wildlife populations and the potential for reduced populations and reduced food supply. With the low traffic volumes projected for the roadway, it is anticipated that the magnitude of this effect will be low. Further reductions in pressure can be achieved by limiting access into areas serviced by the construction access roads and segments of the winter road not incorporated into the ASR, through the addition of physical barriers during construction, and early decommissioning and rehabilitation following construction. Extension of the Chief George Barker Reserve will also help to reduce illegal hunting through enforcement. Community Wildlife Officers could be appointed to patrol the ASR periodically, acting as a deterrent to non-aboriginal hunters conducting hunting activities without a license.

Noise and dust could also have the potential to reduce the availability of wildlife populations for food supply, primarily by scaring them away from the local area of the ASR. Although the physical limit of noise and dust effects is expected to be localized to the area within close proximity of the road corridor, it is likely that most hunting and gathering would occur in that localized area where access is easiest. Reductions in wildlife populations resulting from disturbance caused by dust during construction and operations will be minimized with the implementation of control measures such as water application on the road surface during warmer months and chemical dust suppressants in the winter months. Noise effects will be minimized to the extent possible by ensuring construction vehicles are well maintained, and construction activities are restricted during the sensitive months of May and June when moose and caribou are calving and birds are nesting. To minimize the potential for nest abandonment, clearing activities will take place in winter to avoid the nesting season. Clearing and blasting activities should also be minimized or avoided during May and June. The effect of noise and dust on caribou is expected to be low as known caribou habitat is located well to the east of the ASR corridor.

The effect of ASR construction and operations on the supply of fish is also expected to be low, primarily due to the abundance of fish populations throughout the area. Although the ASR will provide community members new (or easier) access to segments of watercourses that are already used for fishing, it is not expected that the additional access will have a pronounced effect on fish populations or food supply. Local community members would be expected to continue their harvest activities in patterns identified through the TEK Study in addition to opportunistic gathering activities along the ASR. There is a concern that non-community members could over-fish the watercourses as a result of new access provided by the ASR. However, the traffic volumes projected for the ASR are very low, and access to the watercourses at crossing locations will be inhibited through fencing, minimized parking area and shoreline treatment such as gabion baskets and concrete, that would make access more challenging. Community Wildlife Officers could be appointed to patrol the road and deter fishing by non-aboriginal people without a license.

The potential effect of ASR construction and operations on berry gathering by community members as a result of clearing (plant removal) and dust created by construction and operations activities is expected to be low as the number of plants

affected is very small in comparison to the availability of plants throughout the study area.

The potential effect of ASR construction and operations activities on the overall food supply for local community members is expected to be low as the geographic extent of effects is low in relation to the availability of food supplies throughout the study area, and access by non-community members will be controlled by limiting travel to the road corridor. Because traffic volumes are expected to be low, the magnitude of this effect is also considered low. The residual effect of the ASR on food supplies is expected to be not significant.

Community Water Supply

There is a potential for domestic water supplies to become contaminated as a result of sedimentation (turbidity) and/or spilled contaminants arising from construction, operations and maintenance activities. Sources of domestic water supplies that could become contaminated as a result of development of the project include the Berens River, the Bloodvein River, and the Wanipigow River, all of which have been identified as sources of potable water supply and are located adjacent to the ASR right of way. Communities within the study area do not obtain water supply from ground water sources. However, ground water contamination as a result of the spill of contaminants could also result in potential contamination of community water supplies through discharge to surface.

Activities which could generate potential sources of contamination to the waterways include:

- Soil erosion and sediment caused by runoff from exposed surfaces during construction and the road surface during operations and maintenance;
- Spills of contaminants (primarily fuel and engine oil) during construction; and
- Contamination from blasting operations at quarries and borrow pits (construction and operations).

The frequency, magnitude and likelihood of events causing contamination in close proximity to water supply sources during any stage of the Project is considered low as:

- Communities deriving water for community supply are located a long distance from the road, providing (even in the worst case) significant opportunities for dilution and deposition of contaminants before reaching the community;
- Best Management Practices are available to control erosion and sedimentation, including sediment barriers such as silt fencing and turbidity curtains, isolation of in-stream working areas, and energy dissipation during construction; and surface treatments such as rip rap and vegetation during operations, as well as water management systems such as roadside drainage and collection ponds during operations and maintenance;

- Best Management Practices are available to prevent and control contamination from fuel and engine oil spills, such as dedicated re-fuelling areas during construction that include barriers and collection systems, spill clean-up kits and proper fuel storage facilities. A Hazardous Materials Management Plan and Emergency Response Plan will be in place to ensure that accidental spills are addressed quickly, and contaminants are removed from the site before severe contamination can occur.
- All potentially affected communities have water treatment systems that can effectively remove sediment from the water supply.

In the worst case that mitigation at source fails, contamination of the community water supply at Bloodvein, Berens River First Nation, Berens River NAC and Hollow Water First Nation as a result of sedimentation will not be affected as water is treated at a community water treatment plant which is capable of removing sediment. Depending on the specific substance, contaminated materials other than sediment may not be removed. However, concentrations that far from the source of any spill would be negligible (not measureable), and consequently would not have an effect on the potability of water supplies. Should a rare event occur that renders the community water supply unpotable, an alternate water supply would be provided on a temporary basis while the contamination is being remediated. The potential for contamination of community water supplies as a result of ground water contamination is considered to be low as frequency will be low; geographic extent is low and communities are not using ground water directly as a source of potable water.

Overall, the residual effect of ASR construction and operation on community water supplies is considered to be low and the overall significance considered not significant.

Medicinal Plants

There is a potential for plants used by community remembers for medicinal or therapeutic purposes to become affected by construction and operations/maintenance of the ASR, as a result of displacement during ROW clearance and/or disturbance by dust.

The results of the Traditional Ecological Knowledge Study did not reveal specific locations of medicinal plant species within the study area. However, based on information derived from interactions with community members during community meetings and field work, various medicinal plant species are known to exist throughout the entire study area, presumably including the ASR ROW.

Contamination of these special plant species will be controlled during construction and operations through Best Management Practices, such as watering of exposed surfaces during in the warmer months and the application of chemical dust suppressants in the winter months, as needed. Given the abundance of medicinal plants throughout the study area, the low geographic extent of the removal of medicinal plants from the cleared right-of-way, and the limited geographic extent of dust deposition from the ASR, the potential effect of the Project on medicinal plants is considered to be low. The residual

effect, following mitigation is considered to be low and the overall significance to be not significant.

Human Health Effects from Noise and Dust

Potential effects to air quality that could result in health effects to residents within settlement areas/communities in the study area as a result of dust during construction and operations/maintenance activities, are expected to be low as the communities are located a long distance from the road and dust from the ASR is not expected to travel that distance. The residual effect is considered to be not significant.

The potential for health effects from dust to vehicle operators travelling along the all-season road is considered to be moderate, especially during the summer months when vehicle windows are lowered. Effects could include respiratory irritation, and in the worst case, potential vehicle accidents resulting from reduced visibility. Dust will be controlled to the extent practical and cost-effective through the application of water to the road surface during the warmer months and chemical suppressants during the winter months. The residual effect of changes to air quality on human health is considered to be low

Noise from project construction, operations and maintenance, is not expected to be a significant issue to communities, as most construction, maintenance and operations activities will be located a long distance from settled areas, beyond the distance at which construction and noise would travel. Noise generated during the construction period, along segments of construction access roads in closer proximity to communities will be temporary. Routine vehicle maintenance will help to reduce noise levels, and construction activities will be limited to day-time hours when being undertaken in close proximity to settlement areas. No mitigation is required during the operations and maintenance stage, other than to ensure that construction access roads are closed and rehabilitated following the completion of construction. Residual effects of noise on community health are considered to be low and the overall significance is considered not significant.

8.8.2 Environmental Effects to the Local Economy

Tourism and Recreation

Currently, a number of the larger watercourses in the study area are being utilized for tourism and recreational opportunities such as canoeing, camping, hiking, sport fishing, and sport hunting, including the Wanipigow River, English Brook, Steeprock Creek, Rice River, Loon Creek, Bloodvein backwater channel, Bloodvein River, Pakaseken Creek, Longbody Creek, Petopeko Creek, Bradbury River, Pigeon River, Berens River and Poplar River. There is potential for reduced watercourse navigability to adversely affect these activities where structures are placed at watercourse crossings. Although Transport Canada has not yet identified all of these watercourses as navigable, it is assumed they will be subject to the provisions of the Navigable Waters Protection Act (NWPA), requiring that crossing structures meet the design standards established to protect navigation. In addition, all structures will be designed in accordance with AASHTO – LRFD Bridge Design Specifications (Latest Edition) as required by the

Government of Manitoba. As a result, effects on tourism and recreation are not considered to be significant.

During the operations and maintenance phase, it is expected that the ASR will create new opportunities for tourism providing access to areas that were previously inaccessible. Access to traditional lands by non-aboriginal hunters and fishers without licenses will be limited once construction access roads and segments of the winter road not incorporated into the ASR, are closed and rehabilitated.

Mitigation measures to ensure opportunities are shared by both tourists and local communities include providing access to both water and land that is first approved by local communities to ensure the protection of aboriginal rights on traditional lands. Monitoring by Community Wildlife Officers will also occur at the larger watercourse crossings to ensure that non-aboriginal hunters and fishers are in compliance with provincial licensing requirements. With these mitigation measures in place, the effects on tourism are expected to be not significant, even positive (potential for increased economic activity and revenue within the study area).

The potential effect of the ASR on tourism and recreation activities is considered to be low, even positive in that increased access could result in better opportunities for recreation, potentially resulting in increased employment and income within the local economy. Overall significance is considered to be not significant.

Commercial Trapping

Potential effects may be caused to commercial trapping activities as a result of ASR construction, operations and maintenance activities. Traplines registered to both aboriginal and non-aboriginal trappers cover the entire study area. Trapping activities could be affected by construction, operations and maintenance activities through disturbance of animals causing trapping numbers to be reduced and the displacement of animals due to the removal of habitat along the ROW.

Disturbance could be caused during construction by noise and dust from the use of the heavy equipment and blasting causing animals to relocate to another area (away from the trapline areas). Effects could also be caused during the operations and maintenance phase of the project, including vehicle noise and dust, as well as noise and dust from periodic quarrying activities that provide road surface materials for maintenance.

The magnitude of the effect on trapping is considered low and can be controlled through standard Best Management Practices such as dust and noise control, including dust suppressants and timing construction activities so as not affect calving and nesting seasons in May and June. In addition, animals are expected to avoid areas of disturbance, but likely will relocate in areas not far from the ROW, beyond the influence of noise and dust. The residual effect of these effects to wildlife, causing a reduction in trapping success, is considered not to be significant.

It is also expected that the effect of habitat removal along the ROW will also not be significant as the amount of land affected compared to the land available throughout the study area, is considered insignificant. Overall significance is considered to be not significant.

Although the effects of road construction, operation and maintenance are not expected to be significant, it is expected that mitigation will be applied to ensure that affected registered trappers are accommodated through a variety of mitigation types that will be discussed with community leaders and trappers. Overall, the residual effect to commercial trapping is low and the overall significance is considered to be not significant.

Commercial Fishing

Information obtained from community engagement activities and the TEK Study conducted within the local communities in the study area, indicated that commercial fishing is an important source of employment and income for communities located along the Lake Winnipeg shoreline. All known commercial fishing activity occurs in Lake Winnipeg, a long distance from construction and operations/maintenance activities for the all-season road. Due to the distance, potential effects of construction and operations/maintenance of the ASR on commercial fishing activities are expected to be low to non-existent. Residual effects are similarly estimated to be low with an overall significance which is considered to be not significant.

In contrast, the Project could provide a benefit to commercial fishing as the road is expected to provide improved access to prime fishing areas for equipment staging, and an alternate means of transporting fish to market in Winnipeg (via truck haul instead of barge).

Commercial Forestry

The study area falls within the Lake Winnipeg East Section, comprising Forest Management Units 30 to 39.

During construction, timber will be cleared within the ROW, and during operations, the road will provide improved access to areas that were previously difficult to access. This could result in an increase in licensed commercial forestry activity as well as illegal harvesting in licensed areas. Because the area of the cleared ROW is small in comparison to the available area with potential for commercial forestry, the effect of timber removal during construction is considered not to be significant. In addition, trees of commercial value that are cut during construction will be utilized for commercial purposes.

There is potential for increased employment and income opportunities as a result of improved access to areas with commercial forest potential. However, commercial forestry is a regulated activity in Manitoba requiring Forest Cutting Licenses (FMLs), issued based on approved cutting and management plans that emphasize the multi-use nature of a forest.

Although an increase in commercial forestry activity could compete with traditional uses of the forest by members of the local communities, the potential effect is considered to be low, and could be interpreted as positive if the addition of new jobs and contract opportunities (increased revenue within the local economy) is considered beneficial.

It is expected that land use planning and management will be implemented, in consultation with local community leadership, to ensure that commercial forestry is controlled, and provides economic opportunities for local communities.

Overall, the potential and residual effects of ASR construction and operations on commercial forestry is considered to be low and the overall significance is considered to be not significant.

Wild Rice Harvesting

Wild rice harvesting exists on a limited scale within the study area, primarily along the shoreline of some small lakes, well inland of the Lake Winnipeg shoreline. Because of the distance of the all-season road alignment from these areas, no effects from noise and dust are anticipated. Similarly, water quality effects are not anticipated as known rice harvest areas are all located upstream of the Project. Increased access to rice areas as a result of the all-season road is also not considered a significant effect as 1) very few families continue to conduct commercial rice harvesting; and 2) rice areas are still a long way from the road, making access difficult and not likely attractive to opportunistic rice harvesters from outside the local communities. Overall, no mitigation is considered necessary, and residual effects are considered to be low and not significant.

8.9 Environmental Effects on the Cultural Environment

Construction of the proposed ASR has the potential to negatively affect cultural resources, primarily through displacement during clearing of the ROW, or disturbance that could result from increased access to known sites, due to close proximity to the all-season road during operations.

The environmental effects analysis of the cultural environment was conducted utilizing the factors/VECs described in Section 8.3.

The assessment of effects on the cultural environment was conducted considering data provided from two sources:

- A Preliminary Heritage Study conducted by Quaternary which examined the recommended route alignment between Manigotogan to Berens River using data obtained from the Archaeological Site Database, maintained by Historic Resources Branch, Manitoba Culture, Heritage and Tourism.
- Traditional Ecological Knowledge Studies conducted in each of the First Nations communities within the study area.

The significance of potential environmental effects was assessed first, considering the possibility and magnitude of effect that could be caused to cultural VECs as a result of construction, operations and maintenance activities conducted during development and implementation of the Project. At this stage in the Project, mitigation measures have not been identified, other than consideration of realignment of the ROW.

The following paragraphs provide a summary of the assessment of effects of the Project on cultural resources, based on the information provided in Table 8-11.

8.9.1 Environmental Effects to Heritage Resources

River and major stream crossings hold the highest potential for the existence of heritage resources, in the form of major habitation sites, short-term campsites, game observation sites, quarry sites or spiritual sites, especially if food concentrating features are nearby, such as high quality and frequently visited fishing or hunting areas.

Areas of cultural significance identified by local First Nations community members who participated in the Traditional Ecological Knowledge Study, as described in Section 6.0, included summer outpost camps, burial sites, significant water bodies, and unique land forms. Any of these important features could be negatively affected by all phases of project development (construction, operations and maintenance). Although input on specific locations was not obtained, Study participants indicated that burial sites and other spiritual areas are concentrated around the following:

- Hollow Water First Nation and along the Wanipigow River and Lake, northward along the Rice River;
- Bloodvein River and Bloodvein First Nation towards the East Side of Lake Winnipeg;
- Pigeon River former reserve land and the Pigeon River;
- Berens River First Nation and NAC towards the East Side of Lake Winnipeg, and along the Berens River eastward toward Kacheposit;
- Little Grand Rapids First Nation and NAC, north towards Fishing Lake, and south of the reserve extending to Family Lake; and
- Poplar River First Nation towards the East Side of Lake Winnipeg, south east along Poplar River, in and surrounding Weaver Lake.

The highest potential for affecting cultural heritage resources is in locations where the ROW intersects traditional transportation corridors such as watercourses, lakes, trails, etc. Locations with the highest potential are at crossing locations of the primary rivers including the Bloodvein River, Bradbury River, Pigeon River, and Berens River. All crossings of these major rivers have a high potential to affect heritage resources. The right-of-way of the road segment that is located adjacent to the Berens River in the northernmost section of the ASR, also has a high potential to affect cultural heritage resources as it is located on high ground overlooking a major traditional transportation corridor (the Berens River). There is also high potential for effects to cultural resources where the alignment traverses adjacent to an unnamed lake, located about four kilometres south of the Pigeon River. Crossings of the larger streams including Long Body Creek, Petopeko Creek and Taskopekawe Creek, and unnamed tributaries of the larger rivers, have at least a moderate potential for effects to heritage resources,.

As there is and has historically been active traditional use of the lands throughout the study area, there is a high potential for the occurrence of heritage resources. Potential is highest at the major river crossings. The total area (geographic extent) potentially affected is therefore considered to be small, resulting in a low effect. Similarly, given the small footprint of the Project, the likelihood of encountering heritage resources of significant value is low. If significant resources are identified / disturbed, the magnitude of effect is also likely to be low as resources can be catalogued and documented, and re-located. Duration will also be low as after the initial encounter of heritage resources, and following the application of mitigation appropriate to the resource identified, the effect will not continue. Effects to heritage resources, where they occur, are typically considered to have limited temporal effect; more of a one-time event, although the potential for the identification and disturbance to resources that are found by road users, could extend over the life of the Project, so overall duration is considered moderate. The effect on heritage resources would not be reversible (but could be mitigable) during the life of the project. Accordingly a Permanence Significance rating of M (Moderate) was assessed.

Additional measures to be taken at detailed design include development of a confirmatory field investigations development of a pre-construction inventory, and on-going monitoring procedures during construction. Should features or areas with high heritage value be identified either during detailed design, or during construction, these will be identified and either:

- Refinement of the alignment will be undertaken, where it is feasible, or
- If the alignment cannot be refined to avoid the resource, and/or if clearing/construction has already started, work will be ordered to stop until appropriate measures can identified and discussed with/approved by the local community leadership and elders, as well as the Historic Resources Branch, Manitoba Culture, Heritage and Tourism.

Given the nature of potential effects, and the opportunity for effective mitigation, the residual effect of ASR development on heritage resources is considered to be low and the overall significance is considered to be not significant.

8.9.2 Environmental Effects to Archaeological Resources

There has been little archaeological investigation in the study area and very few sites with identified archaeological resources have been recorded. The investigation of recorded archaeological sites listed in the Manitoba Archaeological Sites Database, maintained by Historic Resources, yielded four sites in the entire area.

- In the southern section below Bloodvein -- two archaeological sites—EkLd-1 and EkLe-1— have been recorded, well beyond the centerline of the proposed ASR. Similarly, pictograph sites identified along the Pigeon River are also located well inland from the proposed route of the northern section.

- In section north of Bloodvein to Berens River, the FaLf-1 site is located at Flour Point on the west shore of Lake Winnipeg. A second site, ElLe-1, is located on an island in the mouth of the Bradbury River at the outlet to Lake Winnipeg.

None of these sites, given the location of the preferred alignment and the location of the sites, is expected to be affected by construction, operations or maintenance activities, so the potential effect is very low, and no mitigation is required, other than to conduct pre-construction field surveys and monitor construction as it proceeds.

As a result of the effects analysis to the cultural environment, the residual effects to archaeological resources is considered low and the overall significance is considered to be not significant.

8.9 Accidents and Malfunctions

Potential accidents and malfunctions may occur during construction and operational stages of the project. These include

- hazardous spills on land and water;
- accidental encroachment;
- fire and explosion;
- collisions; and
- third party damage.

The effects of accidents and malfunctions, proposed mitigation, monitoring and follow-up are discussed below.

Environmental effects associated with accidents could include potential effects to the air, water, soil, flora, fauna and aquatic life. An Environmental Management Plan (EMP) and a Health and Safety Plan (HSP) will be developed and will be put in place for construction. Plans will also be developed to prevent and/or minimize accidents/environmental emergencies and provide procedures and protocols to be followed in the case of an accident or malfunction that may result in adverse effects to the environment. In addition to a general requirement of all prime contractors on this Project is to have safety and health plans and be COR certified in addition to environmental protection plans. Safety plans will include safety surveillance, procedures and communication plans as well as safety audits carried out throughout construction. Parallel plans will also be established for maintenance activities.

A preliminary draft of an Emergency Response Plan has been developed and included in Appendix 7.3 of this EIA document. It will be further developed during the functional design phase and will form part of the EMP for the construction phase. This plan will be implemented in case of an emergency and will outline the procedures to be followed in cases where health, safety and environment are at risk, including the chain of command

to be followed. This plan is required to ensure that any emergency is dealt with in an effective manner.

The Emergency Response Plan will be further amended or updated, in consultation with MIT, to address requirements during the operations of the road.

8.9.1 Collisions

The potential exists for serious accidents from vehicle, equipment and wildlife collisions that could result in equipment damage, site damage or injury or mortalities to people and/or wildlife.

The potential of collisions with equipment or wildlife during construction will be managed through worksite safety plans and protocols.

The possibilities of collisions during operation are minimized with the proper design and construction of a road. PR 304 to Berens River all-season road (ASR) will be constructed based on accepted safety principles and in accordance with the most current safety standards. The most up-to-date Manitoba Government safety standards and road design criteria will be applied, and accepted construction practices will be followed. The design of the PR 304 to Berens River ASR will incorporate safety measures such as appropriate design and posted speeds, traffic signals and signage.

Since PR 304 to Berens River is a new road, its construction will result in an increase in travel capacity locally. The Province of Manitoba is responsible for road safety activities on the ASR; responsibilities include monitoring accident rates, identifying potential collision hazards and establishing an on-going program of safety improvement. Posted speed limits and other road traffic rules will be monitored during operation by policing authorities.

8.9.2 Hazardous Materials Spills

Hazardous materials will be used, transported and stored during the construction and operations phases of the ASR. Fuel, lubricants and domestic waste are the primary hazardous materials. Releases of hazardous materials during construction or operation could result from improper storage, collisions, or careless use. Depending on the nature, size and location of the release, contamination of soils or surface/ground waters may occur with indirect effects to wildlife, worker and public health and safety.

Detection, prevention and control measures will be applied throughout the construction and operations periods to prevent spills of hazardous materials. A Hazardous Material Management Plan will also from part of the Environmental Management Plan (EMP) and will provide stringent procedures for the handling, reuse or disposal of any hazardous waste generated during construction of the project. Contractors will be required to meet stringent requirements to conduct all re-fueling of equipment and storage of petroleum products appropriately, in accordance with all applicable guidelines, legislation and best management practices to minimize the risk of spills. Measures will include setback requirements from waterbodies, refueling requirements (i.e. drip pans) and on-site spill

response kits. In addition, emergency response plans will mandatory (Emergency Response Plan Appendix 7.3). Worker training programs will also be included in these plans to ensure the proper handling, storage, transportation and disposal of hazardous waste, including fuels and dangerous goods and emergency response and clean-up. Provincial regulations on hazardous material management and transportation address requirements for transportation, storage, spills and emergency response during operation of the road.

Proposed follow-up includes requiring periodic testing and evaluation of emergency response procedures, inspecting storage areas and inventory records and conducting environmental site assessments as part of hazardous material storage facility decommissioning.

With the application of the mitigation and follow-up measures, the potential effects on the environment and indirect effects on health and safety will be low. The residual effects from accidents involving hazardous spills are deemed not significant.

8.9.3 Accidental Encroachments

Accidental encroachment on protected areas (i.e. wildlife reserves) could occur during the construction period of the project. Protected areas will be monitored throughout the construction period. All protected zones will be clearly marked and cordoned off (flagged) to avoid any possible accidental encroachment and their related potential effects. Any negative effects caused by accidental encroachment will be reported to the appropriate regulatory agency, and corrective action taken.

With the application of the mitigation and monitoring measures, the potential effects on the environment will be low. The residual effects are deemed not significant.

8.9.4 Fires and Explosions

Fire could result from natural events and/or construction or operation activities associated with the ASR. Activities during construction such as welding, cutting, portable heaters, equipment malfunctions, incorrect storage of hazardous materials and worker smoking can result in fires. Explosions may occur during the handling of products with a risk of exploding such as petroleum products, explosives and blasting devices. Explosives will be utilized primarily for the purposes of blasting road foundation and quarries during construction; and quarries during operations.

Fires and explosions can seriously harm workers, the public or the surrounding environment. Depending on local conditions, localized fires spread. The risk of forest fires is usually at its highest during the summer months due to dry conditions. The potential adverse effects from fires and explosions are assessed to be high.

Fire prevention will be enforced through the application of the appropriate fire codes during construction and operation phase activities. The Emergency Response Plan (Section 10.3) will outline ways to deal with fires and provide emergency measures to be followed, should there be such an occurrence. Provincial fire hazard and risk

assessments will be used to guide construction or operations during the forest fire season. Restrictions will be in place on smoking at the work site and camp sites will be enforced on a risk basis.

8.9.5 Damage by Third Party

Damage to any part of the road by a third party can lead to serious accidents. While damage by a third party to the Project is usually of little consequence to the environment, it can lead to serious injury. As a prevention measure, warning signs and fencing will be installed around camps and fuel areas to prevent unauthorized access to these facilities. Access to the existing ASR will remain unaffected.

During operations standard road and safety signage (as per Manitoba Government Standards) will be deployed and maintained to minimize the risk of third party damage due to vehicular usage.

8.10 Cumulative Effects Analysis

The Cumulative Effects Assessment (CEA) associated with the proposed Project was undertaken in regard to the Cumulative Effects Assessment Practitioners Guide (CEAA, 1999). The Practitioners Guide suggests the following considerations:

- Effects of the proposed project in the context of the surrounding regional planning area;
- Effects relative to the existing transportation network and the future linkages created by the Project;
- Effects on Valued Ecosystem Components (VECs) due to interactions with other projects and not just the effects of the single action under review;
- Other past, existing, or currently identified planning initiatives; and
- The significance of other indirect or extended effects.

8.10.1 Scope of the Cumulative Effects Assessment

For the purposes of the cumulative effects analysis, the spatial and temporal boundaries are the same as defined for the Study Area of the Project. Project construction will occur over a 5 year time horizon and operation over the lifetime of project. Other projects and activities in the Study Area are reviewed over the next 5 to 10 years. Any activity beyond this is outside of the available planning horizon.

8.10.2 Other Existing and Planned Projects and Activities

Based on the above noted considerations, it has been determine that:

- The existing Rice River Road, winter roads, and local power distribution lines linking the local communities represent infrastructure initiatives in the study area that are duly considered in the basic effects analysis in this EIA.
- There are currently no major new resource development projects proposed within the Project Study Area related to mining or hydro-electric projects;
- The Province has indicated that no power transmission line is currently planned for the east side of Lake Winnipeg;
- There are no past, existing tourism activities that would be significant affected by the construction or operation of the ASR;
- Tembec Forest Management Licence No. 1 is in the study area. Active forestry operations are located to the east of Hollow Water FN.
- The UNESCO World Heritage Site designation is a planning initiative in the formative stage of development that has a future relationship to this Project. The Province has recently announced $10 million in funding to promote the establishment of this site, however, details on the plans for this area will not be formalized and submitted until 2011. The ASR Project is outside of the proposed boundary for the Heritage Site and is not anticipated to result in cumulative effects.
- East Side Road Transportation Study is currently in process, assessing opportunities to pursue transportation improvements between the communities on the east side of Lake Winnipeg and connections with the rest of the province. This study is still ongoing and no specific projects in the larger study area have yet been identified or planned. Some potential road projects well outside the study area have been proposed, but will not result in cumulative effects with this project.

8.10.3 Environmental Effects of the Project with the Potential for Cumulative Effects with Other Projects or Activities

Of the potential adverse environmental effects identified for the Project, the following are considered relevant for a cumulative effects assessment prior to the application of mitigation.

- Habitat disruption and fragmentation for keystone species (moose and caribou)
- Population effects on keystone species (moose and caribou) as a result of predation and hunting pressures.
- Surface water quality effects resulting from construction activities (erosion, sedimentation and spills of hazardous materials)
- Surface water quality effects resulting from the operation of the road (erosion, sedimentation and spills of hazardous materials associated with vehicular collisions)

8.10.4 Analysis

Potential environmental effects associated with the existing and planned projects/activities in the Project area are:

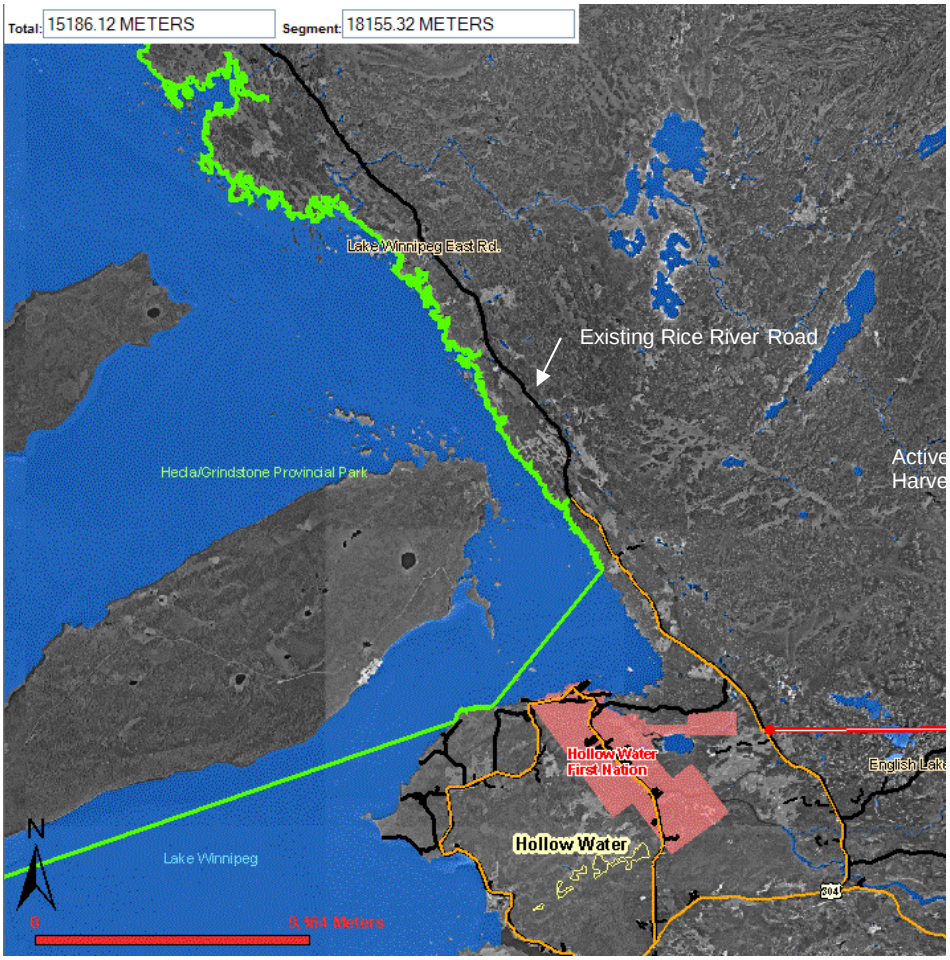
- Habitat fragmentation as a result of forestry activities and the existing winter road and hydro distribution ROWs;
- Adverse effects to keystone species as a result of the creation of movement corridors for predators (wolves) and improved hunting access; and
- Surface water quality effects from forestry activities (erosion, sedimentation and spills of hazardous materials) and winter road operations (spills).

Potential adverse effects of habitat fragmentation as a result of the existing winter road and hydro distribution line have been minimized through the following mitigation proposed for the Project. The alignment has been designed to follow the existing rights of way. The current alignment follows approximately 60% of the existing winter road. Measures identified to close access and allow for vegetative regeneration along the winter road will also further minimize fragmentation, as well as the effects of predator movements and hunting access on key stone species. The cumulative effect of these existing developments with the Project is identified as minor with the application of the aforementioned mitigation measures.

Potential adverse effects of forestry operations in relation to habitat fragmentation with the Project are identified as minor. The proposed upgrade of the existing Rice River Road (STA:000+000 to STA 77+000) will not alter the existing transportation activity associated with the Tembec Forest Management Licence No. 1 and their current Annual Operating Plans. Most of the current forest harvesting activity is occurring more than 15 kilometers east of the Hollow Water First Nations community. The harvest areas as

shown on Figure 8.1 below are accessed via the English Lake and Beaver Creek timber roads serving this area that connect to the existing Rice River Road approximately 1.0 and 3.0 km respectively north of the junction of the Rice River Road and PR304.

Figure 8 - 1: Tembec Forest Harvest Areas



A review of Tembec's forest harvesting areas identified in their Annual Operating Plans for the period 2003 to 2010, indicate that there are no harvesting areas currently identified within the 25 km of the segment of the ASR which is to be constructed between the area of the Bloodvein and the Berens River communities. Most forestry harvesting occurs in the eastern portion of the traditional land areas of the Hollow Water community. The potential for cumulative effects on water quality are minor as Tembec is subject to extensive water quality protection regulations and protection requirements as will the Project.

The potential for cumulative effects of the Project in relation to future forestry operations are mitigated through forestry plan licencing specifying the environmental protection measures. Government also controls timber harvesting quotas and long term plans. The Tembec management plan is up for renewal which offers government the opportunity to specify any additional mitigation measures that may be required to protect water quality and keystone species. As a result of the strength of the migitative measures and ability of the Crown to establish additional measures, the potential for adverse cumulative effects of the Project in relation to future forestry operation is deemed to be minor.

The proposed ASR must cross the Bloodvein River in order to provide transportation opportunities to the Bloodvein and Berens River First Nations. Alternative crossing points were identified from discussions with stakeholders and the Bloodvein First Nation. The preferred crossing and approaches followed the existing Manitoba Hydro distribution line and portions of the winter road network. The Manitoba Hydro right-of-way forms the western edge of the Bloodvein River segment of Atikaki Provincial Park. The proposed crossing alignment is adjacent to the Hydro right-of-way leaving portions of the proposed crossing alignment sitting just inside the western edge of the Atikaki Provincial Park boundary. Construction of the approaches and bridge at the preferred location is not an approved land use within a wilderness park and will require an adjustment to the Atikaki Park boundary to remove approximately 12.1 ha from the Park. The area proposed for removal includes boreal forest and riparian zone along the Bloodvien River. The ESRA is working with Manitoba Conservation regarding the park boundary adjustment and is proposing adding a comparable area to the Park along the Bloodvein River to off-set or compensate for the 12 ha proposed for removal. The area proposed to be added is also boreal forest in the vicinity of the Bloodvein River within 10km of the area proposed for removal. The proposed park boundary adjustments are illustrated in Figures 8.2 and 8.3. The intent of the proposed compensatory changes will not cause any cumulative effects.

The creation of the proposed Pimachiowin Aki World Heritage Site in the study area will not change the ownership of the land. Each jurisdiction will be responsible for planning and management in its area and all aboriginal and treaty rights will remain fully protected.

The route selection study for the ASR acknowledged the location of the proposed Pimachiowin Aki World Heritage Site in the development of route alternatives. The proposed route alignment for the ASR is currently outside of the proposed Pimachiowin Aki WHS and avoids conflicts with the resource and traditional use of this area. There is therefore no cumulative effects created by these two projects.

Figure 8 - 2: Atikaki Provincial Park Land Compensation

Figure 8 - 3: Proposed Adjustment to Existing Atikaki Provincial Park Boundary

8.10.5 Significance and Follow-up

The cumulative environmental effects of the project in combination with the effects of other projects or activities that have been and will likely be carried out within the Project Study area in the foreseeable future were determined to be insignificant. Follow- up in the form of environmental monitoring of keystone species and predator species for the Project will also identify potential cumulative effects related to habitat fragmentation. Follow-up water quality monitoring for cumulative effects is not required.

8.11 Effects of the Environment on the Project

Determination of possible effects of the environment on project activities is based on potential magnification of project activity effects because of weather conditions, the environmental effects associated with poor weather conditions, and induced environmental conditions or factors associated with flood events or forest fires.

Flooding

The proposed project is at risk of flooding due to seasonal flood events. However, the Project design standard of 1:100 year flood event for crossings is intended to limit the potential for flood damage and washouts at crossings and along the road network. In addition, the road will also include regular road side drains and culverts to accommodate seasonal drainage.

Local beaver populations within the immediate area of the ASR may cause damage due to the construction of beaver dams and the plugging of road culverts that may result in blockage of the established drainage system and localized flooding. Regular maintenance activities such as culvert clean-outs will serve address the potential for damage to the road and culvert crossings.

With the mitigation measures, the potential environmental effects from flooding are localized and deemed to be minor and not significant.

Forest Fires

Given the forest fire frequency on the east side of Lake Winnipeg, it is very likely that the portions of the proposed road will be subject to forest fire several times over the lifetime of the project including during construction and operation. In general the project components are made from materials that are not easily affected fire (rock and concrete This will involve periodic road closures, and possible damage to infrastructure such as bridges and maintenance compounds and equipment. Much of the road alignment passes through wetland areas and away from upland forest areas and this serves to reduce the forest fire risk to some degree.

Earthquake

The regional area is in a low seismic hazard area in Canada. Further consideration of the effects of an earthquake is not warranted in the EIA.

Variations in Climatic Conditions

The assessment has also considered the sensitivity of the project to variations in or changes to specific climate parameters (e.g. precipitation, wind, water levels, temperature, humidity, ice conditions, etc.) and has generally considered the potential effects that changes in such parameters may have on the project.

This project has focused on the environmental effects that could result from longer-term climate change effects that would alter the frequency and/or severity of extreme weather events that may affect the use and maintenance of the road.

8.11.1 Climate Change Considerations

Greenhouse Gas Emissions

During the construction period there will be a short term increase in Greenhouse Gas (GHG) Emissions attributed to the construction vehicles and associated equipment, but the quantity cannot be estimated with any accuracy at this time. The increase is not expected to be significant in the context of the provincial transportation sector GHG emissions.

Information presented in Section indicates that Greenhouse Gas (GHG) over a 10 year period of road operations is estimated to be as follows:

- CO Emissions 5.8 tonnes
- NOX Emissions 1.2 tonnes
- VOC Emissions 1.5 tonnes

The general conclusion that can be drawn is that the size and scale of this Project will alter the manner in which goods and services are transported within the study area but will not contribute to any significant increase in Greenhouse Gas (GHG) Emissions in a local or regional context with regard to the Provincial Transportation Sector.